HIGHWAY WORK PROPOSAL

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

Proposal Number: 014

COUNTY	STATE PROJECT	FEDERAL	PROJECT DESCRIPTION	HIGHWAY
St Croix	1020-01-80	WISC 2022372	Hudson - Baldwin; Ih 94 Swef 61 Hudson	IH 094

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: $530,000.00 Payable to: Wisconsin Department of Transportation	Attach Proposal Guaranty on back of this PAGE.
Bid Submittal Date: August 9, 2022 Time (Local Time): 11:00 am	Firm Name, Address, City, State, Zip Code **SAMPLE** **NOT FOR BIDDING PURPOSES**
Contract Completion Time October 27, 2023	
Assigned Disadvantaged Business Enterprise Goal 4%	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)

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

(Date Commission Expires)

Notary Seal

(Bidder Signature)

(Print or Type Bidder Name)

(Bidder Title)

For Department Use Only

Type of Work:
Grading, Base, Milling, Concrete Pavement, Asphalt Pavement, Culvert Pipe, Storm Sewer, Curb & Gutter, Sidewalk, Guardrail, Concrete Barrier, Weigh-In-Motion System, Building Construction, Communiucations Tower, Plantings, Fence, Signs, Sign Structures, Lighting, Pavement Markings

Notice of Award Dated	Date Guaranty Returned

PLEASE ATTACH
PROPOSAL GUARANTY HERE

Effective with November 2007 Letting

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.

Effective with August 2015 Letting

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 departments 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:

1. Have a properly executed annual bid bond on file with the department.

2. 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.

C 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)

March 2010

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

DECEMBER 2000

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.

Special Provisions

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SPECIAL PROVISIONS

1. General.

Perform the work under this construction contract for Project 1020-01-80, Hudson – Baldwin, IH 94 SWEF 61 Hudson, IH 94, St. Croix 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, 2022 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 (20220107)

2. Scope of Work.

The work under this contract shall consist of grading, base aggregate, storm sewer, culvert pipe, HMA pavement, concrete pavement, concrete curb and gutter, permanent signing, pavement marking, lighting, plantings, landscaping, building, weigh-in-motion system, static scale, 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.

Be advised that there may be multiple mobilizations for such items as: traffic control, signing items, temporary pavement marking, salvaged topsoil, seeding, mulching, drainage items and other incidental items related to staging. No additional payment will be made, by the department, for said mobilizations.

Prior to construction operations, enclose the proposed private on-site wastewater treatment system location with safety fence to prevent equipment from entering and storage of materials in this area. The cost of the safety fence is incidental to the cost of the private on-site wastewater treatment system.

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. St. Croix County will perform snow removal operations along IH 94 for freeways and ramps open to traffic. Provide for snow removal along the Hudson SWEF exit and entrance ramps to facilitate safe construction operations and as required to eliminate snow melt run-off from crossing IH 94 and ensure snow and ice are not tracked onto the IH 94 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. Roosts have been identified within 150 feet of the project limits. 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).

To avoid adverse impacts upon the NLEBs, no Clearing is allowed between June 1 and July 31, both dates inclusive.

If the required Clearing is not completed by May 31, the department will suspend all clearing and associated work directly impacted by Clearing. The department will issue a notice to proceed with Clearing and associated work directly impacted by clearing after consulting with the United States Fish and Wildlife Service (USFWS).

Submit a schedule and description of Clearing operations with the ECIP 14 days prior to any Clearing operations. The department will determine, based on schedule and scope of work, what additional erosion control measures shall be implemented prior to the start of Clearing operations, and list those additional measures in the ECIP.

Clearing and Grubbing

Complete all clearing and grubbing on the project by November 15, 2022.

Exit Ramp to Hudson SWEF

Complete construction operations at the Hudson SWEF exit ramp taper prior to November 18, 2022. Do not reopen until completing the ramp paving and shouldering through the ramp exit gore.

Entrance Ramp to Hudson SWEF

Complete construction operations at the Hudson SWEF entrance ramp taper prior to November 18, 2022. Do not reopen until completing the ramp paving and shouldering through the ramp entrance gore.

Construction Staging – IH 94

The work under this contract along IH 94 shall be completed in five stages.

At the beginning of each stage of traffic control requiring a traffic switch on IH 94, all temporary roadways and widening shall be open to traffic a minimum of three calendar days before starting any subsequent removal of existing pavement or structures that would preclude putting traffic back onto the existing lanes if unforeseen circumstances should arise.

Stage 1

Under off-peak lane closures, mill and overlay outside shoulder rumble strip along EB IH 94 to accommodate stage 2 traffic shift.

Stage 2A

Construct temporary pavement along the median of EB IH 94 from 286+00 EB – 395+00 EB to accommodate stage 2B traffic shift. Stage 2 will span the 2022 – 2023 winter months.

Stage 2B

Construct temporary pavement along the median of EB IH 94 from 222+00 EB – 270+00 EB to accommodate stage 3 traffic shift. Construct the new Hudson SWEF exit and entrance ramp connections to EB IH 94. Stage 2B will span the 2022 – 2023 winter months.

Stage 3

Remove the existing mainline weigh-in-motion (WIM) and install new WIM (at new location).

Stage 4

Remove the temporary pavement along the median of EB IH 94 from 222+00 EB – 395+00 EB. Install/reinstall maintenance crossovers and reconstruct median shoulder and ditching.

Stage 5

Under off-peak lane closures, reinstall outside shoulder rumble strip along EB IH 94.

Temporary Single-Lane Closures

Project staging requires roadside work zone, construction vehicle and/or traffic control device encroachments within 6-foot horizontal and/or vertical, from the edge of the shoulder side of a lane. These encroachments require a temporary single-lane closure of the IH 94 lane closest to construction. Refer to the article Lane Rental Fee Assessments for information regarding when lane closures are allowed without incurring lane rental fees.

Shoulder Closures

The contractor will be allowed to perform work on items that are located beyond 6-foot horizontal and/or vertical, from the edge of an open lane of traffic, utilizing a shoulder closure with the approval of the engineer. Construction vehicles and equipment shall be located outside of the 6-foot encroachment area. Shoulder closures shall only occur on one shoulder at a time in each direction. The existing roadway shall be open to two lanes of traffic in each direction. The lane closure restrictions outlined in the article for Lane Rental Fee Assessment will not apply to work that can be completed with an approved shoulder closure.

4. Lane Rental Fee Assessment.

A General

The contract designates some lane closures to perform the work. The contractor will not incur a Lane Rental Fee Assessment for closing lanes during the allowable lane closure times. The contractor will incur a Lane Rental Fee Assessment for each lane closure outside of the allowable lane closure times. If a lane is obstructed at any time due to contractor operations, it is considered a closure. The purpose of lane rental is to enforce compliance of lane restrictions and discourage unnecessary closures.

The allowable lane closure times are shown in the Traffic article.

Submit the dates of the proposed lane, ramp, and roadway restrictions to the engineer as part of the progress schedule.

B Lane Rental Fee Assessment

The Lane Rental Fee Assessment incurred for each lane closure, each ramp closure, and each full closure of a roadway, per direction of travel, is as follows:

- $4,000 per lane, per direction of travel, per hour broken into 15-minute increments

The Lane Rental Fee Assessment represents a portion of the cost of the interference and inconvenience to the road users for each closure. All lane, roadway, or ramp closure event increments 15 minutes and less will be assessed as a 15-minute increment.

The engineer, or designated representative, will be the sole authority in determining time period length for the Lane Rental Fee Assessment.

Lane Rental Fee Assessments will not be assessed for closures due to crashes, accidents, or emergencies not initiated by the contractor.

The department will assess Lane Rental Fee Assessment by the dollar under the administrative item Failing to Open Road to Traffic. The total dollar amount of Lane Rental Fee Assessment will be computed by multiplying the Lane Rental Assessment Rate by the number of 15-minute increments of each lane closure event as described above.

Lane Rental Fee Assessment will be in effect from the time of the Notice to Proceed until the department issues final acceptance. If interim completion time or contract time expires before the completion of specified work in the contract, additional liquidated damages will be assessed as specified in standard spec 108.11 or as specified within this contract.

stp-108-065 (20161130)

5. Traffic.

IH 94 shall remain open to all traffic with two lanes open in each direction at all times during peak hours as described under the IH 94 Peak Hours section.

The work under this contract shall be performed in a manner that will not interfere with the travel lanes and shoulders on IH 94 except as indicated on the plans. Do not haul across, unload material from, stop in, or otherwise interfere with traffic on any portion of IH 94 without a pre-approved traffic control plan and traffic control measures in place.

Traffic control for stage changes shall only be allowed during off-peak traffic periods. The contractor shall made maintain minimum of a 20-foot clear zone within the work zone along IH 94.

Hudson SWEF site construction

Construction of the exit and entrance ramp tapers can be completed during off-peak traffic periods or during Stage 3 when EB IH 94 traffic will be shifted onto temporary pavement in the median.

Mainline Weigh-In-Motion (WIM) construction

Traffic along EB IH 94 will be shifted off alignment onto temporary pavement during Stage 3 to all for the installation of the mainline WIM and adjacent pavement.

Virtual Weigh Station (VWS) construction

Traffic along USH 12 during construction of the VWS area will be reduced to one lane and temporary traffic signals will be utilized on both sides of the work zone to control traffic through the work zone. During construction of the VWS, the IH 94 alternate route will be rerouted south of IH 94 onto STH 35/STH 65.

Temporary lane closures will not be permitted during IH 94 peak travel hours as shown in the tables below:

IH 94 Peak Hours

Freeway Peak Hours		
Pre-Memorial Day		
	Eastbound	**Westbound**
Sunday	10am to 6pm	10am to 9pm
Monday	10am to 7pm	6am to 6pm
Tuesday	10am to 7pm	6am to 6pm
Wednesday	10am to 7pm	6am to 6pm
Thursday	10am to 7pm	6am to 7pm
Friday	9am to 8pm	6am to 7pm
Saturday	9am to 5pm	9am to 6pm

Freeway Peak Hours		
Memorial Day to Labor Day		
	Eastbound	**Westbound**
Sunday	10am to 6pm	10am to 9pm
Monday	10am to 7pm	6am to 6pm
Tuesday	10am to 7pm	6am to 6pm
Wednesday	10am to 7pm	6am to 6pm
Thursday	10am to 7pm	6am to 6pm
Friday	9am to 8pm	6am to 7pm
Saturday	9am to 5pm	9am to 6pm

Freeway Peak Hours		
Post Labor Day		
	Eastbound	**Westbound**
Sunday	10am to 6pm	10am to 9pm
Monday	10am to 7pm	6am to 6pm
Tuesday	1pm to 7pm	6am to 6pm*
Wednesday	12pm to 7pm	6am to 6pm*
Thursday	10am to 7pm**	6am to 6pm
Friday	9am to 8pm**	6am to 7pm
Saturday	9am to 5pm	9am to 6pm
* One lane allowed closed from 10am to 2pm		
** Two Lanes open 8am to 8pm for MEA		

The Minnesota Educator Academy (MEA) annual conference is held the third Thursday of October and generates significant traffic travelling through the IH 94 corridor on Thursday, Friday, and Sunday.

All lane and shoulder closures and duration are subject to the approval of the engineer based on operational needs and safety. Notify the engineer if there are any changes in the schedule, early completions, or cancellations of the scheduled work.

Wisconsin Lane Closure System Advance Notification

Provide the following advance notification to the engineer for incorporation into the Wisconsin Lane Closure System (LCS).

TABLE 108-1 CLOSURE TYPE AND REQUIRED MINIMUM ADVANCE NOTIFICATION

Closure type with height, weight, or width restrictions (available width, all lanes in one direction < 16 feet)	**MINIMUM NOTIFICATION**
Lane and shoulder closures	7 calendar days
Full roadway closures	7 calendar days
Ramp closures	7 calendar days
Detours	7 calendar days
Closure type without height, weight, or width restrictions (available width, all lanes in one direction ≥ 16 feet)	**MINIMUM NOTIFICATION**
Lane and shoulder closures	3 business days
Ramp closures	3 business days
Modifying all closure types	3 business days

Discuss LCS completion dates and provide changes in the schedule to the engineer at weekly project meetings in order to manage closures nearing their completion date.

Temporary Regulatory Speed Limit Reduction

During engineer-approved regulatory speed limit reductions, install temporary speed limit signs on the inside and outside shoulders of divided roadways to enhance visibility. When construction activities impede the location of a post-mounted regulatory speed limit sign relocate the sign for maximum visibility to motorists. If work last less than seven days mount the regulatory speed limit sign on a portable sign support.

Post temporary regulatory speed limit signs in work zone only during continuous worker activity. During periods of no work activity or when the traffic controls are removed from the roadway, cover or remove the temporary speed limit signs.

Conduct work operations in a manner that causes the least disruption to traffic movements on IH 94 and interchange ramps. 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 or vehicles. All access to IH 94 by construction equipment will be at existing interchange locations.

Do not perform work in the median concurrently with work in the outside lane or outside shoulder with IH 94 traffic running between work areas.

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 94.

Do not use maintenance crossings connecting eastbound and westbound roadways of IH 94 during construction operations unless the median lanes are closed to traffic. The contractor is responsible for maintaining and restoring all maintenance crossings to their original condition upon completion of this contract.

Construction traffic cannot travel counter-directional adjacent to IH 94 through traffic except for removal of traffic control devices for lane opening operations.

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 30 feet of the edge of traffic lane carrying IH 94 traffic or within the median during non-working hours. In the event of an emergency, protect any equipment, vehicles, or construction materials which remain within 30 feet of the edge of a traffic lane during non-working hours with temporary roadside barrier according to the standard specifications and meeting the requirements of the AASHTO Roadside Design Guide.

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
- St. Croix County Sheriff's Department
- St. Croix County Highway Department

6. 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 94 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, September 2, 2022 to 6:00 AM Tuesday, September 6, 2022 for Labor Day;
- From noon Friday, November 18, 2022 to 6:00 AM Monday, November 21, 2022 for Deer Season Opening Weekend;
- From noon Wednesday, November 23, 2022 to 6:00 AM Monday, November 28, 2022 for Thanksgiving;
- From noon Friday, December 23, 2022 to 6:00 AM Monday, December 26, 2022 for Christmas;
- From noon Friday, December 30, 2022 to 6:00 AM Monday, January 2, 2023 for New Year's Day;
- From noon Friday, May 26, 2023 to 6:00 AM Tuesday, May 30, 2023 for Memorial Day;
- From noon Friday, June 30, 2023 to 6:00 AM Wednesday, July 5, 2023 for Independence Day;
- From noon Friday, September 1, 2023 to 6:00 AM Tuesday, September 5, 2023 for Labor Day.

stp-107-005 (20210113)

7. Utilities.

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

stp-107-065 (20080501)

Underground and overhead utility facilities are located within the project limits. Coordinate construction activities with a call to Diggers Hotline or a direct call to the utilities that have facilities in the area, as required per state statues. Use caution to maintain the integrity of underground facilities and maintain OSHA code clearances from overhead facilities at all times.

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.

AT&T Legacy – Communication has underground facilities within the project limits at the following locations:

- Underground facilities are located in the area of ditch excavation from Station 337+00R – Station 349+00R and Station 376+00R – Station 389+00R.
- Underground facilities are located in the area of storm sewer and culvert construction at Station 343+35R, Station 345+22R, and Station 378+95R.

AT&T Legacy will replace the cable in conflict from Station 335+25 – Station 350+00 prior to construction. The cable will be replaced approximately 5 feet off the new right-of-way at a depth of 6 feet.

AT&T Legacy will replace the cable in conflict from Station 375+00 – Station 390+00 prior to construction. The cable will be replaced approximately 5 feet off the new right-of-way at a depth of 6 feet.

Relocations are anticipated to be completed by May 2022.

AT&T Wisconsin – Communication has underground facilities within the project limits at the following locations:

- Station 3369+12L in the area of culvert and roadway construction (connection to the existing building).
- Station 121+77US to Station 123+55US in the area of the virtual weigh station installation along USH 12.

AT&T Wisconsin will be discontinuing their underground telephone service to the existing building during construction, prior to the beginning of demolition. Provide advance notice prior to beginning demolition activities. AT&T Wisconsin anticipates two working days to discontinue service.

Baldwin Telecom – Communication has underground facilities within the project limits at the following locations:

- Station 121+77US to Station 123+55US in the area of the virtual weigh station installation along USH 12.

No conflicts anticipated.

CenturyLink – Communication has underground facilities within the project limits. No conflicts anticipated.

Level 3 Communications – Communication has underground facilities within the project limits at the following locations:

- Underground facilities are located in the area of ditch excavation from Station 337+00R – Station 349+00R and Station 376+00R – Station 389+00R.
- Underground facilities are located in the area of storm sewer and culvert construction at Station 343+35R, Station 345+22R, and Station 378+95R.

Level 3 Communications will replace the cable in conflict from Station 335+25 – Station 350+00 prior to construction. The cable will be replaced approximately 5 feet off the new right-of-way at a depth of 6 feet.

Level 3 Communications will replace the cable in conflict from Station 375+00 – Station 390+00 prior to construction. The cable will be replaced approximately 5 feet off the new right-of-way at a depth of 6 feet.

Relocations are anticipated to be completed by May 2022.

Midwest Natural Gas – Gas/Petroleum has underground facilities within the project limits. No conflicts anticipated.

Sprint Communications – Communication has underground facilities within the project limits at the following locations:

- Station 120+50US to Station 126+50US along the Union Pacific Railroad corridor in the area of the virtual weigh station installation along USH 12.

No conflicts anticipated.

St. Croix Electric Coop – Electricity has underground and overhead facilities within the project limits at the following locations:

- Underground facilities are located in Station 3369+12L in the area of culvert and roadway construction (existing building's electrical service).

St. Croix Electric Coop will replace the existing service with two new services (one single phase and one three phase) during construction once rough grading has been completed. Provide advance notice prior to beginning excavation within 50 feet of existing underground electrical service. St. Croix Electric Coop anticipates three working days to discontinue service.

Village of Roberts – Sewer has underground facilities within the project limits. No conflicts anticipated.

Village of Roberts – Water has underground facilities within the project limits. No conflicts anticipated.

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

- Overhead facilities are located in the area of the virtual weigh station installation from Station 121+77US to Station 123+55US.

No conflicts anticipated.

Xcel Energy – Gas/Petroleum has underground facilities within the project limits at the following locations:

- Station 120+50US to Station 126+50US along the south side of the road in the area of the virtual weigh station installation along USH 12.

No conflicts anticipated.

8. Work by Others – Utility.

WisDOT ITS – Communication has underground fiber optic facilities within the project limits at the following locations:

- Station 337+00R – Station 349+00R and Station 376+00R – Station 389+00R in the area of ditch excavation.
- Station 343+35R, Station 345+22R and Station 378+95R in the area of storm sewer and culvert construction.

WisDOT ITS – Communication facilities will be relocated by AT&T Legacy prior to construction. AT&T Legacy will replace the cable in conflict from Station 335+25 – Station 350+00 prior to construction. The cable will be replaced approximately 5 feet off the new right-of-way at a depth of 6 feet.

WisDOT ITS – Communication facilities will be relocated by AT&T Legacy prior to construction. AT&T Legacy will replace the cable in conflict from Station 375+00 – Station 390+00 prior to construction. The cable will be replaced approximately 5 feet off the new right-of-way at a depth of 6 feet.

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 “General Conditions of the Contract for Construction” AIA Document A201 - 2007, published by the American Institute of Architects.

If there is a discrepancy or conflict between the referenced specification and the standard specifications regarding contract administration, part 1 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, 2022 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, Hudson SWEF and Hudson SWEF Communications Tower: St. Croix Electric Coop has existing service facilities along the existing right-of-way at the rear of the site. St. Croix Electric Coop plans on providing two new underground services to the proposed building location (one single-phase for site lighting and one three-phase for the building) and one underground service to the communications tower location (single-phase). St. Croix Electric Coop will require three days to complete the electric service installation from the existing right-of-way to the proposed SWEF building during construction. Contact Rob Dooley of St. Croix Electric Coop at (715) 796-5637 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 Rob Dooley to check on the status of the application upon award of the bid.

Coordinate temporary electrical service needs for construction with Rob Dooley. 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.

Electrical Service, Hudson SWEF Mainline WIM and Hudson SWEF Virtual Weigh Station: Xcel Energy has existing service facilities located south of the proposed mainline weigh-in-motion location along Hallie Court. Xcel Energy plans on providing an underground service from Hallie Court to the IH 94 south right-of-way. Xcel Energy will work with the electrical contractor to install a meter socket on the

south side of IH 94 near the mainline weigh-in-motion system. Xcel Energy will require two days to complete the electric service installation to the proposed mainline WIM site during construction. Contact Darren Nordskog at (715) 386-4798 of Xcel Energy at least three weeks in advance of needing them onsite to coordinate electrical service installation efforts.

Xcel Energy has existing service facilities adjacent to the proposed virtual weigh station (VWS) along the south side of USH 12. Xcel Energy will work with the electrical contractor to install a meter socket between Ross Road and Clints Trail. Xcel Energy will require two days to complete the electric service installation to the proposed VWS site during construction. Contact Darren Nordskog at least three weeks in advance of needing them onsite to coordinate electrical service installation efforts.

A service request and application have been submitted for each location by the department. Contact Darren Nordskog to check on the status of the application upon award of the bid.

Any meter sockets/pedestals supplied and installed by the electrical contractor must be approved by Xcel Energy.

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

Network Service, Hudson SWEF: WisDOT Bureau of Traffic Operations has an existing network fiber facility located along the existing right-of-way at the rear of the site. The plans include providing a new underground service by installing conduit and fiber optic cable between the existing handhole and the proposed SWEF building for State Patrol use.

Contact Mark Woody at (715) 635-8173 of Wisconsin State Patrol 45 days in advance to coordinate splicing operations and to verify proper placement of fiber between the existing handhole and proposed connection to the Hudson SWEF building.

All necessary splicing, terminations, and equipment connections at the proposed Hudson SWEF building is to be included as part of the telecommunications work inside the building.

Utility installation costs for the network connection are included as part of the project.

Natural Gas Service, Hudson SWEF: Midwest Natural Gas has existing service facilities south of the project area. Midwest Natural Gas plans on providing an underground service from the south right-of-way to the proposed building location. Midwest Natural Gas anticipates three working days to complete the new service. Contact Rick Schermerhorn at (608) 780-0210 of Midwest Natural Gas 30 days prior to needing them onsite to coordinate construction activities.

A service request and application have been submitted by the department. Contact Justin Jacobs at (715) 797-0590 to check on the status of the application upon award of the bid.

Utility installation costs for natural gas service to the project SWEF building meter location is to be paid for separately by the department.

Internet Service, Hudson SWEF Virtual Weigh Station: Baldwin Telecom has existing service facilities along the south right-of-way in the project area. Baldwin Telecom plans on providing an underground service from the south right-of-way to the proposed location. Baldwin Telecom will require five days to complete the internet service installation. Contact Matt Knegendorf at (715) 688-1034 of Baldwin Telecom 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 Matt Knegendorf to check on the status of the application upon award of the bid.

Utility installation costs for internet service to the virtual weigh station location is to be paid for separately by the department.

11. Discontinued Utility Service Connection.

Coordinate all required utility work disconnections according to standard spec 107.22.

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

Electrical Service, Hudson SWEF Existing Mainline WIM: Xcel Energy has an existing service for the existing Hudson mainline WIM located east of Kinney Road. Contact Darren Nordskog at (715) 386-4798 of Xcel Energy at least three weeks in advance of needing them onsite to coordinate electrical service disconnection efforts.

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

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

The department has obtained a U.S. Army Corps of Engineers Section 404 permit. 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 Aaron Gustafson at (715) 919-3051.

stp-107-054 (20210708)

13. Information to Bidders, WPDES General Construction Storm Water Discharge Permit.

The department has obtained coverage through the Wisconsin Department of Natural Resources to discharge storm water associated with land disturbing construction activities of this contract under the Wisconsin Pollutant Discharge Elimination System General Construction Storm Water Discharge Permit (WPDES Permit No. WI-S066796-1). A certificate of permit coverage is available from the regional office by contacting Thomas DeWinter at (608) 266-8073. Post the permit in a conspicuous place at the construction site.

stp-107-056 (20180628)

14. 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.

15. Notice to Contractor, Notification of Demolition and/or Renovation No Asbestos Found.

Richard F. Stickler, License Number AII-425, inspected the existing Hudson SWEF for asbestos on June 19, 202. No regulated Asbestos Containing Material (RACM) was found on this structure. A copy of the inspection report is available from the HCCI August bid letting page under Supplemental Information.

According to NR447 and DHS159, ensure that DNR or DHS receives a completed Notification of Demolition and/or Renovation (DNR Form 4500-113 (R 4/11), or subsequent revision) via U.S. mail, hand-delivery, or using the online notification system at least 10 working days before beginning any construction or demolition. Pay all associated fees. Provide a copy of the completed 4500-113 form to Thomas DeWinter at (608) 266-8073 and DOT BTS-ESS attn: Hazardous Materials Specialist, PO Box 7965, Madison, WI 53707-7965. In addition, comply with all local or municipal asbestos requirements.

Use the following information to complete WisDNR form 4500-113:

- Site Name: Hudson SWEF
- Site Address: Mile Post 6, EB IH 94, Town of Warren, St. Croix County
- Ownership Information: WisDOT State Patrol
- Contact: Thomas DeWinter
- Phone: (608) 266-8073
- Age: 30 years old. This structure was constructed in 1992.

Insert the following paragraph in Section 6.g.:

> If asbestos not previously identified is found or previously non-friable asbestos becomes crumbled, pulverized, or reduced to a powder, stop work immediately, notify the engineer, and the engineer will notify the department's Bureau of Technical Services at (608) 266-1476 for an emergency response as specified in standard spec 107.24. Keep material wet until it is abated or until it is determined to be non-asbestos containing material.

stp-107-125 (20120615)

16. Removing Guardrail

Contact Joel Allen, Patrol Superintendent for the St. Croix Highway Department at (715) 760-1904 prior to removal of existing guardrail. The County may be interested in receiving salvaged materials for future maintenance repairs. Any materials deemed salvageable shall be delivered by the contractor to St. Croix County Highway Department, 300 Oak Ridge Parkway Baldwin, WI 54002. If the County determines they no longer are interested in receiving salvaged materials or materials are deemed unsalvageable, remove and dispose according to standard spec. 204.

17. Removing Buildings Hudson SWEF, Item 204.0235.001.

Conform to the requirements of standard spec 204 and as hereinafter specified.

The department has investigated the existing Hudson SWEF building for the presence of asbestos. The inspection report was completed on June 19, 2020. No asbestos was positively located, but asbestos is assumed to be present within the paper insulation in the back of electrical service boxes and metal doors with fire rating tags. The identified paper insulation and/or Transite contacts within electrical service panels/service boxes in the building are to be removed once de-energized and prior to demolition by an abatement contractor if the panels/boxes are not going to be re-used.

In addition, the existing Hudson SWEF building was investigated for the presence of lead-based paint. All paint chip samples that were taken tested negative for lead.

A copy of the inspection report is available from the HCCI August bid letting page under Supplemental Information.

Dispose of any and all materials associated with the buildings, including fuel tanks, underground pressure tanks, and lighting control cabinet as part of this item.

Coordinate electrical service termination to the building with the utility (St. Croix Electric Coop) before beginning construction/demolition activities. Remove electrical service to the building and abandon all existing conduits a minimum of 2-feet below finished grade.

Abandon wells and remove septic tanks within the site as separate items included in the contract.

Contact Sgt. Greg Venne at (715) 492-0699 to coordinate the beginning of demolition activities to ensure State Patrol has removed all files and equipment prior to the beginning of demolition. State Patrol will require three weeks to vacate the site prior to demolition.

The contractor is responsible for the proper disposal of all items located within the existing buildings once State Patrol has vacated the site. This includes (but is not limited to) any remaining fluorescent light bulbs/fixtures, tires, or other miscellaneous supplies stored onsite.

18. Removing Street Light Assembly, Item 204.9060.S.001.

A General

This special provision describes removing existing street light assemblies and salvaging or disposing them off the project site.

B Materials

Poles and luminaire arms shall be either salvaged or disposed off the project site by the contractor, as directed by the engineer in the field. The contractor shall be responsible for the disposal of HPS luminaires and internal wiring.

C Construction

After coordination with the NW Region Electrical Unit, and the local utility, the existing lighting equipment shall be disconnected and transported off site to the NW region electrical facilities and/or to a recycling/garbage facility as directed by the engineer in the field.

All existing lighting equipment or miscellaneous accessories designated for salvage shall be removed from the unit without compromising the ability of the item to be reinstalled. The contractor will be responsible for items and shall replace anything damaged during the remove and salvage process.

Disconnect all luminaires for separate disposal.

D Measurement

The department will measure Removing Street Light Assembly by each assembly removed, 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
204.9060.S.001	Removing Street Light Assembly	EACH

Payment is full compensation for disconnecting luminaires from the assembly for separate disposal; for removing poles, luminaire arms, and miscellaneous accessories; and for disposal or salvage of all other removed materials.

The department will pay separately for luminaire disposal under the item 659.5000.S Lamp, Ballast, LED, Switch Disposal by Contractor.

19. Removing Traffic Signal Assembly, Item 204.9060.S.002.

A General

This special provision describes removing existing traffic signal assemblies and salvaging or disposing them off the project site.

B Materials

Poles and signal heads shall be either salvaged or disposed off the project site by the contractor, as directed by the engineer in the field. The contractor shall be responsible for the disposal of internal wiring.

C Construction

After coordination with the NW Region Electrical Unit, and the local utility, the existing signal equipment shall be disconnected and transported off site to the NW region electrical facilities and/or to a recycling/garbage facility as directed by the engineer in the field.

All existing signal equipment or miscellaneous accessories designated for salvage shall be removed from the unit without compromising the ability of the item to be reinstalled. The contractor will be responsible for items and shall replace anything damaged during the remove and salvage process.

Disconnect all bulbs for separate disposal.

D Measurement

The department will measure Removing Traffic Signal Assembly by each assembly removed, 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
204.9060.S.002	Removing Traffic Signal Assembly	EACH

Payment is full compensation for disconnecting bulbs from the assembly for separate disposal; for removing poles, luminaire arms, and miscellaneous accessories; and for and disposal or salvage of all other removed materials.

The department will pay separately for bulb disposal under the item 659.5000.S Lamp, Ballast, LED, Switch Disposal by Contractor.

20. Removing Speaker Assembly, Item 204.9060.S.003.

A General

This special provision describes removing existing speaker assemblies and salvaging or disposing them off the project site.

B Materials

Speakers shall be either salvaged or disposed off the project site by the contractor, as directed by the engineer in the field. The contractor shall be responsible for the disposal of wood posts and internal wiring.

C Construction

After coordination with the NW Region Electrical Unit, and the local utility, the existing speaker equipment shall be disconnected and transported off site to the NW region electrical facilities and/or to a recycling/garbage facility as directed by the engineer in the field.

All existing speaker equipment or miscellaneous accessories designated for salvage attached to the existing wood posts shall be removed from the unit without compromising the ability of the item to be reinstalled. The contractor will be responsible for items and shall replace anything damaged during the remove and salvage process.

D Measurement

The department will measure Removing Speaker Assembly by each assembly removed, 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
204.9060.S.003	Removing Speaker Assembly	EACH

Payment is full compensation for removing wood poles, steel pole, screw-in bases, luminaire arms, luminaires, communication equipment, miscellaneous accessories and disposal or salvage of all removed materials.

21. Removing Electronic Message Board, Item 204.9060.S.004.

A General

This special provision describes removing existing electronic message boards and salvaging or disposing them off the project site.

B Materials

Message boards shall be either salvaged or disposed off the project site by the contractor, as directed by the engineer in the field. The contractor shall be responsible for the disposal of internal wiring.

C Construction

After coordination with the NW Region Electrical Unit, and the local utility, the existing message board shall be disconnected and transported off site to the NW region electrical facilities and/or to a recycling/garbage facility as directed by the engineer in the field.

All existing electronic message board equipment or miscellaneous accessories designated for salvage shall be removed from the unit without compromising the ability of the item to be reinstalled. The contractor will be responsible for items and shall replace anything damaged during the remove and salvage process.

D Measurement

The department will measure Removing Electronic Message Board by each message board removed, 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
204.9060.S.004	Removing Electronic Message Board	EACH

Payment is full compensation for removing message board, miscellaneous accessories and disposal or salvage of all removed materials.

22. Removing Electrical Pedestal, Item 204.9060.S.005.

A General

This special provision describes removing existing electrical pedestal and disposing them off the project site.

B Materials

Electrical pedestal shall be disposed away from the project site by the contractor.

C Construction

After coordination with the NW Region Electrical Unit, and the local utility, the existing electrical pedestal shall be disconnected and disposed of.

D Measurement

The department will measure Removing Electrical Pedestal by each pedestal removed, 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
204.9060.S.005	Removing Electrical Pedestal	EACH

Payment is full compensation for removing pedestal, miscellaneous accessories and disposal of all removed materials.

23. Removing Security Camera, Item 204.9060.S.006.

A General

This special provision describes removing existing security cameras and salvaging or disposing them off the project site.

B Materials

Security cameras shall be either salvaged or disposed off the project site by the contractor, as directed by the engineer in the field. The contractor shall be responsible for the disposal of internal cabling.

C Construction

After coordination with the NW Region Electrical Unit, and the local utility, the existing security camera shall be disconnected and transported off site to the NW region electrical facilities and/or to a recycling/garbage facility as directed by the engineer in the field.

All existing security camera equipment or miscellaneous accessories designated for salvage shall be removed from the unit without compromising the ability of the item to be reinstalled. The contractor will be responsible for items and shall replace anything damaged during the remove and salvage process.

D Measurement

The department will measure Removing Security Camera by each camera removed, 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
204.9060.S.006	Removing Security Camera	EACH

Payment is full compensation for removing security camera, miscellaneous accessories and disposal or salvage of all removed materials.

24. Removing CORS Station, Item 204.9060.S.007.

A Description

This special provision describes removing the existing CORS stations conforming to standard spec 204.

B Materials

Each concrete monument is a decommissioned Continuously Operating Reference Station (CORS) and consists of a concrete pillar set atop a concrete base. The approximate location of the concrete monuments are Station 2368+97P RT and Station 2369+77P RT.

C Construction

Excavate and remove concrete monuments.

Dispose of concrete monuments as specified for disposing of materials under standard spec 203.3.5.

Backfill holes resulting from removing concrete monuments as specified for backfilling trenches in standard spec 203.3.6.

Backfill to the elevation of the natural ground, the proposed finished earth subgrade, or finished slopes, as necessary due to the location of the removed concrete monuments.

D Measurement

The department will measure Removing CORS Station by each station removed, 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
204.9060.S.007	Removing CORS Station	EACH

Payment is full compensation for removing the existing CORS Stations, associated pull boxes and conduit, miscellaneous accessories, and disposal or salvage of all removed materials.

25. Removing Electrical Conductors from Existing Conduit, Item 204.9090.S.001.

A General

This special provision describes removing electrical conductors from existing conduit and salvaging or disposing them off the project site.

B (Vacant)

C Construction

Wires shall be removed from the existing underground conduits as shown on the plans and as directed by the engineer. The engineer shall verify the extent of the wiring removal prior to disconnecting luminaires. Any necessary splices or disconnections shall be done as part of this pay item. Removed wires shall become property of the contractor and shall be disposed of off the project site.

D Measurement

The department will measure Removing Electrical Conductors from Existing Conduit by the linear foot, acceptably completed.

E Payment

The department will measure Removing Electrical Wires from Existing Conduit by linear feet of conduit from where wires shall be removed and disposed of, regardless of conductor quantity within conduit, acceptably completed. The vertical length and wire slack shall be incidental to this pay item.

ITEM NUMBER	DESCRIPTION	UNIT
204.9090.S.001	Removing Electrical Conductors from Existing Conduit	LF

Payment is full compensation for removing electrical conductors, miscellaneous accessories and disposal or salvage of all removed materials.

26. 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)

27. Rout and Seal, Item 415.6000.S.

A Description

This special provision describes routing, cleaning, drying, and sealing the longitudinal edge of pavement joints in new asphaltic pavement shoulders immediately adjacent to the edge of the concrete mainline pavement.

B Materials

Furnish material that conforms to the requirements of the Specifications for Joint Sealants, Hot-Poured, for Concrete and Asphalt Pavements, ASTM Designation: D 6690, Type II, modified to require that the bond strength test be run at -20 degrees F. (The unmodified ASTM D 6690, Type II allows this test to be run at either 0 degrees F or -20 degrees F.)

Deliver each lot or batch of sealing compound to the jobsite in the manufacturer’s original sealed container. Mark each container with the manufacturer’s name, batch or lot number, and the safe heating temperature. Present the manufacturer’s certification stating that the compound meets the requirements of this specification. Before applying the sealant, furnish to the engineer a certificate of compliance and a copy of the manufacturer’s recommendations on heating and applying the sealant.

C Construction

C.1 Equipment

Heat the sealing compound to the pouring temperature recommended by the manufacturer in an approved kettle or tank, constructed as a double boiler, with the space between the inner and outer shells filled with oil or other satisfactory heat transfer medium. If, and when, using the heating kettle on concrete or asphaltic pavement, properly insulate the heating kettle to ensure heat is not radiated to the pavement surface.

Make rout cuts in a single pass. Two-pass cutting will not be allowed. Use a self-propelled mechanical router capable of routing the bituminous pavement to provide a 1.0:1.0 depth to width ratio of all routed cracks. The router blade or blades shall be of such size and configuration to cut the desired joint reservoir in one pass. No spacers between blades shall be allowed unless the contractor can demonstrate to the engineer that the desired reservoir and rout cut can be obtained with them. Either wet or dry routing will be permitted provided the above conditions are met. Use a pressure distributor for applying sealing material through a hand-operated wand or nozzle according to sealant manufacturer’s instructions.

C.2 Methods

Conduct the operation so that the routing, cleaning, and sealing are continuous operations. Traffic shall not be allowed to knead together or damage the routed joints. Rerout, if necessary, routed joints not sealed before traffic is allowed on the pavement when routing and sealing operations resume. Do not perform rout cutting, cleaning, and sealing, within 48 hours of the placement of the shoulder's surface course.

Rout the longitudinal joint to a minimum width of 3/4 inches and a minimum depth of 3/4 inches. Use a power vacuum or equivalent to immediately remove any routing slurry, dirt, or deleterious matter adhering to the joint walls or remaining in the joint cavity, or both. Before sealing, dry the cleaned joints either by air-drying or by using a high capacity torch. Immediately before sealing, blow out the dried crack with a blast of compressed air, 80-psi minimum. Continue cleaning until the joint is dry, and until all dirt, dust, or deleterious matter is removed from the joint and adjacent pavement to the satisfaction of the engineer. If the air compressor produces dirt or other residue in the joint cavity, the contractor shall be required to clean the joint again.

If cleaning operations could cause damage to, or interfere with, traffic in adjacent lanes, or both, provide protective screening that is subject to the approval of the engineer to the cleaning operation.

Following cleaning, dry the routed joints and warm them with a hot air lance. Take care not to burn the pavement surface. Under no circumstances shall more than two minutes elapse between the time the hot air lance is used, and the sealant is placed.

Provide positive temperature control and mechanical agitation. Do not heat the sealant to more than 20 degrees F below the safe heating temperature. The safe heating temperature can be obtained from the manufacturer's shipping container. Provide a direct connecting pressure type extruding device with nozzles shaped for insertion into the joint. Immediately remove sealant spilled on the surface of the pavement.

Seal the joints when the sealant material is at the pouring temperature recommended by the manufacturer. Fill the joint such that after cooling, the sealant is flush with the adjacent pavement surface. Do not overfill the joint; the engineer may allow a very slight overband. Sand shall not be spread on the sealed joints to allow for opening to traffic. Before opening to traffic, the sealant shall be tack free.

D Measurement

The department will measure Rout and Seal in length by the linear foot, completed according to the contract and accepted.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
415.6000.S	Rout and Seal	LF

Payment is full compensation for rout cutting; cleaning the joint; sealing the joint; and cleanup.

stp-415-100 (20210113)

28. QMP HMA Pavement Nuclear Density.

A Description

Replace standard spec 460.3.3.2 (1) and standard spec 460.3.3.2 (4) with the following:

(1) This special provision describes density testing of in-place HMA pavement with the use of nuclear density gauges. Conform to standard spec 460 except as modified in this special provision.

(2) Provide and maintain a quality control program defined as all activities and documentation of the following:

1. Selection of test sites.
2. Testing.
3. Necessary adjustments in the process.
4. Process control inspection.

(3) Chapter 8 of the department's construction and materials manual (CMM) provides additional detailed guidance for QMP work and describes required procedures.

https://wisconsindot.gov/rdwy/cmm/cm-08-00toc.pdf

(4) The department's Materials Reporting System (MRS) software allows contractors to submit data to the department electronically, estimate pay adjustments, and print selected reports. Qualified personnel may obtain MRS software from the department's web site at:

http://www.atwoodsystems.com/

B Materials

B.1 Personnel

(1) Nuclear gauge owners and personnel using nuclear gauges shall comply with WisDOT requirements according to 460.3.3 and CMM 8-15.

B.2 Testing

(1) Conform to ASTM D2950 and CMM 8.15 for density testing and gauge monitoring methods. Conform to CMM 8-15.10.4 for test duration and gauge placement.

B.3 Equipment

B.3.1 General

(1) Furnish nuclear gauges according to CMM 8-15.2.

(2) Furnish nuclear gauges from the department's approved product list at

https://wisconsindot.gov/Pages/doing-bus/eng-consultants/cnslt-rsrces/tools/appr-prod/default.aspx

B.3.2 Comparison of Nuclear Gauges

B.3.2.1 Comparison of QC and QV Nuclear Gauges

(1) Compare QC and QV nuclear gauges according to CMM 8-15.7.

B.3.2.2 Comparison Monitoring

(1) Conduct reference site monitoring for both QC and QV gauges according to CMM 8-15.

B.4 Quality Control Testing and Documentation

B.4.1 Lot and Sublot Requirements

B.4.1.1 Mainline Traffic Lanes, Shoulders, and Appurtenances

(1) Divide the pavement into lots and sublots for nuclear density testing according to CMM 8-15.10.2.

(2) Determine required number of tests according to CMM 8-15.10.2.1.

(3) Determine random testing locations according to CMM 8-15.10.3.

B.4.1.2 Side Roads, Crossovers, Turn Lanes, Ramps, and Roundabouts

(1) Divide the pavement into lots and sublots for nuclear density testing according to CMM 8-15.10.2.

(2) Determine required number of tests according to CMM 8-15.10.2.2.

(3) Determine random testing locations according to CMM 8-15.10.3.

B.4.2 Pavement Density Determination

B.4.2.1 Mainline Traffic Lanes and Appurtenances

(1) Calculate the average sublot densities using the individual test results in each sublot.

(2) If all sublot averages are no more than one percent below the target density, calculate the daily lot density by averaging the results of each random QC test taken on that day's material.

(3) If any sublot average is more than one percent below the target density, do not include the individual test results from that sublot when computing the lot average density and remove that sublot's tonnage from the daily quantity for incentive. The tonnage from any such sublot is subject to disincentive pay as specified in standard spec 460.5.2.2.

B.4.2.2 Mainline Shoulders

B.4.2.2.1 Width Greater Than 5 Feet

(1) Determine the pavement density as specified in B.4.2.1.

B.4.2.2.2 Width of 5 Feet or Less

(1) If all sublot test results are no more than 3.0 percent below the minimum target density, calculate the daily lot density by averaging all individual test results for the day.

(2) If a sublot test result is more than 3.0 percent below the target density, the engineer may require the unacceptable material to be removed and replaced with acceptable material or allow the nonconforming material to remain in place with a 50 percent pay reduction. Determine the limits of the unacceptable material according to B.4.3.

B.4.2.3 Side Roads, Crossovers, Turn Lanes, Ramps, and Roundabouts

(1) Determine the pavement density as specified in B.4.2.1.

B.4.2.4 Documentation

(1) Document QC density test data as specified in CMM 8.15. Provide the engineer with the data for each lot within 24 hours of completing the QC testing for the lot.

B.4.3 Corrective Action

(1) Notify the engineer immediately when an individual test is more than 3.0 percent below the specified minimum in standard spec 460.3.3.1. Investigate and determine the cause of the unacceptable test result.

(2) The engineer may require unacceptable material specified in B.4.3(1) to be removed and replaced with acceptable material or allow the nonconforming material to remain in place with a 50 percent pay reduction. Determine limits of the unacceptable area by measuring density of the layer at 50-foot increments both ahead and behind the point of unacceptable density and at the same offset as the original test site. Continue testing at 50-foot increments until a point of acceptable density is found as specified in standard spec 460.5.2.2(1). Removal and replacement of material may be required if extended testing is in a previously accepted sublot. Testing in a previously accepted sublot will not be used to recalculate a new lot density.

(3) Compute unacceptable pavement area using the product of the longitudinal limits of the unacceptable density and the full sublot width within the traffic lanes or shoulders.

(4) Retesting and acceptance of replaced pavement will be as specified in standard spec 105.3.

(5) Tests indicating density more than 3.0 percent below the specified minimum, and further tests taken to determine the limits of unacceptable area, are excluded from the computations of the sublot and lot densities.

(6) If two consecutive sublot averages within the same paving pass and same target density are more than one percent below the specified target density, notify the engineer and take necessary corrective action. Document the locations of such sublots and the corrective action that was taken.

B.5 Department Testing

B.5.1 Verification Testing

(1) The department will have a HTCP certified technician, or ACT working under a certified technician, perform verification testing. The department will test randomly at locations independent of the contractor's QC work. The department will perform verification testing at a minimum frequency of 10 percent of the sublots and a minimum of one sublot per mix design. The sublots selected will be within the active work zone. The contractor will supply the necessary traffic control for the department's testing activities.

(2) The QV tester will test each selected sublot using the same testing requirements and frequencies as the QC tester.

(3) If the verification sublot average is not more than one percent below the specified minimum target density, use the QC tests for acceptance.

(4) If the verification sublot average is more than one percent below the specified target density, compare the QC and QV sublot averages. If the QV sublot average is within 1.0 lb/ft^3 of the QC sublot average, use the QC tests for acceptance.

(5) If the first QV/QC sublot average comparison shows a difference of more than 1.0 lb/ft^3 each tester will perform an additional set of tests within that sublot. Combine the additional tests with the original set of tests to compute a new sublot average for each tester. If the new QV and QC sublot averages compare to within 1.0 lb/ft^3, use the original QC tests for acceptance.

(6) If the QV and QC sublot averages differ by more than 1.0 lb/ft^3 after a second set of tests, resolve the difference with dispute resolution specified in B.6. The engineer will notify the contractor immediately when density deficiencies or testing precision exceeding the allowable differences are observed.

B.5.2 Independent Assurance Testing

(1) Independent assurance is unbiased testing the department performs to evaluate the department's verification and the contractor's QC sampling and testing including personnel qualifications, procedures, and equipment. The department will perform the independent assurance review according to the department's independent assurance program.

B.6 Dispute Resolution

(1) The testers may perform investigation in the work zone by analyzing the testing, calculation, and documentation procedures. The testers may perform gauge comparison according to B.3.2.1.

(2) The testers may use comparison monitoring according to B.3.2.2 to determine if one of the gauges is out of tolerance. If a gauge is found to be out of tolerance with its reference value, remove the gauge from the project and use the other gauge's test results for acceptance.

(3) If the testing discrepancy cannot be identified, the contractor may elect to accept the QV sublot density test results or retesting of the sublot in dispute within 48 hours of paving. Traffic control costs will be split between the department and the contractor.

(4) If investigation finds that both gauges are in error, the contractor and engineer will reach a decision on resolution through mutual agreement.

B.7 Acceptance

(1) The department will not accept QMP HMA Pavement Nuclear Density if a non-compared gauge is used for contractor QC tests.

C (Vacant)

D (Vacant)

E Payment

E.1 QMP Testing

(1) Costs for all sampling, testing, and documentation required under this special provision are incidental to the work. If the contractor fails to perform the work required under this special provision, the department may reduce the contractor's pay. The department will administer pay reduction under the Non-performance of QMP administrative item.

E.2 Disincentive for HMA Pavement Density

(1) The department will administer density disincentives as specified in standard spec 460.5.2.2.

E.3 Incentive for HMA Pavement Density

(1) The department will administer density incentives as specified in standard spec 460.5.2.3.

stp-460-020 (20181119)

29. 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)

30. Seeding.

Add the following to standard spec spec 630.2.1.5.1.1:

Table 630-3 may be used for the mixtures provided in the table:

TABLE 630-3 (OPTIONAL SEED MIXTURES)

SPECIES COMMON NAME (Acceptable Varieties)	SPECIES BOTANICAL NAME	PURITY minimum %	GERMINATION minimum %	MIXTURE PROPORTIONS (in percent) Two options for each mix type							
				NO.10		NO.20		NO.30		NO.40	
				#1	#2	#1	#2	#1	#2	#1	#2
Kentucky Bluegrass (Low Maintenance)	Poa pratensis	98	85	40	42	6	6	10	13	35	35
* Red Fescue (Creeping)	Festuca rubra	97	85	10	13	5	7	15	15	10	15
Hard Fescue (Improved)	Festuca ovina var. duriuscula	97	85			24	22	25	25	20	20
Tall Fescue (Improved Turf Type)	Festuca arundinacea	98	85			40	40				
Salt Grass (Fult's or Salty)	Puccinella distans	98	85					15	15		
Redtop	Agrostis alba	92	85	5	5						
Perennial Ryegrass	Lolium perenne	96	85	25	30	25	25	25	32	25	30
White Clover	Triflium repens	95	90	10	10						
Chewings Fescue	Festuca rubra var. commutata	98	85	10				10		10	
Sheep's Fescue	Festuca ovina	97	85								

* A blend of fescue type will be permitted to achieve the specified Red Fescue (Creeping) percentage using any of the following varieties as substitutes:

Red Fescue (Creeping)
Hard Fescue (Improved)
Chewings Fescue
Sheep's Fescue

31. Furnishing and Planting Plant Material.

This project shall have a plant establishment period of two years.

Conform to standard spec 632, and as herein after provided.

32. 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)

33. Basic Traffic Queue Warning System, Item 643.1205.S.

A Description

This special provision describes providing, repositioning, operating, maintaining, monitoring, calibrating, testing and removing a basic traffic queue warning system (QWS) capable of measuring vehicular speeds at downstream sections of a roadway, and activating the system.

B Materials

Provide Basic Traffic QWS components and software that is National Transportation Communications for ITS Protocol (NCTIP) compliant.

B.1 Portable Traffic Sensors (PTS)

Provide PTS that are nonintrusive and capable of capturing vehicle speed in mph. Integrate each sensor with a modem to communicate with the automated system manager.

B.2 Static Traffic Control Signs with Temporary Flashing Beacon Signs (FBS)

Provide static traffic control signs with temporary flashing beacon signs conforming to standard spec 658.2(2) for Traffic Signal Faces. Ensure each FBS is integrated with a modem, and other equipment (e.g., automated system manager) mounted on it, and acts as a single device for communicating with similarly integrated devices and displaying real-time traffic conditions.

B.3 Automated System Manager (ASM)

Provide an ASM that assesses current traffic data captured by the PTS and activates/deactivates the FBS based on predetermined speed thresholds.

B.4 System Communications

Ensure Basic Traffic QWS communications meet the following requirements:

1. Perform required configuration of the Basic Traffic QWS's communication system automatically during system initialization.
2. Communication between the server and any individual FBS or PTS are independent through the full range of deployed locations, and do not rely upon communications with any other FBS or PTS.
3. Incorporate an error detection/correction mechanism into the Basic Traffic QWS communication system to ensure the integrity of all traffic condition data.

B.5 System Acceptance

Submit vendor verification to the engineer and Bureau of Traffic Operations (DOTBTOworkzone@dot.wi.gov) 14 calendar days before the pre-construction meeting that the system will adequately perform the functions specified in this special provision. Adequate verification includes past successful performance of the system, literature and references from successful use of the system by other agencies, and/or demonstration of the system.

Provide contact information for a designated representative responsible for monitoring the performance of the system and for making modifications to the operational settings as the engineer directs. Provide all testing and calibration equipment.

C Construction

C.1 General

Install and reposition Basic Traffic Queue Warning System per plan or as the engineer directs. Provide plan to the engineer and Bureau of Traffic Operations (DOTBTOworkzone@dot.wi.gov) 14 calendar days before the pre-construction meeting.

PTS may be mounted on FBS, arrow board or other trailer devices.

Install PTS at the following locations:

1. Place first PTS within the lane closure taper.
2. Place second PTS 5,700 feet upstream of the lane closure taper or on FBS #3.
3. Place third PTS 2 miles upstream of the lane closure taper or on FBS #2.

Install FBS at the following locations, delineated by 5 drums:

1. Place first FBS (FBS #3) 5,700 feet upstream of the lane closure taper.
2. Place second FBS (FBS #2) 2 miles upstream of the lane closure taper.
3. Place third FBS (FBS #1) 3 miles upstream of the lane closure taper.

If there are more than 2 lanes or specified in the plans, place FBS on both sides of the roadway.

Number the devices in chronological order so they are visible from the shoulder with 6-inch white high reflective sheeting.

Provide technical personnel for all system calibration, operation, maintenance, and timely on-call support services.

Promptly correct the system within 24 hours of becoming aware of a deficiency in the operation or individual part of the system. A minimum of three days before deployment, place the Basic Traffic QWS and demonstrate to the department that the Basic Traffic QWS is operational.

Maintain the Basic Traffic QWS for the duration of the project. Ensure the system operates continuously (24 hours, 7 days a week) in the automated mode throughout the duration of the project.

Remove the system upon completion.

C.2 Reports

Provide an electronic copy of a weekly summary report of all data via email to the engineer. Ensure the report includes, at a minimum, the average speed per sensor, time in congestive state per sensor and number of triggers per day.

C.3 Meetings

Attend mandatory in-person pre-construction meetings with the department. Attend additional meetings as deemed necessary by the department. These meetings may be held in person or via teleconference, as scheduled by the department.

C.4 Programming

C.4.1 General

Program the Basic Traffic QWS to ensure that the following general operations are performed:

1. Provide a password protected login to the ASM, website and all other databases.
2. Automatic setting of the FBS to reflect current traffic flow status updated every 60 seconds for congestion. Ensure to remove a congestion message when 180 seconds of average traffic speeds above the current level are observed, or utilize a customized frequency as determined by the engineer.
3. The FBS activate based on pre-determined speed thresholds from the next downstream sensor.
    - FBS #3 shall activate based on traffic speeds at the PTS located within the lane closure taper.
    - FBS #2 shall activate based on traffic speeds at the PTS located approximately 1 mile upstream of lane closure taper, or at FBS #3.
    - FBS #1 shall activate based on traffic speeds at the PTS located 2 miles upstream of lane closure taper, or at FBS #2.
4. Provide real-time data from the ASM to a website with a full color mapping feature and refresh every 60 seconds. Make data on website available to the department staff at all times for the duration of the work zone activity. Ensure website includes:
    - Vehicle speeds
    - FBS triggers
    - Device locations
5. Archive all traffic data in a Microsoft Excel format with date and time stamps.
6. Configure the website to quantify system failures which includes communication disruption between any devices in the system configuration, FBS malfunctioning, PTS malfunction, loss of power, low battery, etc.
7. Automatically generate and send an email alert any time a user specified queue is detected by the system.
8. Ensure the system autonomously restarts in case of any power failure.

C.4.2 System Operation Strategy

Arrange for the vendor/manufacturer to coordinate system operation, detection, and trends/thresholds with the engineer.

The sequences below are a minimum requirement, but can be adjusted at the discretion of the engineer, are as follows:

Free Flow:

If the current PTS speed on a downstream section is at or above 40 mph, the next upstream FBS will not flash.

Slow or Stopped Traffic:

If the current PTS speed on a downstream section of the roadway is between the 39 mph and 0 mph (for example, 35 mph), the next upstream FBS shall flash.

C.5 Calibration and Testing

At the beginning of the project perform a successful field test and calibration at the Basic Traffic QWS location to verify the system is detecting accurate vehicle speeds, and accurately relaying the information to the ASM and the FBS.

Send email of successful calibration and testing to the engineer.

D Measurement

The department will measure Basic Traffic Queue Warning System by the day, acceptably completed, measured as each complete system per roadway.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
643.1205.S	Basic Traffic Queue Warning System	DAY

Payment is full compensation for providing, repositioning, operating, maintaining, monitoring, calibrating, testing, and removing the complete system consisting of FBS, PTS, ASM, and system communications.

Failure to correct a deficiency to the FBS, PTS, or ASM within 24 hours after notification from the engineer or the department will result in a one-day deduction of the measured quantity for each day in which the deficiency is not corrected.

Failure to correct the website within 24 hours after notification from the engineer will result in a 10% reduction of the day quantity for each day the website is down.

The engineer will have sole discretion to assess the deductions for an improperly working Basic Traffic QWS.

stp-643-046 (20210113)

34. Install Conduit Into Existing Item, Item 652.0700.S.

A Description

This special provision describes installing proposed conduit into an existing manhole, pull box, junction box, communication vault, or other structure.

B Materials

Use Conduit Rigid Nonmetallic Schedule 40 2-inch, one per location, as provided and paid for under other items in this contract. Furnish backfill material, topsoil, fertilizer, seed, and mulch conforming to the standard spec.

C Construction

Expose the outside of the existing structure without disturbing existing conduits or cabling. Drill the appropriate sized hole for entering conduits at a location within the structure without disturbing the existing cabling and without hindering the installation of new cabling within the installed conduit. Fill void area between the drilled hole and conduit with an engineer-approved filling material to protect against conduit movement and entry of fill material into the structure. Tamp backfill into place.

D Measurement

The department will measure Install Conduit Into Existing System by the unit, acceptably installed. Up to five conduits entering a structure per entry point into the existing structure will be considered a single unit. Conduits in excess of five, or conduits entering at significantly different entry points into the existing pull box, manhole, or junction box will constitute multiple units of payment.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
652.0700.S	Install Conduit Into Existing Item	EACH

Payment is full compensation for excavating, drilling holes; furnishing and installing all materials, including bricks, coarse aggregate, sand, bedding, and backfill; for excavating and backfilling; and for furnishing and placing topsoil, fertilizer, seed, and mulch in disturbed areas; for properly disposing of surplus materials; and for making inspections.

stp-652-070 (20100709)

35. Lamp, Ballast, LED, Switch Disposal by Contractor, Item 659.5000.S.

A Description

This special provision describes the packaging of lamps, ballasts, LEDs, and mercury containing switches (e.g., overhead roadway lighting, underdeck bridge, wall packs, pedestrian signals, traffic control stop lights and warning flashers, fluorescent bulbs, and thermostats) removed under this contract for disposal as hazardous materials.

For Lamp, Ballast, LED, Switch Disposal by Contractor, coordinate removal by the department's hazardous waste disposal vendor.

B Materials

B.1 Disposal by Contractor

Items removed under this contract will be considered the property of the department for waste generator identification. The contractor is responsible for coordinating with the department's hazardous waste vendor for disposal:

https://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/environment/hazwaste-contacts.pdf

C Construction

Provide a secure, level location removed from the travelled way for storage of the material for disposal.

Pack intact fixtures in the packaging of the new lamps used to replace them, or packaging affording the equivalent protection. Place in full, closed stackable cartons.

Pile cartons no more than four high if palletized and secure cartons with shrink wrap to prevent shifting or falling of the loads. Clearly mark each pallet with the words "Universal Waste Lamps" or "Universal Waste Ballasts", the date, and the number of fixtures on each pallet.

Pack broken fixtures into (min.) 6 mil thick plastic bags and place inside sturdy cardboard boxes or the equivalent. Mark the outer packaging with the term "Broken Fixtures/Lamps", the date and the number of broken fixtures clearly marked on the box.

The hazardous waste vendor will not accept fixtures improperly packaged. The vendor will reject any fixtures not removed as part of a contract pay item or otherwise required under this contract.

Pack ballasts and mercury containing switches in appropriate containers.

C.1 Disposal by Contractor

Complete the lamp and ballast inventory (https://wisconsindot.gov/Documents/doing-bus/eng-consultants/cnslt-rsrces/environment/dotlampballastinventory.dotx) and contact the hazardous waste vendor to coordinate pickup and disposal at a location specified by the contractor. Consolidate all pallets and boxes from one project at a single location. Contact the hazardous waste vendor to set up an appointment for pickup. The hazardous waste vendor requires a minimum of one week advance notice to schedule pickup.

D Measurement

The department will measure Lamp, Ballast, LED, Switch Disposal by Contractor as each individual unit received by the hazardous waste vendor, properly packaged and acceptably completed, matching the total number of units provided on the inventory form. The department will not measure broken fixtures that exceed a total of 10 percent of all fixtures to be disposed.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
659.5000.S	Lamp, Ballast, LED, Switch Disposal by Contractor	EACH

Payment for Lamp, Ballast, LED, Switch Disposal by Contractor is full compensation for handling, packaging, labeling and scheduling disposal with the hazardous waste vendor.

The department will pay separately for the work under which the lamps, ballasts LED or Switches are removed from service.

stp-659-500 (20220107)

36. Red Granite Chips, Item SPV.0035.001.

A Description

This work shall consist of furnishing and installing Red Granite Chips within the planting areas as indicated on the plans.

B Materials

Red Granite Chips shall be 3/4 inch uniform in size. All fines shall be screened from the aggregate within a one-quarter inch (1/4”) tolerance. Red Granite Chips shall be composed of fractured rocks that are naturally red and silver in color (commonly known as “Ruby Red Granite”). The material shall be free of organic and inorganic debris and trash.

Material shall be granite stone. Colored gravel shall not be allowed.

C Construction

After the planting is completed and all landscape materials have been installed, the contractor shall install the Red Granite Chips to a 4” depth and fully cover all weed barrier fabric. The contractor is responsible for assuring the 4” depth throughout the beds and will not be paid for applying at a thicker depth unless specifically directed in the field by the engineer.

Contractor shall take care to allow for the watering wells as shown on the planting details with the placement of the Red Granite Chips.

Contractor shall ensure that all plant material and surrounding surfaces are free of Red Granite Chips prior to leaving the job site.

D Measurement

The department will measure Red Granite Chips by the cubic yards, 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.0035.001	Red Granite Chips	CY

Payment is full compensation for furnishing and installing the Red Granite Chips.

37. Trash Receptacles, Item SPV.0060.001.

A Description

This special provision describes providing furnishing and installing trash receptacles, complete and in place, at the locations as designated on the plans or as directed by the engineer.

B Materials

Trash receptacles shall be steel reinforced concrete with a smooth, weatherstone finish and sand color. Trash receptacles shall be of 53-gallon capacity and shall have a plastic cover with flip type opening. Furnish five sets of catalogue cut and manufacturer's shop drawings to the engineer for approval before ordering.

Acceptable manufacturers are listed below.

1. Pre-Terra Products
   PO Box 1520
   Wausau, WI 54402-1520
   (800)388-8728
2. Environmental Features, Inc.
3. Quick Crete Products
4. Approved equal.

C Construction

Install trash receptacles in locations indicated on the plans or as directed by the engineer.

D Measurement

The department will measure Trash Receptacles as each individual unit in place, and 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.0060.001	Trash Receptacles	EACH

Payment is full compensation for furnishing, hauling and installing trash receptacles.

38. Electrical Service, Hudson SWEF, Item SPV.0060.002.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide electrical service from an existing source(s) to a transformer(s) for the new Hudson SWEF Building location according to the plans and as hereinafter provided. Electrical service shall include underground three-phase power to transformers near the proposed building location and single-phase power for the site lighting including furnishing and installation of transformers and transformer pads; underground service to the new SWEF building; wire and terminations at transformers and at meter sockets; and meters.

Site lighting; site telephone/internet/network service, and telephone wiring and equipment within the SWEF 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 (Vacant)

C Construction

Contractor makes all arrangements and coordinates electric utility service work with St. Croix Electric Coop.

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 electric utility company (St. Croix Electric Coop) charges will be paid for separately by the department.

Contractor includes all other work not completed by St. Croix Electric Coop but necessary for complete installation.

D Measurement

The department will measure Electrical Service, Hudson SWEF as each individual unit, in place and 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.0060.002	Electrical Service, Hudson SWEF	EACH

Payment is full compensation for providing and coordinating overhead and/or underground electric service from existing source to the transformer(s) at the proposed locations, to the SWEF building, transformers, transformer pads, and meter.

39. Electrical Service, Hudson SWEF Mainline WIM, Item SPV.0060.003.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide electrical service from an existing source(s) to a transformer(s) for the new mainline weigh-in-motion location according to the plans and as hereinafter provided. Electrical service shall include underground single-phase power to the mainline weigh-in-motion location along IH 94 including furnishing and installation of transformers and transformer pads; underground service to the mainline weigh-in-motion location; wire and terminations at transformers and at meter sockets; and meters.

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 (Vacant)

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 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, Hudson SWEF Mainline WIM as each individual unit, in place and 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.0060.003	Electrical Service, Hudson SWEF Mainline WIM	EACH

Payment is full compensation for providing and coordinating overhead and/or underground electric service from existing source to the transformer(s) at the proposed locations, to the mainline weigh-in-motion location, transformers, transformer pads, and meter.

40. Electrical Service, Hudson SWEF Virtual Weigh Station, Item SPV.0060.004.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide electrical service from an existing source(s) to a transformer(s) for the new virtual weigh station location according to the plans and as hereinafter provided. Electrical service shall include underground single-phase power to the virtual weigh station location along USH 12 including furnishing and installation of

transformers and transformer pads; underground service to the virtual weigh station location; wire and terminations at transformers and at meter sockets; and meters.

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 (Vacant)

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 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, Hudson SWEF Virtual Weigh Station as each individual unit, in place and 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.0060.004	Electrical Service, Hudson SWEF Virtual Weigh Station	EACH

Payment is full compensation for providing and coordinating overhead and/or underground electric service from existing source to the transformer(s) at the proposed locations, to the virtual weigh station location, transformers, transformer pads, and meter.

41. Discontinue Electrical Service, Hudson SWEF Existing Mainline WIM, Item SPV.0060.005.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to discontinue the electrical service to the existing mainline weigh-in-motion located east of Kinney Road.

B (Vacant)

C Construction

Contractor makes all arrangements and coordinates electric utility service work with Xcel Energy.

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 to discontinue the service.

D Measurement

The department will measure Discontinue Electrical Service, Hudson SWEF Existing Mainline WIM as each individual unit, in place and 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.0060.005	Discontinue Electrical Service, Hudson SWEF Existing Mainline WIM	EACH

Payment is full compensation for coordinating the discontinuance of the underground electric service.

42. Natural Gas Service, Hudson SWEF, Item SPV.0060.006.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide underground natural gas service to new SWEF Building.

B (Vacant)

C Construction

Contractor makes all arrangements and coordinates natural gas utility work with Midwest Natural Gas.

Utility provides natural gas service to the project SWEF building meter location.

The natural gas utility company (Midwest Natural Gas) charges shall be paid for separately by the department.

Contractor includes all other work not completed by Midwest Natural Gas but necessary for complete installation.

D Measurement

The department will measure Natural Gas Service, Hudson SWEF as each individual unit, in place and 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.0060.006	Natural Gas Service, Hudson SWEF	EACH

Payment is full compensation for providing and coordinating underground natural gas service to new SWEF Building, furnishing and installing system, and associated coordination.

43. Internet Service, Hudson SWEF Virtual Weigh Station, Item SPV.0060.007.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide internet service to the virtual weigh station.

B (Vacant)

C Construction

Contractor makes all arrangements and coordinates internet utility service work with Baldwin Telecom. The internet utility company (Baldwin Telecom) charges will be paid for separately by the department. Contractor includes all other work not completed by Baldwin Telecom but necessary for complete installation.

D Measurement

The department will measure Internet Service, Hudson SWEF Virtual Weigh Station as each individual unit, in place and 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.0060.007	Internet Service, Hudson SWEF Virtual Weigh Station	EACH

Payment is full compensation for providing and coordinating internet service from existing source to the virtual weigh station location.

44. Construction Staking Initial Layout Parking Lot, Item SPV.0060.008.

A Description

This work shall consist of contractor performed construction staking required of the initial layout for the parking lot.

B (Vacant)

C Construction

Set and maintain construction stakes or marks to achieve the required accuracy and to support the method of operations. Check the department provided horizontal and vertical control information. Provide stakes to establish and maintain intermediate vertical and horizontal control for reference line alignment, radius points, and slopes on the ground, running bench level circuits and offsetting the horizontal roadway alignment. These stakes and markings constitute the field control used to govern and execute the work.

Verify the existing ground elevations as shown for all roadways on cross section sheets for accuracy. Take and document a minimum of 3 shots per roadway section. Set and maintain slope stakes on each side of the road at each cross-section location the plans show.

Document and provide complete descriptions and reference ties of the control points, alignment points, and benchmarks to the engineer to allow for quick reestablishment of the plan data at any time during construction and upon project completion.

Protect and reestablish all roadway alignment affected by the plan, or as the engineer directs.

D Measurement

The department will measure Construction Staking Initial Layout Parking Lot as each individual unit, in place and 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.0060.008	Construction Staking Initial Layout Parking Lot	EACH

Payment is full compensation for locating and setting all construction stakes; for resetting damaged or missing preliminary construction stakes, for protecting and reestablishing the alignments, and for setting and checking slope stakes.

45. Construction Staking Subgrade Parking Lot, Item SPV.0060.009.

A Description

This work shall consist of contractor performed construction staking required of the subgrade for the parking lot.

B (Vacant)

C Construction

Set construction stakes or marks at a minimum of 50-foot intervals including additional stakes each cross section to match the plan cross section as necessary to achieve the required accuracy and support the method of operations. Also, set and maintain stakes as necessary to establish horizontal and vertical position for intersecting road radii, horizontal and vertical curves, and curve transitions. Locate stakes to within 0.25 feet of the true horizontal position and establish the grade elevation to within 0.03 feet of the true vertical position.

D Measurement

The department will measure Construction Staking Subgrade Parking Lot as each individual unit, in place and 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.0060.009	Construction Staking Subgrade Parking Lot	EACH

Payment is full compensation for locating and setting all construction stakes; for relocating and resetting damaged or missing construction stakes.

46. Construction Staking Concrete Pavement Parking Lot, Item SPV.0060.010.

A Description

This work shall consist of contractor performed construction staking required of the concrete pavement for the parking lot.

B (Vacant)

C Construction

Set construction stakes or marks at a minimum of 25-foot intervals. Set and maintain additional stakes as necessary to establish location and grade along intersecting radii; and for vertical curves, horizontal curves, and curve transitions according to the plan. Locate stakes to within 0.02 feet of the true horizontal position and establish elevations to within 0.01 feet of the true vertical position. Set and maintain sufficient additional stakes at each cross section to achieve the required accuracy and to support the method of operations.

D Measurement

The department will measure Construction Staking Concrete Pavement Parking Lot as each individual unit, in place and 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.0060.010	Construction Staking Concrete Pavement Parking Lot	EACH

Payment is full compensation for locating and setting all construction stakes; for relocating and resetting damaged or missing construction stakes.

47. OSOW Warning System, Item SPV.0060.011.

A Description

This special provision describes furnishing and installing a vehicle activated flashing beacon warning system. The system will include in-pavement vehicle detection, a control unit, wireless communications, and a solar powered flashing assembly.

B Materials

Pull Boxes

Furnish 24x 36 non-conductive pull boxes according to standard spec 653 and as shown in the plan.

Loop Detector Conduit

Furnish loop detector conduit according to standard spec 652 and as shown in the plan.

Conduit

Furnish 2-inch rigid nonmetallic conduit according to standard spec 652 and as shown in the plan.

Loop Detector Wire

Furnish loop detector wire according to standard spec 655.

Loop Detector Lead-in Cable

Furnish loop detector lead-in cable according to standard spec 655.

Light Pole Unit

Furnish materials to construct a Type 5 lighting pole, Transformer Base, and Type 5 lighting base according to the pertinent standard specifications.

Detection Unit

Furnish a detection unit consisting of a processing unit, an enclosure, a loop detector amplifier, a wireless communication system, and any incidental equipment, connectors, wiring, and power supply units required to assemble a functioning system. All materials furnished shall be interoperable. The contractor is responsible for ensuring interoperability of the components, constructing a functional system, and demonstrating function of the system to the engineer.

Processing Unit

Furnish a processing unit capable of receiving input from the loop detector amplifier and communicating with the flasher control unit via the wireless communication system to set the state of the flasher control unit, either flash or dark. The processing unit shall be capable of setting the state of the flasher control unit to flash for a specified period following each call resulting from the in-pavement loop detector.

The processing unit shall be capable of the following functions applied to inputs from the loop detector:

- Delay – delay action resulting from a call on the detector or a specified period of time.
- Extend – hold a call on the detector for a specified period of time.
- Lock-out – ignore a call on the detector if an uninterrupted call persists for longer than a specified period of time. This function is intended to prevent continuous operation of the flasher assembly in the even a vehicle is parked on the loop detector.

Enclosure

Furnish an enclosure that is NEMA rated for outdoor use and for the protection of the detection unit components. The enclosure shall include all mounting equipment and be compatible with mounting to a Type 5 street light pole as shown on the plans.

Loop Detector Amplifier

Furnish a loop detector amplifier capable of operating the in-pavement loop detector and providing on-off input to the processing unit.

Wireless Communication System

Furnish a wireless communication system capable of communicating with the flasher control unit. The system shall be capable of operating at the distance shown in the plans between the detection unit and the flasher control unit.

Flasher Control Unit

Furnish a flasher control unit consisting of a processing unit, an enclosure, a wireless communication system, a solar power supply, and any incidental equipment, connectors, wiring, and power supply units required to assemble a functioning system. All materials will be mounted to the type I sign as shown on the plans. All materials furnished shall be interoperable. The contractor is responsible for ensuring interoperability of the components, constructing a functional system, and demonstrating function of the system to the engineer.

Processing Unit

Furnish a processing unit capable of receiving input from the detection unit via the wireless communication system. The processing unit shall be capable of activating the beacon assembly, consisting of two 12” traffic signal lenses and an emergency vehicle preemption (EVP) confirmation beacon. When activated, the lenses shall be illuminated in an alternating pattern, with only one lens illuminated at a time, completing this cycle approximately once every one second. The EVP confirmation beacon shall illuminate concurrently with one of the traffic signal lenses.

Enclosure

Furnish an enclosure that is NEMA rated for outdoor use and for the protection of the flasher control unit components. The enclosure shall include all mounting equipment and be compatible with mounting on the type I sign support.

Wireless Communication System

Furnish a wireless communication system capable of communicating with the detection unit. The system shall be capable of operating at the distance shown in the plans between the detection unit and the flasher control unit.

Solar Power Supply

Furnish a solar power supply system consisting of a battery or batteries, solar panels, a control unit, and any other required components to create a functioning system. The solar power supply shall be rated to supply power for all flasher control unit components, at the geographic location proposed, with an expected battery life of three years. The battery life shall be guaranteed by a factory warranty and the deparment shall be named as the obligee on the manufacturer warranty.

Flasher Assembly

Furnish a flasher assembly to be mounted beneath the type I sign consisting of a mounting bracket(s), two single lens yellow traffic signal heads and one EVP confirmation beacon.

Mounting Brackets

The signal mounting brackets shall be suitable for the purpose of mounting single lens traffic signal heads to a type I sign. They shall be mounted so that they appear underneath the sign and are facing oncoming traffic.

Traffic Signal Heads

Furnish single lens traffic signal heads with yellow LED lenses. Furnish signal mounting hardware according to the pertinent provisions of the standard specifications.

EVP Conformation Beacon

Furnish an EVP confirmation beacon and mounting hardware suitable for mounting to the type I sign support.

Materials to be Paid for with Separate Bid Item

- Type 1 sign and supports
- Lighting pole and base

All other items required for a working system shall be included as incidental to this special provision

C Construction

Pull Boxes

Construct pull boxes according to standard spec 653 and as shown in the plan.

Loop Detector Conduit

Construct loop detector conduit according to standard spec 652 and as shown in the plan.

Conduit

Construct conduit according to standard spec 652 and as shown in the plan.

Light Pole Unit

Construct a Type 5 lighting pole, Transformer Base, and Type 5 lighting base according to the pertinent standard specifications.

Loop Detector Wire

Construct loop detector wire according to standard spec 655.

Loop Detector Lead-in Cable

Construct loop detector lead-in cable according to standard spec 655.

Detection Unit

Construct the detection unit as one complete system in the location shown in the plans. The contractor shall be responsible for constructing the unit and ensuring that it functions properly and is interoperable with the flasher control unit.

Flasher Control Unit

Construct the flasher control unit as one complete system in the location shown in the plans. The contractor shall be responsible for constructing the unit and ensuring that it functions properly and is interoperable with the detection unit and the flasher assembly.

Flasher Assembly

Construct the flasher assembly as one complete system in the location shown in the plans. The contractor shall be responsible for constructing the unit and ensuring that it functions properly and is interoperable with the flasher control unit.

Traffic signal heads shall be mounted such that they are visible to traffic approaching the type I sign to which they are mounted. The EVP confirmation beacon shall be mounted in the reverse direction so that it is visible from the SWEF facility control room.

D Measurement

The department will measure the OSOW Warning System bid item 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.0060.011	OSOW Warning System	EACH

Payment for OSOW Warning System is full compensation for furnishing and installing a fully-functional, vehicle-actuated wireless flashing beacon system, mounting equipment, and all incidental materials required.

48. Static Scale Pit Oil/Water Separator System, Item SPV.0060.012.

A Description

This item contains equipment and materials necessary for the installation of an oil/water separator and discharge pipe.

B Materials

Base product shall be an oil separator constructed of high density polyethylene suitable for below grade installation, with adjustable riser system, built-in flow control, integral vent connections.

Based on Schier Model OS-75. Steel products of similar performance by J.R. Smith, Rockford, or Wade will be acceptable.

Pre-cast concrete products meeting the State of Wisconsin requirements will also be acceptable

Unit nominal capacities and dimensions shall be as follow:

- 4” inlet connection suitable for PVC pipe.
- 4” outlet connection suitable for PVC pipe.
- Maximum flow rate of 75 GPM
- Minimum liquid holding capacity of 125 gallons
- Maximum oil storage capacity of 80 gallons
- Maximum sand holding capacity of 19 gallons
- Fluid operating temperatures ranging from 32-150 degrees.

Substitute products using external flow control means will be acceptable.

Manhole cover shall be suitable for pedestrian traffic only and rated 2,000 lb. total loading capacity.

Polyvinyl Chloride Pipe: ASTM D2729

C Construction

Install device per manufacturer’s recommendations.

D Measurement

The department will measure the Static Scale Pit Oil/Water Separator System bid item 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.0060.012	Static Scale Pit Oil/Water Separator System	EACH

Payment for Static Scale Pit Oil/Water Separator System is full compensation for materials and work necessary for design, staking, and installation of oil/water separator and PVC piping to discharge inlet.

49. Traffic Control Vertical Panels, Item SPV.0060.013.

A Description

This special provision describes the furnishing and installing vertical panels, their supporting posts, and surface-mounted bases according to the MUTCD and pertinent requirements of standard spec 643.

B Materials

Provide vertical panels and flexible supporting posts made of non-metallic material that have a reactive spring so as to be resistant to direct wheel impacts with speeds up to 60 mph and have the capability of immediately restoring itself to a vertical position when struck by a standard vehicle.

The surface-mounted bases shall have a maximum size of 8 inches square and shall not be a hazard to vehicles. Provide new and unused vertical panels, supporting posts, and bases. Provide vertical panels with alternating orange and white reflective stripes according to MUTCD. The panels shall face direction of traffic as indicated on the plans and shall have an overall height above the pavement of 36 inches. The dimensions of the reflective sheeting shall be 12 inches by 24 inches. Reflective sheeting shall meet the requirements of standard spec 637.2.2.2 and shall be suitable for use on reboundable traffic control devices. The alternating orange and white stripes shall slope downward when facing the panel in the direction traffic is to flow.

C Construction

Attach vertical panels and supporting posts to the bases according to the manufacturer's recommendations. The bases shall be fastened to the pavement using the manufacturer’s recommendations.

D Measurement

The department will measure Traffic Control, Vertical Panels in place by each individual panel, 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.0060.013	Traffic Control Vertical Panels	EACH

Payment is full compensation for furnishing, installing, and removing the vertical panels, their supporting posts, bases and mounting hardware.

50. Fiber Optic Patch Panel, Item SPV.0060.014.

A Description

Furnish and install a fiber optic patch panel according to the following standards.

B Materials

Furnish a Fiber Optic Patch Panel capable of accommodating 12 count single-mode OS2 fiber and SC connectors and be designed to fit into one standard rack mount space. The body of the patch panel shall be black in color.

C Construction

Have a certified fiber optic technician perform work for fiber optic terminations, splicing and testing. Have a certified fiber optic technician supervise all fiber optic cable installation. Test the panel and demonstrate that all equipment is operational to the inspector. Ensure termination does not exceed attenuation limits specified in standard spec 678.3.4.

D Measurement

The department will measure Fiber Optic Patch Panel by each, 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.0060.014	Fiber Optic Patch Panel	EACH

Payment is full compensation for furnishing and installing the fiber optic patch panel.

51. Electrical Service, Hudson SWEF Communications Tower, Item SPV.0060.015.

A Description

This work consists of all coordination, work by utility, and work by contractor as required to provide electrical service from an existing source(s) to a transformer(s) for the new Hudson SWEF Communications Tower location according to the plans and as hereinafter provided. Electrical service shall include underground single-phase power to transformers near the proposed communications tower building location including furnishing and installation of transformers and transformer pads; underground service to the new communications tower building; wire and terminations at transformers and at meter sockets; and meters.

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 (Vacant)

C Construction

Contractor makes all arrangements and coordinates electric utility service work with St. Croix Electric Coop.

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 electric utility company (St. Croix Electric Coop) charges will be paid for separately by the department.

Contractor includes all other work not completed by St. Croix Electric Coop but necessary for complete installation.

D Measurement

The department will measure Electrical Service, Hudson SWEF Communications Tower as each individual unit, in place and 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.0060.015	Electrical Service, Hudson SWEF Communications Tower	EACH

Payment is full compensation for providing and coordinating overhead and/or underground electric service from existing source to the transformer(s) at the proposed locations, to the communications tower building, transformers, transformer pads, meter; and all associated coordination, labor, material, equipment, tools, and incidentals necessary to complete the work.

52. General Requirement for Building Construction.

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

SWEF Building, General Construction
SWEF Building, Plumbing
SWEF Building, Heating and Ventilating
SWEF Building, Electrical

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

DIVISION 00 – CONTRACTING REQUIREMENTS

Section 00 72 00 – General Conditions

PART 1 – GENERAL

1.1 REFERENCED DOCUMENT

A. AIA DOCUMENT A201, 2007 EDITION

1. The “General Conditions of the Contract for Construction” AIA Document A201 - 2007, published by the American Institute of Architects, is hereby made a part of the contract documents.

2. Copies of the AIA documents can be obtained from:

AIA Wisconsin
321 South Hamilton Street
Madison WI 53703-4000
Phone: (608) 257-8477
Fax: (608) 257-0242

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION 00 72 00

END OF DIVISION 00 – CONTRACTING REQUIREMENTS

DIVISION 01 – GENERAL REQUIREMENTS

Section 01 11 00 – Summary of Work

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. "Primary or Lead Contractor": The Roadway Contractor is the Primary or Lead Contractor. Refer to the Roadway Special Provisions for the Primary or Lead Contractor's Scope of Work.

B. "General Building Contractor": The General Building Contractor shall be a subcontractor to the Roadway Contractor. The Work described in Divisions 1-33 are the responsibility of the General Building Contractor.

C. "Standard Specifications": Refers to the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Edition of 2022.

D. "Roadway Special Provisions": Refers to the requirements for the roadway portion of the project.

E. "Building Specifications": Refers to the building specifications Divisions 1-33.

1.3 PROJECT DESCRIPTION

A. The BUILDING portion of the Project consists of:

1. A new Safety and Weight Enforcement Facility to be constructed near Hudson, WI. The facility will include State Patrol operations office, toilet facilities, storage areas, multipurpose room and truck indoor inspection bays.

B. The BUILDING portion of the Work consists of:

1. Construction of a single level slab-on-grade structure with recessed inspection pits, and underground access to a static scale. Work includes, but is not limited to concrete footings and foundations, concrete slab-on-grade, recessed cast-in-place concrete floor recessed inspection pits, concrete masonry exterior cavity walls and interior partitions, precast hollowcore concrete plank, structural steel, steel open web joists, steel decking, interior architectural woodwork, foundation waterproofing, insulation, nailbase roof insulation, prefinished metal wall and soffit panels, fluid-applied air barrier membrane, standing seam metal roofing, flashing and sheet metal, gutters and downspouts, caulking and firestopping, metal doors and frames, sectional overhead doors, flush wood doors, aluminum entrances and storefront framing, door hardware, glass and glazing, insulated translucent panels, metal studs and gypsum board, tiling, acoustical tile ceilings, resilient flooring, carpeting, painting, high performance coatings, interior and exterior signage, toilet room accessories, fire extinguishers, metal lockers, safety netting, exterior sun control devices, flagpole, A/V equipment, window treatment, floor grids, furnishings, and fixed seating. The Inspections area will have a dry-pipe fire suppression system. The work will also include complete plumbing, HVAC, electrical, and communications cable and equipment.

1.4 WORK SEQUENCE AND SCHEDULE

A. The Work sequence for the Divisions 1 through 33 will be the General Building Contractor's responsibility to coordinate with the owner, the Supervising Professional, and all required Trades.

B. Refer to the Roadway Special Provisions for Substantial (Interim) and Final Building Completion dates.

1.5 PERMITS

A. Local building permits shall be the responsibility of the General Building Contractor.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 11 00

Section 01 25 00 – Substitution Procedures

PART 1 – GENERAL

1.1 SUMMARY

A. This section refers to substitutions for the BUILDING portion of this contract only. Refer to "Submittals" in the Roadway Special Provisions for non-building substitutions.

B. All substitution request during pre-bid must be submitted Per FDM Procedure 19-22-5 using the Question and Answer (Q/A) feature within Bid Express website (https://www.bidx.com/),

1.2 EQUALS AND SUBSTITUTIONS

A. It is not the intention of the State of Wisconsin Dept. of Transportation to limit or restrict competition by the use of any “Brand Name”, reference to a particular manufacturer, process, technique, catalog number or other identifying information. Such proprietary specifications or use of “Brand Names” are intended to establish a level of quality or the minimum essential requirements to which the contractor must conform, unless more explicit restrictions are stated to apply.

B. Substitutions: Substitutions may be used where 'approved equal' is specified. Substitutions must be approved by the Supervising Professional, and must meet or exceed specifications listed.

1. The burden of proof that a substitution meets or exceeds the specifications shall be the responsibility of the proposer.

C. For approval, the proposer must submit required data to the Supervising Professional according to Section 01 33 00 – Submittal Procedures.

1. Submit concise, annotated documentation comparing the specification to the proposed substitution.

D. When the Contract Documents list performance or functional characteristics in connection with Work to be performed, these characteristics are mandatory for reasons of design.

E. Material, equipment, or processes offered for use as an “Equal” or “Substitution” may be proposed by the contractor. Such proposals shall guarantee the proposed “Equal” or “Substitution” to be capable of performing the duties of the originally specified material, equipment, or process.

F. It shall be the sole responsibility of the contractor to provide all documentation, regardless of type or quantity to clearly establish the qualifications of items proposed as ‘Equals’ or ‘Substitutions’.

G. When ‘Equals’ or ‘Substitutions’ are approved by the architects and incorporated into the Project by the contractor, all costs incurred to 1) correct deficiencies in items, 2) provide for installation or hookup, or 3) to achieve performance specified in the Contract Documents, will be borne by the contractor.

H. Any substitute material or equipment installed by the contractor without approval of the architect shall be subject to immediate removal and all costs required to conform to the Contract Documents shall be borne by the contractor.

I. The contractor shall assume all liability and responsibility for any changes in the Work including agreed to Value Engineering changes or additional Work, required to accommodate use of proposed and approved ‘Equals’ or ‘Substitutions’ does not relieve the contractor from the obligation to coordinate such changes with the Work may be affected by them, and to pay all additional costs resulting from their inclusion in the Work may be affected by them and to pay all additional costs resulting from their inclusion in the Work, even if additional costs or Work become apparent after execution of the change or installation of the ‘Equal’ or ‘Substitution’. The contractor’s liability shall include payment of any additional costs incurred by the Wisconsin Dept. of Transportation made necessary by, or directly connected to, such changes.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 25 00

Section 01 31 00 – Project Management and Coordination

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division 1 specification sections, apply to this section.

1.2 SUMMARY

A. This section includes administrative provisions for coordinating construction operations on project including but not limited to, the following:

1. Coordination Drawings
2. Administrative and Supervisory Personnel
3. General Project Coordination Procedures
4. Project Meetings

B. Related Sections:

1. Division 1 Section 'Construction Progress Documentation' for preparing and submitting the contractor's construction schedule.

1.3 SUBMITTALS

A. Coordination Drawings: Prepare coordination drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation or products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base coordination drawings on reproductions of the contract documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical and electrical systems.

b. Indicate required installation sequences

c. Indicate dimensions shown on the contract drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the contract.

B. Staff Names: Within 15 days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to project.

1. Post copies of list in project meeting room, in temporary field office and by each temporary telephone.

1.4 COORDINATION

A. Coordinate construction to ensure efficient and orderly installation of each part of the work.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the work depends on installation of other components, before or after its installation.
2. Coordinate installation of components to ensure maximum accessibility for required maintenance, service and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.

B. If necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports and list of attendees at meetings.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the work. Such administrative activities include, but are not limited to, the following:

1. Preparation of contractor's construction schedule.
2. Preparation of the schedule of values
3. Installation and removal of temporary facilities and controls
4. Delivery and processing of submittals
5. Progress meetings
6. Pre-installation meetings
7. Project closeout activities

1.5 PROJECT MEETINGS

A. General: Schedule and conduct meetings at project site

1. Attendees: Inform participants and others involved and individuals whose presence is required, of date and time of each meeting. Notify owner and architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute meeting minutes to everyone concerned, included owner and architect, within three days of meeting.

B. Pre-construction Meeting: Schedule a pre-construction meeting before starting construction at a time convenient to owner and architect, but no later than 15 days after execution of the agreement. Hold the meeting at project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Agenda: Discuss items of significance that could affect progress, including:
   a. Tentative Construction Schedule
   b. Phasing
   c. Critical Work Sequencing
   d. Designation of Responsible Personnel
   e. Procedures for Processing Field Decisions and Change Orders
   f. Procedures for Processing Applications for Payment
   g. Submittal Procedures
   h. Preparation of Record Documents
   i. Use of the Premises
   j. Responsibility for Temporary Facilities and Controls
   k. Parking
   l. Office, Work and Storage Areas
   m. Equipment Deliveries and Priorities
   n. First Aid

o. Security

p. Progress Cleaning

q. Working Hours

C. Pre-Installation Meetings: Conduct a preinstallation meeting at project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents

b. Options

c. Related Change Orders

d. Purchases

e. Deliveries

f. Submittals

g. Review of Mockups

h. Possible Conflicts

i. Compatibility Problems

j. Time Schedules

k. Manufacturer’s Written Recommendations

l. Warranty Requirements

m. Compatibility of Materials

n. Acceptability of Substrates

o. Temporary Facilities and Controls

p. Space and Access Limitations

q. Regulations of Authorities Having Jurisdiction

r. Testing and Inspecting Requirements

s. Required Performance Results

t. Protection of Construction and Personnel

3. Record significant conference discussions, agreements and disagreements.

4. Do not proceed with installation if the meeting cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene the meeting at earliest feasible date.

D. Progress Meetings: Conduct progress meetings at regular intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of the owner, the architect and the contractor, each subcontractor, supplier and other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with project and authorized to conclude matters relating to the work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review W items of significance that could affect progress. Include topics for discussion as appropriate to status of project.

   a. Contractor's Construction Schedule: Review progress since the last meeting. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the contract time.

   b. Review present and future needs of each entity present, including the following:

      I. Interface Requirements

      II. Sequence of Operations

      III. Status of Submittals

      IV. Deliveries

      V. Off-Site Fabrication

      VI. Access

      VII. Site Utilization

      VIII. Temporary Facilities and Controls

      IX. Work Hours

      X. Hazards and Risks

      XI. Progress Cleaning

      XII. Quality and Work Standards

      XIII. Change Orders

      XIV. Documentation of Information for Payment Requests

3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.

4. Schedule Updating: Revise contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 31 00

Section 01 32 00 – Progress Documentation and Procedures

PART 1 – GENERAL

1.1 SUMMARY

1.2 This section is covered in the sections entitled "Prosecution and Progress" in the Standard Specifications and in the Roadway Special Provisions.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 32 00

Section 01 33 00 – Submittal Procedures

PART 1 – GENERAL

1.1 SUBMITTAL REVIEW: A/E approval is required for submittals described herein.

1.2 DEFINITIONS

A. Submittal Descriptions: Submittals requirements are specified in the technical sections.

1. Preconstruction Submittals - Submittals which are required prior to start of construction (work) or commencing work on site or the start of the next major phase of the construction on a multi-phase contract. Includes schedules, tabular list of data, or other pertinent information regarding products, materials, equipment, or components to be used in the work, submitted prior to start of construction work or next major phase of construction.

a. Certificates of insurance

b. Surety bonds

c. List of proposed Subcontractors

d. List of proposed products

e. Construction Progress Schedule

2. Shop Drawings

a. Drawings, diagrams and schedules specifically prepared to illustrate some portion of the work.

I. Diagrams and instructions from a manufacturer or fabricator for use in producing the product and as aids to the contractor for integrating the product or system into the project.

3. Product Data

a. Catalog cuts, illustrations, schedules, diagrams, performance charts, instructions and brochures illustrating size, physical appearance and other characteristics of materials, systems or equipment for some portion of the work.

b. Samples of warranty language when the contract requires extended product warranties.

4. Samples

a. Fabricated or unfabricated physical examples of materials, equipment or workmanship that illustrate functional and aesthetic characteristics of a material or product and establish standards by which the work can be judged.

b. Color samples from the manufacturer’s standard line (or custom color samples if specified) to be used in selecting or approving colors for the project.

c. Field samples and mock-ups constructed on the project site establish standards by which the ensuring work can be judged. Includes assemblies or portions of assemblies which are to be incorporated into the project and those which will be removed at conclusion of the work.

5. Design Data

a. Design calculations, mix designs, analyses or other data pertaining to a part of work.

b. Design submittals, design substantiation submittals and extensions or design submittals.

6. Test Reports

    a. Report signed by authorized official of testing laboratory that a material, product or system identical to the material, product or system to be provided has been tested in accord with specified requirements. (Testing must have been within three years of date of contract award for the project)

    b. Report which includes findings of a test required to be performed by the contractor on an actual portion of the work or prototype prepared for the project before shipment to job site.

    c. Report which includes finding of a test made at the job site or on sample taken from the job site, on portion of work during or after installation.

    d. Investigation reports.

    e. Daily logs and checklists

    f. Final acceptance test and operational test procedure

7. Certificates

    a. Statements printed on the manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements. Must be dated after award of project contract and clearly name the project.

    b. Document required of contractor, or of a manufacturer, supplier, installer or Subcontractor through contractor, the purpose of which is to further quality of orderly progression of a portion of the work by documenting procedures, acceptability of methods or personnel qualifications.

8. Manufacturer's Instructions

    a. Preprinted material describing installation of a product, system or material, including special notices and (MSDS) concerning impedances, hazards and safety precautions.

9. Manufacturer's Field Reports

    a. Documentation of the testing and verification actions taken by manufacturer's representative at the job site, in the vicinity of the job site, or on a sample taken from the job site, on a portion of the work, during or after installation, to confirm compliance with manufacturer's standards or instructions. The documentation must be signed by an authorized official of a testing laboratory or agency and must state the test results; and indicate whether the material, product, or system has passed or failed the test.

    b. Factory test reports.

10. Operation and Maintenance Data

    a. Data that is furnished by the manufacturer, or the system provider, to the equipment operating and maintenance personnel, including manufacturer's help and product line documentation necessary to maintain and install equipment. This data is needed by operating and maintenance personnel for the safe and efficient operation, maintenance and repair of the item.

    b. This data is intended to be incorporated in an operations and maintenance manual or control system.

11. Closeout Submittals

a. Documentation to record compliance with technical or administrative requirements or to establish an administrative mechanism.

b. Special requirements necessary to properly close out a construction contract. For example, Record Drawings and as-built drawings. Also, submittal requirements necessary to properly close out a major phase of construction on a multi-phase contract.

1.3 QUANTITY OF SUBMITTALS

A. Number of Shop Drawings and Product Data.

1. Submit one electronic copy of submittals of shop drawings, product data and/or manufacturer's instructions requiring review and approval by the A/E.

B. Number of Samples

1. Submit two samples, or one set of samples showing manufacturer's range of standard finishes/colors. One approved sample will be retained by A/E and one will be returned to contractor.

C. Number of Copies Design Data and Certificates

1. Submit in compliance with quantity requirements specified for shop drawings.

D. Number of Copies Test Reports and Manufacturer's Field Reports.

1. Submit in compliance with quantity requirements specified for shop drawings other than field test results.

E. Number of Copies of Operation and Maintenance Data

1. Submit three hard copies of O&M Data and one electronic copy to the A/E for review and approval.

F. Number of Copies of Preconstruction Submittals and Closeout Submittals

1. Unless otherwise specified, submit one electronic copy of administrative submittals.

1.4 VARIATIONS

A. Variations from contract requirements require approval of the A/E and will be considered where advantageous to owner.

B. Considering Variations

1. Discussion with A/E prior to submission will help ensure functional and quality requirements are met and minimize rejections and re-submittals.

2. Specifically point out variations from contract requirements. Failure to point out deviations may result in the A/E rejection.

C. Proposing Variations

1. When proposing variation, deliver written request to the A/E, with documentation of the nature and features of the variation and why the variation is desirable and beneficial to owner. If lower cost is a benefit, also include an estimate of the cost savings. In addition to documentation required for variation, include the submittals required for the item. Clearly mark the proposed variation in all documentation.

D. Warranting That Variations Are Compatible

1. When delivering a variation for approval, the contractor, warrants that this contract has been reviewed to establish that the variation, if incorporated, will be compatible with other elements of work.

1.5 SCHEDULING

A. Deliver submittals to the A/E on a timely basis that allows a review period of at least 15 days from date of receipt by the A/E. No delay damages or time extensions will be allowed for time lost as a result of late submittals.

1. For submittals requiring review by fire protection engineer, allow review period, beginning when the A/E receives submittal from the contractor.

2. Period of review for each resubmittal is the same as for initial submittal.

1.6 SUBMITTAL REVIEW

A. Corrections or comments made on the shop drawings do not relieve the contractor from compliance with the requirements of the drawings and specifications.

B. The contractor is responsible for reviewing and certifying that submittals are in compliance with contract requirements. Submittals shall be reviewed by the General Contractor prior to forwarding onto the A/E and shall indicate field measurements, quantities and site conditions that will impact the installation covered by the submittal.

C. Review Notations

1. A/E review will be completed within 15 calendar days after date of submission. Submittals will be returned to the contractor with the following notations:

a. Submittals marked “approved” or “accepted” authorize the contractor to proceed with the work covered.

b. Submittals marked “approved as noted” or “approved except as noted, resubmittal not required,” authorize the contractor to proceed with the work covered provided he takes no exception to the corrections.

c. Submittals marked “not approved” or “disapproved.” Or “revise and resubmit,” indicate noncompliance with the contract requirements or design concept, or that submittal is incomplete. Resubmit with appropriate changes. No work shall proceed for this item until resubmittal is approved.

d. Submittals marked “not reviewed” will indicate submittal has been previously reviewed and approved, is not required, does not have evidence of being reviewed and approved by contractor, or is not complete. A submittal marked “not reviewed” will be returned with an explanation of the reason it is not reviewed. Resubmit submittals returned for lack of review by contractor or for being incomplete, with appropriate action, coordination, or change.

1.7 DISAPPROVED (OR REJECTED) SUBMITTALS

A. Contractor shall make corrections required by the A/E. The A/E shall be notified if the contractor considers any correction or notation on the returned submittals to constitute a change to the contract drawings or specifications.

B. If changes are necessary to submittals, the contractor shall make such revisions and submission of the submittals according to the procedures above. No item of work requiring a submittal change is to be accomplished until the changed submittals are approved.

1.8 APPROVED (/ACCEPTED) SUBMITTALS

A. The A/E’s approval or acceptance of submittals is not to be construed as a complete check, and indicates only that the general method of construction, materials, detailing and other information are satisfactory. The contractor is responsible for confirming and correlating all quantities and dimensions.

1.9 APPROVED SAMPLES

A. Approval of a sample is only for the characteristics or use named in such approval and is not to be construed to change or modify any contract requirements. Before submitting samples, the contractor is to assure that the materials or equipment will be available in quantities required in the project. No change or substitution will permitted after a sample has been approved.

B. Match the approved samples for materials and equipment incorporated in the work. If requested, approved samples, including those which may be damaged in testing, will be returned to the contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the contractor, at his expense, upon completion of the contract. Samples not approved will also be returned to the contractor at his expense, if so requested.

C. Failure of any materials to pass the specified tests will be sufficient cause for refusal to consider, under this contract, any further samples of the same brand or make of that material. The A/E reserves the right to disapprove any material or equipment to meet contract requirements.

D. Samples of various materials or equipment delivered on the site or in place may be taken by the A/E for testing. Samples failing to meet contract requirements will automatically void previous approvals. Contractor to replace such materials or equipment to meet contract requirements.

END OF SECTION 01 33 00

Section 01 40 00 – Quality Requirements

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of contract, including General and Supplementary Conditions and other Division I specification sections, apply to this section.

1.2 SUMMARY

A. This section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve the contractor of responsibility for compliance with the contract document requirements.

1. Specified tests, inspection and related actions do not limit the contractor's quality-control procedures that facilitate compliance with the contract document requirements.

2. Requirements for the contractor to provide quality-control services required by architect, owner or authorities having jurisdiction are not limited by provisions of this section.

C. Related section include:

1. Divisions 2 through 16 sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Mockups: Full-size, physical example assemblies to illustrate finishes and materials. Mockups are used to verify selection made under sample submittals, to demonstrate aesthetic effects and workmanship, qualities of materials and execution and to review construction, coordination, testing or operation; they are not samples.

B. Testing Agency: An entity engaged to perform specific tests, inspections or both. Testing laboratory shall mean the same as testing agency.

1.4 SUBMITTALS

A. Qualification Data: For testing agencies specified in 'Quality Assurance' article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

B. Reports: Certified written reports that include:

1. Date of issue
2. Project Title and Number
3. Name, Address and Telephone Number of Testing Agency
4. Dates and Locations of Samples and Tests or Inspections
5. Description of the Work and Test and Inspection Method
6. Identification of Product and Specification Section
7. Complete Test or Inspection Data
8. Test and Inspection Results and an Interpretation of Test Results
9. Ambient Conditions at Time of Sample Taking and Testing and Inspection
10. Opinions on Whether Tested or Inspected Work Complies with the Contract Documents.
11. Name and Signature of Laboratory Inspector
12. Recommendations of Retesting and Reinspecting

C. Permits, Licenses and Certificates: For owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records and similar documents, established for compliance with standards and regulations bearing on performance of the work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

B. Factory-Authorized Service Representative Qualifications: An authorized representative of the manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design and extent to those indicated for this project.

C. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this project, whose work has resulted in construction with a record of successful in-service performance.

D. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this project and with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly or product that are similar to those indicated for this project in material, design and extent.

F. Testing Agency Qualifications: An agency with the experience and capability to conduct testing and inspecting indicated, as documented by ASTM E 548, and that specializes in types of tests and inspections to be performed.

G. 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 approved by architect. Notify architect five days in advance of dates and times when mockups will be constructed.

2. Demonstrate the proposed range of aesthetic effects and workmanship.

3. Obtain architect's approval of mockups before starting work, fabrication and construction.

a. Approval of mockups does not constitute approval of deviations from the contract documents contained in mockups unless such deviations are specifically approved by architect in writing.

4. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed work.

5. Demolish and remove mockups when directed, unless otherwise indicated.

1.6 QUALITY CONTROL

A. Unless otherwise indicated, provide quality-control services specified or required by authorities having jurisdiction.

1. When services are indicated as the contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

a. Notify testing agencies at least 24 hours in advance of time when work that requires testing or inspecting will be performed.

b. Submit a certified written report, in duplicate, of each quality-control service.

2. When services are indicated to be performed by independent agencies the owner will separately contract to provide inspections, tests and similar quality control services.

    a. The contractor shall provide administrative help to the owner for such services, including recommendations for agencies and preparation of contracts. Agencies shall invoice the owner directly.

    b. Agencies under contract with the owner shall not perform duties under contract with the contractor.

3. Testing and inspecting requested by contractor and not required by the contract documents are the contractor's responsibility.

4. Submit additional copies of each written report directly to authorities having jurisdiction when they do direct.

B. Manufacturer's Field Services: Where indicated, engage a factory authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing.

C. Retesting and Reinspecting: Regardless of whether original tests or inspections were contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that revised or replaced Work that failed to comply with requirements established by the contract documents.

D. Testing Agency Responsibilities: Cooperate with architect and contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify architect and contractor promptly of irregularities or deficiencies observed in the work during performance of its services.

2. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

3. Submit a certified written report in duplicate, of each test, inspection and similar quality-control service through contractor.

4. Do not release, revoke, alter or increase requirements of the contract documents or approve or accept any portion of the work.

5. Do not perform duties of the contractor.

E. Associated Services: Cooperate with agencies performing required tests, inspections and similar quality-control services and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the work

2. Incidental labor and facilities necessary samples of materials that require testing and inspecting.

3. Adequate quantities of representative samples of materials that require testing and inspecting.

4. Assist agency in obtaining samples.

5. Facilities for storage and field curing of tests samples.

6. Delivery of samples to testing agencies.

7. Preliminary design mix proposed for use for material mixes that require control by testing agency.

8. Security and protection for samples and for testing and inspecting equipment at project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples and similar activities.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspections, sample taking and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other sections of these specifications. Restore patched areas and extend restoration into adjoining areas in a manner that eliminates evidence of patching.

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are the contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 01 40 00

Section 01 50 00 – Temporary Facilities and Services

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Refer to Divisions 22, 23 and 26 for temporary building facilities and services such as heat and lighting.

B. Temporary site facilities and services are provided by the roadway contractor and are covered elsewhere in the Standard Specifications and in these Roadway Special Provisions.

PART 2 – SERVICES

2.1 FENCING

A. The General Building Contractor shall provide a neat appearing movable prefabricated chain link security fence where indicated on the drawings around contractors staging areas and perimeter of exterior excavations for new footings and foundations. Provide gates, properly constructed and braced, complete with hinges, hasps, and padlocks in number and location required for proper control, delivery and distribution of material and equipment.

B. Barricade Fencing: Plastic barricade type fencing shall be used for utility trenching.

C. All protective fencing shall be maintained in an upright, orderly fashion throughout the construction schedule. In areas where existing trees are to be protected, the area inside the protective fencing shall not be used for any purpose related to construction activities, such as material storage, vehicle parking, portable toilets, or other disruptive activities that would result in damage of any kind to the site inside the fence.

2.2 TOILETS

A. The General Building Contractor shall provide and maintain sanitary outdoor temporary toilets, in sufficient number required for the force employed. The toilets shall comply with International Building Code Chapter 29 on Plumbing Systems. Toilets shall be self-contained chemical type.

2.3 TELEPHONES

A. It is expected that each contractor have access to their own cell phone for their own use. No additional telephone service will be provided

2.4 WATER SUPPLY

A. The General Building Contractor shall supply all water required for construction and other purposes until the permanent water supply system is accepted and in operation.

B. Lavatory and slop sinks used by workmen shall be kept clean and sanitary at all times.

C. Immediately after award of contract, the Plumbing Trade shall make arrangements for maintaining temporary connections and extension of existing water service facilities. As soon as possible, the Plumbing Trade shall install the permanent main into the building and provide a temporary gate valve, extend piping, provide temporary water meter, and provide two 3/4" hose bibbs on each floor, located where directed. Permanent risers may be used for temporary service. Provide two 3/4" hose bibbs outside of the building at suitable locations for construction purposes where directed.

D. The Plumbing Trade shall supply, maintain the installation, and remove it when directed by General Building Contractor and shall provide necessary patching of surfaces and structure after such temporary service is removed.

E. The General Building Contractor shall prevent waste of water and shall maintain valves, connections, and hoses in perfect condition, at all times. Trades shall provide their own hose or piping from hose bibbs.

F. Immediately after award of contract, the Plumbing Trade shall make arrangements to begin underground sewer work and shall complete sewer work, including backfilling required, as soon as possible.

2.5 TEMPORARY ELECTRICAL WORK

A. For this project, provide a 200 amp. 120/240 VAC, Single-phase, 3-wire electric service for use by the contractors for small power tools, temporary field offices, temporary lighting or for operation of construction equipment and testing. Trades requiring voltage other than basic temporary system specified, or a special single phase run, shall make their own arrangements with the owner for cost of energy used, and the Electrical Trade for the cost of installation, and removal when no longer required.

B. The General Building Contractor shall pay for all electrical energy consumed for construction purposes for all trades including temporary offices, for operation of ventilating equipment, and for testing and operating of all equipment.

C. Any Trade that has a temporary office shall provide and pay for installation of temporary service for lighting of such temporary office.

D. The Electrical Trade shall provide, at no cost to others, all lamps, wiring, switches, sockets and similar equipment required for temporary system until substantial completion. Upon completion of the project, the Electrical Trade shall remove the temporary system.

E. The temporary lighting system shall be sufficient to enable all trades to safely complete their work and to enable the Lead Contractor to check all work as it is being done. Illumination shall be 5 foot-candles minimum in all areas and, in addition, shall meet or exceed the requirements of 29 CFR 1926.56 Illumination (OSHA regulations).

F. Provide at least one duplex outlet for small power tools for each 400 square feet of floor space, 120 volt single phase. Circuits shall be 20 ampere, single pole.

G. According to the latest issue of the National Electrical Code, all temporary electrical circuits for construction purposes shall be equipped with combination ground fault interrupter and circuit breakers meeting the requirements of UL for Class A, Group 1 devices. The ground fault interrupter portion shall be solid state type, insulated and isolated from the breaker mechanism. A test button shall be provided for checking the device. The breaker mechanism shall provide overload and short circuit protection and shall be operated by a toggle switch with over center switching mechanism so that contact cannot be held closed.

H. All Trades shall furnish their extension cords and lamps other than those furnished for general lighting.

I. All Trades and other separate contractors shall be allowed to use electric service provided for general lighting and fractional horsepower hand tools at no cost.

J. Trades requiring voltage other than basic temporary system, three phase power, or a special single phase run, for operation of construction equipment or testing shall make their own arrangements with the Lead Contractor and Electrical Trade for the cost of installation, and removal when no longer required.

K. Heating and Ventilating Trade shall provide wiring, equipment and connections for portable or temporary heating units.

L. The Electrical Trade shall expedite the work under this contract in such a manner that the permanent power wiring system and panels will be installed and connected to permanent heating and ventilating equipment in time to operate and test this equipment to permit the use of portions of heating and ventilating system for temporary heating during construction. Permanent wiring and connections may be used at permanent equipment; however, the use of the permanent system during construction shall in no way waive any part of the guarantee period.

M. After Substantial Completion of the permanent electrical system and building wiring, permanent receptacles may be used during finishing work. Permanent wiring for lighting fixtures, switches and receptacles shall be installed only after all masonry and plastering has been completed, but this wiring shall not be used for motors larger than fractional HP or for welding equipment. Circuits for larger motors and welding equipment may be provided with special circuits to mains of electrical panels at the expense of those trades requiring them, provided that special permission is obtained from Lead Contractor and the installation is made by skilled electricians.

2.6 COLD WEATHER PROTECTION

A. All heating and protective covering, required to protect the work from injury due to freezing and moisture during the construction period and prior to enclosure of the building, shall be classed as COLD WEATHER PROTECTION. Such protection shall be provided and paid for by the General Building Contractor.

B. Heat required to protect materials from injury due to freezing during the construction period and prior to enclosure, shall be provided by means of portable heating units intended for this purpose.

C. All heating units must be approved types. Proper ventilation must be provided. The use of temporary units whose product of combustion will damage fresh concrete, mortar or other building materials, will not be allowed. Use of coke or oil salamanders is prohibited.

D. If electrical power is required for oil or gas portable heating units, it may be taken from the available temporary power source and paid for by the General Building Contractor.

E. Heating units and the area surrounding the units shall be kept in a clean and safe condition.

2.7 ENCLOSURE

A. Before the building, or portion thereof, can be considered enclosed, the General Building Contractor shall have advanced the construction of the building to conform with the following requirements.

B. The exterior walls should be erected to full thickness and height shall extend to the top of the horizontal level which encloses the space intended to receive heat. If erection of full thick walls is not feasible, erection of back-up wall only will be accepted if approved weatherproofing of back-up materials is provided to avoid damage to back-up materials.

C. The horizontal slab, which will serve as the overhead enclosure of the spaces to receive heat (whether it be the roof slab or intermediate floor slab), shall have all openings covered with closures capable of sustaining any loads imposed thereon. The entire overhead enclosure shall be made weatherproof.

D. Provide approved translucent material for temporary enclosure of window openings if they have not been glazed. Plain or reinforced polyethylene film or other suitable translucent material will be acceptable, provided it is installed in or on a well fitting rigid wood frame and kept in good repair. This means of temporary enclosure shall be used for other minor openings in walls.

E. Construct temporary walls as required to protect contents and to separate the interior enclosed sections from the interior open section of the building during construction. Temporary wall enclosure shall consist of plywood panels, at least 3/8" thick, fastened to wood framework, consisting of 2 x 4 studs spaced 24" o.c., securely spiked to wood plates, top and bottom. Provide intermediate girts between studs as required for fastening of plywood. Temporary walls must provide protection from dirt, dust, and drafts.

F. Provide exterior doors with hinges, self-closing device, and locks.

G. Make suitable provisions for passage of air to permit proper drying out of the building.

H. At end of day's work, securely close temporary enclosures. Padlock exterior doors. The General Building Contractor shall supervise effectiveness of enclosures.

I. Where reference is made to a "portion of the building", it is intended to mean definable areas of the building such as a group of floor levels or an entire wing of the building. It is not intended to require a room-by-room or erratic piece-meal enclosure operation but shall provide for an orderly expansion of large adjacent or related areas to be enclosed which are advantageous to the progress of the work and approved by Lead Contractor.

2.8 TEMPORARY HEAT

A. All heating required after enclosure of the building up to substantial completion shall be classified as TEMPORARY HEAT. Enclosure is defined in preceding Article.

B. It shall be the responsibility of the General Building Contractor to see that every precaution is used to prevent unnecessary escape of heat.

C. For installations that are not connected to central plant steam or central plant hot water, the lead contractor shall pay the fuel costs for temporary heat for both permanent heating systems used for temporary heat and/or temporary heating systems used for temporary heat.

D. The General Building Contractor shall pay for all electrical energy consumed for temporary heat.

E. The Heating Trade shall provide one of the following systems or a combination thereof, for furnishing temporary heat:

1. Permanent heating system may be used for temporary heating. If permanent system is used, the Heating Trade shall install in their permanent location heating coils or connectors as approved by Lead Contractor, with controls to maintain temperatures required. Temporary filters shall be used in the permanent system. Provide bases, shields, etc., around heating elements to prevent too rapid drying of adjacent concrete, masonry or plaster. Relocation of some of the permanent heating system equipment may be required during construction to prevent interference with new construction. Temporary units may be installed in such areas during the time permanent equipment is not operating due to relocation

2. The distribution piping of the permanent heating system may be utilized for supply and return to unit heaters on each floor in lieu of temporary piping, provided approved connections, controls and protection of such piping is maintained.

3. If the permanent air system is used during temporary heating period, temporary filters shall be provided in the system and they shall have efficiency equal to the permanent filters. The return air ductwork shall be protected from construction dirt by temporary filters placed over return openings.

F. If the Heating Trade does not have one of the above systems in operation by the time the building is enclosed, then the Heating Trade shall provide, maintain and supervise the operation of temporary portable units with necessary automatic controls to provide required temperatures. Current required may be taken from the temporary electrical service. See "Temporary electrical Installation". Cost of fuel to operate portable units shall be paid by the lead contractor.

G. All electrical wiring required for temporary heating units shall be furnished and installed by Heating Trade, from temporary wiring service. Electrical wiring to permanent equipment used for temporary heating that has been mounted in its permanent location shall be wired by trades skilled in that work.

H. The use of open salamanders as portable heating units will not be approved. All portable temporary heating units shall be properly ventilated to prevent combustion gases from remaining in the heating area.

I. The Heating Trade must ascertain if heating equipment will operate on the temporary electrical service available. If service is insufficient to operate equipment, Heating Trade shall make other arrangements.

J. The Heating Trade shall be responsible for the proper adjustment and maintenance of the system, and shall supervise and be responsible for the operation of the system used for temporary heating until State occupies the building. Supervision shall include periodic checking of operation as required.

K. A minimum temperature of 45 degrees and a maximum temperature of 60 degrees for the building shall be maintained by the Heating Trade, except for a period of at least ten days prior to the placing of interior woodwork and throughout the placing of this and other finish, varnishing, painting, etc., and until substantial completion to provide sufficient heat to ensure a temperature in the spaces involved of not less than 70 degrees nor more than 80 degrees.

L. The temporary heating system shall be removed by the Heating Trade after the permanent heating system has been installed and operating. Surfaces and structure shall be patched as required. Temporary heating equipment shall be relocated by the Heating Trade as required during construction to prevent interference with new construction.

M. At completion of construction work or when temporary heat is no longer required, Heating Trade must repair any damage done to permanent equipment during temporary heating period and also perform the necessary cleaning of all ducts and equipment. The Heating Trade shall provide permanent filters to the complete satisfaction of Lead Contractor.

2.9 FIRE PROTECTION

A. The General Building Contractor shall provide and maintain in working order during the entire construction period, a minimum of three fire extinguishers on each floor level of the building, and one in temporary office. Extinguishers shall be non-freeze type such as A-B-C rated dry chemical, of not less than 10-pound capacity each. In addition, any Subcontractor who maintains an enclosed shed on the site shall provide and maintain, in an accessible location, one or more similar nonfreezing type fire extinguisher in each enclosed shed.

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 50 00

Section 01 73 00 – Execution Requirements

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.
9. Sleeves and Openings
10. Cutting and patching

B. Related Sections include the following:

1. Standard Specifications "Prosecution and Progress" for procedures for coordinating field engineering with other construction activities.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Supervising Professionals and owners, and other information specified.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

D. Final Property Survey: Submit two hard copies and one electronic versions showing the Work performed and record survey data.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of storm sewer and water-service piping; and underground electrical services.

2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:

a. Description of the Work.

b. List of detrimental conditions, including substrates.

c. List of unacceptable installation tolerances.

d. Recommended corrections.

2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.

4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.

5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility and owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

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

1. Notify Supervising Professional not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Supervising Professional's written permission.

C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Supervising Professional. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Supervising Professional promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.

2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.

3. Inform installers of lines and levels to which they must comply.

4. Check the location, level and plumb, of every major element as the Work progresses.

5. Notify Supervising Professional when deviations from required lines and levels exceed allowable tolerances.

6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations (refer to structural plans for detail denoting control between site and foundation).

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Supervising Professional.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Supervising Professional. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Supervising Professional before proceeding.

2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.

2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.

3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.

2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.

3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

4. Maintain minimum headroom clearance of 8 feet (2.4 m) in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Supervising Professional.

2. Allow for building movement, including thermal expansion and contraction.

G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 SLEEVES AND OPENINGS

A. Each contractor requiring sleeved openings shall furnish all sleeves required for their penetrations whether or not they are responsible for providing the respective openings. Contractors furnishing sleeves to others for installation shall do this in a timely manner so as not to impede the project schedule.

B. Openings shown on the structural and/or architectural drawings shall be the responsibility for the Lead Contractor. Sleeves furnished by other contractors for openings shown on the structural and/or architectural drawings shall be installed by the Lead Contractor.

C. Openings that are required and are not shown on the structural and/or architectural drawings shall be the responsibility of the contractor requiring the openings. The contractor requiring the opening shall install sleeves for these openings or cut openings as needed (including floor openings within chases).

D. Individuals skilled in such work shall accomplish installation of sleeves and openings.

E. Each contractor shall be responsible for coordinating locations of their sleeves with work of other trades.

F. Each contractor who requires sleeves and/or openings shall submit through the Construction Manager to the A/E for review and approval, layout drawings of all such required sleeves and/or openings. Sleeve and openings layout drawings shall be received by the Construction Manager a minimum of two weeks prior to installation of the sleeves and openings. Sleeve and opening sizes and locations shall be dimensioned from column lines and floor elevations or from a point of reference approved by A/E.

3.7 CUTTING AND PATCHING

A. Cutting and patching required to access work in existing walls, in chases, above inaccessible ceilings, below floors, etc., shall be by the contractor who requires the access, unless shown on the bid documents otherwise or noted otherwise.

B. The contractor shall do all cutting or fitting of the work as required to make its several parts fit together, or to receive the work of others, as shown or reasonably implied by the drawings or specifications, or as may be directed by A/E. Holes cut in exterior walls and/or roofs shall be waterproofed.

C. The contractor who cuts shall also be responsible for patching. Where cutting and patching is required, the contractor shall hire individuals skilled in such work to do cutting and patching.

D. The contractor who removes or relocates building components which leaves a remaining opening shall be responsible for patching the opening.

E. Patching includes repairing openings to match adjacent construction and painting the surface to match existing. Painting means covering the entire wall where patching is to be done to nearest break point or corner unless indicated to be done by other trades.

F. Contractor shall not endanger any work by cutting, digging, or otherwise and shall not cut or alter the work of others without their consent.

G. Do not pierce beams or columns without permission of A/E and then only as directed in writing. If any ductwork, piping, conduit, etc. is required through walls or floors where no sleeve has been provided, use a core drill or saw cut to prevent damage and structural weakening.

H. Wherever any material, finish, or equipment, is damaged, the skilled trade shall accomplish the repair or replacement in that particular work and the cost shall be charged to the party responsible for the damage. The A/E reserves the right to disallow any means and/or methods that, in the opinion of A/E, are harmful to and/or not in the best interest of preserving the improvements receiving the work.

3.8 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to project site for owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by owner's construction forces.

1. Construction Schedule: Inform owner of General Building Contractor's preferred construction schedule for owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify owner if changes to schedule are required due to differences in actual construction progress.

2. Pre-installation Conferences: Include owner's construction forces at pre-installation conferences covering portions of the Work that are to receive owner's work. Attend pre-installation conferences conducted by owner's construction forces if portions of the Work depend on owner's construction.

3.9 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris. Temperature is expected to rise above 80 deg. F. (27 deg C).

2. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.

2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

K. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.10 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C.T Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.11 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.12 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 01 73 00

Section 01 74 23 – Final Cleaning

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.

1. Special cleaning requirements for specific elements of the Work are included in appropriate Sections of the specifications.

B. General Project closeout requirements are included in Section "Project Closeout."

C. General cleanup and waste removal requirements are included elsewhere in the Standard Specifications.

D. Except as otherwise indicated, each General Building Contractor is responsible for final cleaning of their own work. The General Building Contractor is responsible for coordination of final cleaning where more than one prime contractor is involved in final cleaning a single area or piece of equipment.

E. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.

2. Do not burn or bury debris, rubbish or other waste material on the premises.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer's instructions.

B. Complete the following cleaning operations before requesting inspection for Certification of Substantial Completion for the entire Project or a portion of the Project. Complete checklist B, sign form, and submit to Supervising Professional.

C. Compliance: Remove waste materials from the site and dispose of in a lawful manner.

1. Where extra materials of value remain after completion of associated construction have become the owner's property, dispose of these materials as directed.

D. Removing Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

FINAL CLEANING – CHECKLIST 'B'

- ☐ Clean the Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
- ☐ Remove tools, construction equipment, machinery and surplus material from the site.
- ☐ Remove snow and ice to provide safe access to the building.
- ☐ Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- ☐ Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
- ☐ Wash concrete floors in unoccupied spaces.
- ☐ Vacuum clean carpet and similar soft surfaces, removing debris and excess nap. Shampoo if required.
- ☐ Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- ☐ Remove labels that are not permanent labels.
- ☐ Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
- ☐ Wipe interior surfaces of all cabinetwork including shelves, vertical dividers, and drawers.
- ☐ Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
- ☐ Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- ☐ Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated for temporary facilities during construction.
- ☐ Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.
- ☐ Leave the Project clean and ready for occupancy.

To the best of my knowledge, the above list has been completed.

General Building Contractor Signature Representing Date

Return this completed, signed form to the Supervising Professional prior to requesting inspection for Substantial Completion.

END OF SECTION 01 74 23

Section 01 77 00 – Project Closeout Procedures

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for project closeout, including:

1. Substantial Completion.

2. Final Completion and Final Payment.

B. Closeout requirements for specific construction activities are included in the appropriate Sections in Divisions 2 through 32.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Submittal Procedures.

2. Final Cleaning.

3. Project Record Documents.

4. Operating and Maintenance Data/Owner Training.

1.3 SUBSTANTIAL COMPLETION

A. General: Before requesting inspection for certification of Substantial Completion, complete checklists A, B, and C, which are found in this manual. Return the signed forms to the Supervising Professional. Inspection for Substantial Completion will not be conducted until the Supervising Professional is satisfied that these requirements have been met.

B. Application for Payment: In the Application for Payment that coincides with, or first follows, the date Substantial Completion is claimed, show 100 percent completion for the portion of the Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and a statement showing an accounting of changes to the Contract Sum.

1. If 100 percent completion cannot be shown, include a list of incomplete items, the value of incomplete construction, and reasons the Work is not complete.

C. Inspection Procedures: Upon receiving the request for inspection, the Supervising Professional will either proceed with inspection or advise the General Building Contractor of unfilled requirements. The Supervising Professional will prepare the Certificate of Substantial Completion following inspection or advise the General Building Contractor of construction that must be completed or corrected before the certificate will be issued.

1. The Supervising Professional will repeat inspection when requested and assure that the Work has been substantially completed. The General Building Contractor shall be responsible for hourly payments of additional site reviews made by the Supervising Professional or engineer with costs deducted from the General Building Contractor's balance.

2. Results of the completed inspection will form the basis of requirements for final acceptance.

SUBSTANTIAL COMPLETION – CHECKLIST 'A'

General Building Contractor Responsibilities

Prior to the General Building Contractor's request for Substantial Completion, the General Building Contractor is responsible for the following:

- ❑ Submit a list to the Supervising Professional of incomplete items, stating reasons why each of the items is incomplete. The General Building Contractor shall stipulate a monetary value to complete each item.
- ❑ Notify the owner 30 days prior to any insurance coverage changes. Copy the Supervising Professional on this correspondence.
- ❑ Submit all warranties, maintenance contracts, and required operating instructions to the Supervising Professional for review and distribution to the owner. See section 01 78 23 for timing.
- ❑ Obtain the Certificate of Occupancy to allow the owner's full and unrestricted use of the project. General Building Contractor to check with the local zoning ordinance for required permits or certificates. Submit to the Supervising Professional for review and distribution to the owner.
- ❑ Submit record documents that show all changes made during construction, including all drawings, specifications, and addenda. Submit to the Supervising Professional for distribution to the owner.
- ❑ Deliver to the owner material replacement and maintenance stock as called for in the specifications.
- ❑ Complete the keying schedule, and deliver to the owner with properly tagged master, submaster, room and special keys. Make final changes to lock cylinders and coordinate shifting building security to the owner.
- ❑ Instruct the owner to operate and maintain all systems and equipment. Submit completed copies of checklist C from Section 01 78 23 to the Supervising Professional.
- ❑ Discontinue or change over and remove temporary facilities from the site, along with construction tools, mock-ups, and similar elements.
- ❑ Complete the final clean up requirements, including touch up painting. Restore all damaged finishes. Submit completed checklist B to the Supervising Professional. See Section 01 74 23.
- ❑ Submit all required guarantees, certificates of inspections, and bonds. Sign a written guarantee at the completion of the work that covers all items requiring guarantees under the specifications. Submit copies to the owner and Supervising Professional.

To the best of my knowledge, the above list has been completed. I hereby request the Supervising Professional's inspection for substantial completion.

General Building Contractor Signature Representing Date

Return this completed, signed form to the Supervising Professional

1.4 FINAL ACCEPTANCE

A. General: Before requesting final inspection for certification of final completion and final payment, comply with the following checklist. List exceptions in the request.

B. FINAL COMPLETION

1. General Building Contractor's Responsibilities:

a. Submit the final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

b. Submit an updated final statement, accounting for final additional changes to the Contract Sum.

c. Submit a certified copy of the Supervising Professional's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Supervising Professional.

d. Submit consent of surety to final payment.

e. Submit a final liquidated damages settlement statement.

f. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

C. Re-inspection Procedure: The Supervising Professional will re-inspect the Work upon receipt of notice that the Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to the Supervising Professional.

1. Upon completion of re-inspection, the Supervising Professional will prepare a certificate of final completion or advise the General Building Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance. The General Building Contractor shall be responsible for hourly payments of additional site reviews made by the Supervising Professional or engineer with costs deducted from General Building Contractor balance.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 01 77 00

Section 01 78 23 – Operating & Maintenance Data/Owner Training

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for operating and maintenance manuals including the following:

1. Operating and maintenance manuals.
2. Material finish and maintenance information.
3. Owner training and instruction.

B. Related Sections:

1. Division 2-32 Sections for special operating and maintenance data requirements for specific pieces of equipment or building operating systems.
2. Division 1 Section “Submittals” for preparing shop drawings and product data.
3. Division 1 Section “Project Close out” for general closeout requirements.

1.3 SUBMITTALS

A. Initial Submittal: Submit 1 draft copy of each manual at least 21 days before requesting inspection for Substantial Completion. Refer to SUBSTANTIAL COMPLETION Checklist A, Section 01 77 00. Include a complete operation and maintenance directory. Supervising Professional will return 1 copy of draft and mark whether general scope and content of manual are acceptable.

B. Final Submittal: Submit 1 copy of each manual in final form at least 15 days before final inspection. Supervising Professional will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Supervising Professional's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Supervising Professional's comments.

PART 2 – PRODUCTS

2.1 MANUALS, GENERAL

A. Organization: Organize manuals into suitable sets of manageable size.

B. Identification: Bind data into individual binders for each manual, properly identified on front and spine. For large manuals, provide an index sheet and thumb tabs for separate categories.

C. Binders: Provide heavy-duty, 3-ring, vinyl-covered binders, 1 to 2 inch (25 to 50 mm) thick as required to contain information, sized for 8-1/2-by-11-inch (215-by-280-mm) paper with inside pockets or pocket folders for folded sheets.

D. Table of Contents: After the Title Page, include a typewritten table of contents for each volume, arranged systematically according to the Project Manual format. Include a list of each product included, identified by product name or other appropriate identifying symbol and indexed to the content of the volume.

E. Content: In each manual, include information specified in individual Specification Sections and in this Section.

F. Warranties, Bonds and Service Contracts: Provide a copy of each warranty, bond or service contract in the appropriate manual for the information of the owner's operating personnel.

G. Provide written data outlining procedures to be followed in the event of product failure. List circumstances and conditions that would affect validity of the warranty or bond.

H. Responsibility: The General Building Contractor is responsible for submitting maintenance manuals for all Work. Where a manual includes information on installations by more than one contract, the contractor who is the principal source of information shall receive information from other contractors, coordinate and collate information for a unified manual, and provide binders and submittal as specified.

2.2 OPERATION MANUALS

A. For each major building component and its controls, include the following in the manuals for daily operations and management of the systems and equipment:

1. System or equipment description with design factors and assumptions.
2. Manufacturer name.
3. Model number.
4. Serial number of each component.
5. Emergency instructions.
6. Spare parts list.
7. Copies of specific warranties, bonds, and service contracts.
8. Wiring diagrams.
9. Recommended maintenance procedures and turn-around times.
10. Inspection and system-test procedures.
11. Copies of applicable Shop Drawings and Product Data.
12. Listing of required maintenance materials.
13. Names and addresses of sources of maintenance materials.
14. Maintenance drawings and diagrams.
15. Precautions against improper maintenance and exposure.

2.3 MATERIAL AND PRODUCT MAINTENANCE MANUALS

A. Architectural Products: Provide manufacturer's data and instructions on care and maintenance of architectural products, including applied materials and finishes, as applicable:

1. Manufacturer's catalog number.
2. Size.
3. Material composition.
4. Color.
5. Texture.
6. Reordering information for specially manufactured products.

B. Care and Maintenance Instructions: Provide information on care and maintenance, including manufacturer's recommendations for types of cleaning agents to be used and methods of cleaning. Provide information regarding cleaning agents and methods that could prove detrimental to the product. Include manufacturer's recommended schedule for cleaning and maintenance.

C. Moisture-Protection and Weather-Exposed Products: Provide complete manufacturer's data with instructions on inspection, maintenance and repair of products exposed to the weather or designed for moisture-protection purposes, as applicable:

1. Applicable standards.
2. Chemical composition.
3. Installation details.
4. Inspection procedures.

5. Maintenance information.

6. Repair procedures.

2.4 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Equipment and Systems: Provide the following information for each piece of equipment, each building operating system, and each electric or electronic system.

1. Description: Provide a complete description of each unit and related component parts, including the following:

a. Equipment or system function.

b. Operating characteristics.

c. Limiting conditions.

d. Performance curves.

e. Engineering data and tests.

f. Complete nomenclature and number of replacement parts.

2. Manufacturer's Information: For each manufacturer of a component part or piece of equipment provide the following:

a. Printed operating and maintenance instructions.

b. Assembly drawings and diagrams required for maintenance.

c. List of items recommended to be stocked as spare parts.

3. Maintenance Procedures: Provide information detailing essential maintenance procedures, including the following:

a. Routine operations.

b. Trouble-shooting guide.

c. Disassembly, repair and reassembly

d. Alignment, adjusting and checking.

4. Operating Procedures: Provide information on equipment and system operating procedures, including the following:

a. Start-up procedures.

b. Equipment or system break-in.

c. Routine and normal operating instructions.

d. Regulation and control procedures.

e. Instructions on stopping.

f. Shut-down and emergency instructions.

g. Summer and winter operating instructions.

h. Required sequences for electric or electronic systems.

i. Special operating instructions.

5. Servicing Schedule: Provide a schedule of routine servicing and lubrication requirements, including a list of required lubricants for equipment with moving parts.

6. Controls: Provide a description of the sequence of operation and as-installed control diagrams by the control manufacturer for systems requiring controls.

a. Provide as-installed color-coded piping diagrams, where required for identification.

7. Valve Tags: Provide charts of valve tag numbers, with the location and function of each valve.

8. Circuit Directories: For electric and electronic systems, provide complete circuit directories of panel boards, including the following:

   a. Electric service.

   b. Controls.

   c. Communication.

PART 3 – EXECUTION

3.1 INSTRUCTING THE OWNER'S AND/OR TENANT'S PERSONNEL

A. General: Prior to final inspection, instruct the owner's and/or Tenant's personnel in operation, adjustment, and maintenance of products, equipment and systems. Provide instruction at mutually agreed upon times.

B. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

   1. Fire-protection systems.

   2. Motorized doors.

   3. Intrusion detection systems.

   4. Refrigeration systems, including chillers, cooling towers, condensers, pumps, and distribution piping.

   5. HVAC systems, including air-handling equipment, air distribution systems, and terminal equipment and devices.

   6. HVAC instrumentation and controls.

   7. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies, and motor controls.

   8. Packaged engine generators, including transfer switches.

   9. Lighting equipment and controls.

   10. Communication systems, including surveillance, and television equipment.

C. For equipment that requires seasonal operation, provide similar instruction during other seasons.

D. Use the operation and maintenance manuals for each piece of equipment or system as the basis of instruction. Review contents in detail to explain all aspects of operation and maintenance.

E. Complete Checklist C for each system requiring instruction or training and submit to the Supervising Professional prior to requesting inspection for Substantial Completion.

CHECKLIST 'C' - OPERATING AND MAINTENANCE INSTRUCTIONS
OWNER TRAINING & DEMONSTRATION CERTIFICATION

Project Name: _____ **Project No.**_____

Owner: _____

Building Component/System Training conducted by (Name, Company)

The General Building Contractor shall arrange for each installer of equipment that requires regular maintenance to meet with the owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:

- ☐ Maintenance manuals.
- ☐ Record documents.
- ☐ Spare parts and materials.
- ☐ Tools.
- ☐ Lubricants.
- ☐ Fuels.
- ☐ Identification systems.
- ☐ Control sequences.
- ☐ Hazards.
- ☐ Cleaning.
- ☐ Warranties and bonds.
- ☐ Maintenance agreements and similar continuing commitments.

☐ As part of instruction for operating equipment, demonstrate the following procedures:

- ☐ Start-up.
- ☐ Shutdown.
- ☐ Emergency operations.
- ☐ Noise and vibration adjustments.
- ☐ Safety procedures.
- ☐ Economy and efficiency adjustments.
- ☐ Effective energy utilization.

I have completed the above review to the owner's satisfaction.

Owner Signature Representing Date

General Building Contractor Signature Representing Date

Return this completed, signed form to the Supervising Professional prior to requesting Final Inspection. (Use as many forms as required by Specification Divisions 1 -32.)

END OF SECTION 01 78 23

Section 01 78 39 – Project Record Documents

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents.

B. Project Record Documents required include the following:

1. Marked-up copies of Contract Drawings.

2. Marked-up copies of Specifications and addenda.

C. Related Sections: The following Sections contain requirements that relate to this Section:

1. Submittals.

2. Project Closeout.

3. Divisions 2 through 32 Sections for specifying Project Record Document requirements for specific pieces of equipment or building operating systems.

D. Maintaining Documents and Samples: Store record documents in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition. Make documents available at all times for the Supervising Professional's inspections.

1.3 RECORD DRAWINGS

A. Markup Procedure: During construction, maintain a set of blue- or black-line white prints of Contract Drawings and Shop Drawings for Project Record Document purposes.

1. Mark these Drawings to show the actual installation where the installation varies from the installation shown originally. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later. Items required to be marked include, but are not limited to, the following:

a. Dimensional changes to the Drawings.

b. Revisions to details shown on the Drawings.

c. Depths of foundations below the first floor.

d. Location and depth of underground utilities.

e. Revisions to routing of piping and conduits.

f. Revisions to electrical circuitry.

g. Actual equipment locations.

h. Duct size and routing.

i. Locations of concealed internal utilities.

j. Changes made by change order or Construction Change Directive.

k. Changes made following the Supervising Professional's written orders.

l. Details not on original Contract Drawings.

2. Mark record sets with red erasable colored pencil. Use other colors to distinguish between changes for different categories of the Work at the same location.

3. Mark important additional information that was either shown schematically or omitted from original Drawings.

4. Note Construction Change Directive numbers, alternate numbers, change-order numbers, supplemental instructions number, construction bulletin numbers, and similar identification.

B. Responsibility for Markup: The General Building Contractor, whether the individual or entity is the installer, subcontractor, or similar entity, shall prepare the markup on record drawings.

1. Accurately record information in an understandable drawing technique.

2. Record data as soon as possible after obtaining it. Record and check the markup prior to enclosing concealed installations.

3. At time of Substantial Completion, submit record drawings to the Supervising Professional for the owner's records. Organize into sets and bind with durable cover sheets that include appropriate identification, including titles, dates, and other information.

1.4 RECORD SPECIFICATIONS

A. During the construction period, maintain one copy of the Project Specifications, including addenda and modifications issued, for Project Record Document purposes.

1. Mark the Specifications to indicate information on concealed installations that would be difficult to identify or measure and record later.

2. Upon completion of markup, submit record Specifications to the Supervising Professional for the owner's records.

3. Each prime contractor is responsible for marking up Sections that contain its own Work.

a. The General Building Contractor is responsible for collecting marked-up record Sections from each of the other prime contractors. The General Building Contractor is also responsible for collating these Sections in proper numeric order with its own Sections to form a complete set of record Specifications.

b. The General Building Contractor is responsible for submitting the complete set of record Specifications as specified.

1.5 MISCELLANEOUS RECORD SUBMITTALS

A. Refer to other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Immediately prior to Substantial Completion, complete miscellaneous records, and place in good order, properly identified and bound or filed, ready for use and reference. Submit to the Supervising Professional for the owner's records.

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.1 RECORDING

A. Post changes and modifications to the Documents as they occur. Do not wait until the end of the Project.

END OF SECTION 01 78 39

END OF DIVISION 01 – GENERAL REQUIREMENTS

53. SWEF Building, General Construction, Item SPV.0060.100.

A Description

This item consists of the general construction work for the SWEF (Safety & Weight Facility) building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure SWEF Building, General Construction 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.0060.100	SWEF Building, General Construction	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.

DIVISION 03 – CONCRETE

Section 03 30 00 – Cast-In-Place Concrete

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applicable provisions of Division 1 shall govern all work under this section.

B. Section Includes:

1. Cast-in-place concrete
2. Formwork, shoring, bracing, and anchorage
3. Concrete reinforcement, anchor bolts, waterstops and accessories
4. Installation of perimeter insulation
5. Underslab vapor retarder barrier
6. Underslab rigid insulation
7. Granular base under slab-on-grade floors

1.2 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. Section 05 12 00 – Structural Steel: Anchor bolts

B. Section 07 21 13 – Board Insulation: Perimeter and underslab insulation installation.

1.3 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel: Anchor Bolts

B. Section 07 13 00 – Waterproof Membrane System: Foundation wall waterproofing

C. Section 07 21 13 – Board Insulation: Perimeter insulation, protection board, underslab rigid insulation

D. Division 22 – Plumbing: Trench drain system

E. Division 23 – HVAC: In-Slab Radiant Heating

F. Division 26 – Electrical: In-slab and underslab conduits and electrical equipment.

G. Section 31 23 00 – Excavation & Fill

1.4 REFERENCES

A. American Concrete Institute (ACI):

1. ACI 318-Building Code Requirements for Reinforced Concrete.
2. ACI 301-Specifications for Structural Concrete in Buildings.

B. American Society for Testing and Material (ASTM):

1. ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement.
2. ASTM A497 – Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
3. ASTM A615 – Deformed and Plain Billet-Steel for Concrete Reinforcement.
4. ASTM C 33 - Concrete Aggregates.
5. ASTM C94 – Ready-Mixed Concrete.
6. ASTM C150 – Portland Cement.
7. ASTM C260 – Air Entraining Admixtures for Concrete.
8. ASTM C309 – Liquid Membrane-Forming Compounds for Curing Concrete.

1.5 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures:

1. Shop Drawings

a. Fabrication Drawings

I. Formwork

II. Reinforcing steel

b. Provide erection drawings for concrete formwork that show placement of reinforcement and accessories, with reference to the contract drawings. Reproductions of contract drawings are unacceptable. Electronic CAD foundation background plans will be made available to the Concrete subcontractor.

2. Product Data

a. Materials for curing concrete.

I. Joint filler

II. Aggregate Materials

III. Cement

IV. Fly Ash

V. Portland Cement.

VI. Ready-Mix Concrete.

VII. Vapor retarder membrane.

VIII. Bonding Materials.

IX. Concrete Curing Materials

X. Reinforcement

XI. Liquid Chemical Floor Hardener.

XII. Water stop

3. Samples

a. Submit the following samples:

I. Three samples of water stop, 12 inch long, including samples of straight run splices and prefabricated corner sections.

4. Design Data

a. Concrete mix design

I. Fifteen days minimum prior to concrete placement, submit a mix design for each strength and type of concrete. Submit a complete list of materials including type; brand; source and amount of cement, fly ash, pozzolans, ground slag, and admixtures; and applicable reference specifications.

II. Provide mix proportion data using at least three different water-cement ratios for each type of mixture, which produce a range of strength encompassing those required for each class and type of concrete required. If source material changes, resubmit mix proportion data using revised source material. Provide only materials that have been proven by trial mix studies to meet the requirements of this specification, unless otherwise approved in writing by the A/E. Indicate clearly in the submittal where each mix design is used when more than one mix design is submitted.

III. Submit additional data regarding concrete aggregates if the source of aggregate changes. Submit copies of the fly ash, and pozzolan test results, in addition. The approval of fly ash, and pozzolan, test results must be within 6 months of submittal date.

1.6 QUALITY ASSURANCE:

A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this project and whose work has resulted in construction with record of successful in-service performance.

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

C. Comply with latest provisions of ACI 301, "Specifications for Structural Concrete for Buildings," ACI 318, "Building Code Requirements for Reinforced Concrete," and CRSI "Manual of Standard Practice," except where more stringent requirements are indicated.

1.7 TESTING AND QUALITY CONTROL SERVICES

A. Selection and Payment

1. The General Building Contractor shall employ and pay for services of an independent testing laboratory to perform specified inspection and testing.

2. Employment of testing laboratory shall in no way relieve contractor of obligation to perform work according to requirements of the Contract Documents.

B. Quality Assurance

1. Laboratory: Authorized to operate in the State of Wisconsin.

C. Contractor Submittals

1. Prior to start of Work, submit testing laboratory name, address, and telephone number, and names of registered engineer that will be responsible for the testing and submittal of test results.

2. Submit test reports to the architect’s office.

D. Laboratory Responsibilities

1. Perform sampling and testing of concrete work as described under this section, Art. 3.09 – Field Quality Control.

PART 2 – PRODUCTS

2.1 FORM MATERIALS:

A. General: Furnish form materials according to ACI 301 with sufficient stability to withstand pressure of placed concrete without bow or deflection. Forms shall be of plywood, metal framed plywood faces or other acceptable panel-type materials to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.

B. Forms for Exposed Concrete Surfaces: Suitable panel-type material to provide continuous, straight, smooth, exposed surfaces. New plywood complying with U.S. Product Standards PS-1, Plyform Class I, B-B Concrete Form Plywood, B-Matte MDO by Simpson, 5/8” or 3/4” thick without defects, mill oiled and edge sealed or wood forms lined with 3/16” tempered pressed wood or 1/4” thick plywood B-B conforming to EXT-DFPA as large as possible to minimize joints.

C. Formed Surfaces Concealed From View

1. Wood: Clean straight lumber dressed on face and edges, nominal 1” thickness or plywood 5/8” or 3/4” thick conforming to EXT-DFPA or metal forms smooth and as large size as possible.

D. Form Ties

1. For Unexposed Concrete: Adjustable length removable or snap-off type fabricated to leave holes no larger than 1” in diameter in face of concrete with breakpoint 1” or more from surface.

2. For Exposed Concrete: Snap-off type (break point 1” or more from surface) with plastic cones added to form a 1-1/4” diameter, 1-1/2” deep recess around tie which shall be grouted flush to match adjacent concrete surface.

3. Wire ties or site fabricated ties will not be permitted.

4. Form Release Agent: Commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, nor impair subsequent treatments of concrete surfaces requiring bond or adhesion, nor impede wetting of surfaces to be cured with water or curing compound. Material shall be appropriate for environmental conditions encountered.

2.2 GRANULAR BASE UNDER SLAB-ON-GRADES

A. Provide 6 inches of clean sand and gravel having less than 5% particles passing the #200 sieve. Compact to a minimum of 95% of it’s maximum standard Proctor density (ASTM D 698).

2.3 REINFORCING MATERIALS

A. Clean, free of loose rust, mill scale, dirt, ice, etc., as follows:

B. Deformed Reinforcing Bars: ASTM A 615, Grade 60, unless otherwise indicated.

C. Epoxy-Coated Reinforcing Bars: ASTM A 775/A 775M

D. Steel Bar Mats: ASTM A 184/A 184M, assembled with clips.

1. Steel Reinforcement: ASTM A 615/A 615M, Grade 60, deformed bars.

2. Steel Reinforcement: ASTM A 706/A 706M, deformed bars.

E. Plain-Steel Wire: ASTM A 82, as drawn.

F. Welded Wire Fabric: ASTM A 185, 65,000 psi yield strength, fabricated from as-drawn steel wire into flat sheets.

G. Deformed-Steel Welded Wire Fabric: ASTM A 497, flat sheet.

2.4 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI’s “Manual of Standard Practice” from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:

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

2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60. Cut bars true to length with ends square and free of burrs.

C. Epoxy-Coated Joint Dowel bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60, plain-steel bars.

D. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.

2.5 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150, Type 1.

B. Fly Ash: Class C, ASTM 618.

C. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to architect. Normal weight coarse aggregate to be crushed stone or gravel. Fine aggregate shall be natural sand.

1. For exterior exposed surfaces (slabs, walks, platforms, ramps, steps, etc.) do not use fine or coarse aggregates containing spalling-causing deleterious substances (chert). Submit tests on aggregate substantiating this requirement.

2. Water: Potable (drinkable).

2.6 ADMIXTURES:

A. General: Admixtures are limited to the following, unless approved by architect. Provide admixtures that contain less than 0.1 chloride ions.

1. Air-Entraining Admixture: ASTM C 260. Materials shall be compatible with other required admixtures. Subject to compliance with requirements provide one of the following:

a. Daravair, W. R. Grace & Company.

b. Micro-Air, Master Builders, Incorporated.

c. Sika AER, Sika Corporation.

d. Synthetic Air, Euclid Chemical Company.

2. Water-Reducing, Retarding, and Accelerating Chemical Admixtures: ASTM C 494. Type A. Subject to compliance with requirements provide one of the following:

a. Eucon WR 75, Euclid Chemical Company.

b. Pozzolith 220N, Master Builders, Incorporated.

c. WRDA with Hycol, W. R. Grace & Company.

3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F, containing no chloride ions.

a. Eucon 37, Euclid Chemical Company.

b. Rheobuild 1000, Master Builders, Incorporated.

c. Sikament, Sika Corporation.

d. WRDA 19, W.R. Grace & Company.

4. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E, containing no chloride ions.

a. Accelguard 80, Euclid Chemical Company.

b. Daraset, W.R. Grace & Company.

c. Pozzolith 500, Master Builders, Incorporated.

5. Water-Reducing, Retarding Admixture: ASTM C 494, Type D, containing no chloride ions.

a. Eucon Retarder 100, Euclid Chemical Company.

b. Daratard-17, W.R. Grace & Company.

c. Plastiment, Sika Corporation.

d. Pozzolith 100XR, Master Builders, Incorporated.

6. Viscosity Modifying Admixture

a. Polychem VMA, General Resource Technology, Inc., Eagan, MN

7. Waterproofing Admixture

a. Xypex C-500, XYPEX Chemical Corporation, Richmond, BC, Canada.

b. Used as an integral waterproofing admixture at the time of batching.

c. Applicable to the following below-grade foundation walls:

I. Scale Tunnel 001

II. Stair 002

III. Recessed Inspection Pits 125 & 126.

2.7 RELATED MATERIALS

A. Expansion Joint Filler

1. Flexible, lightweight, nonstaining, polyethylene, closed-cell compressible foam compatible with cold-applied sealants, caulks and hot-pour joint sealants. Foam expansion joint filler shall have a pre-scored removable strip to provide a uniform sealing reservoir.

2. Complying with:

ASTM D 1622, 2.0 lbs/cu. ft. density

ASTM D 3575, 55 psi tensile strength

ASTM D3575 0.5% vol. max. water absorption

3. Thickness: Provide 1/2” thickness where slabs abut walls, columns, or other vertical surfaces.

4. Manufacturer: W.R. Meadows ‘Deck-O-Foam’

B. Waterstop

1. Provide 4” wide x 3/16” thick flat ribbed flexible PVC waterstop.

2. Manufacturers

a. Greenstreak Style No. 781 or equivalent profile as manufactured by

b. BoMetals, Inc.

c. Powder Springs, GA.

3. The PVC waterstop shall be extruded from an elastomeric plastic material of which the basic resin is prime virgin polyvinyl chloride. The PVC compound shall not contain any scrapped or reclaimed material or pigment whatsoever.

4. Performance Requirements as follows:

Property	**Test Method**	**Required Limits**
Water absorption	ASTM D 570	0.15% max
Tear Resistance	ASTM D 624	200 lb/in (35 kN/m) min.
Ultimate Elongation	ASTM D 638	350% min.
Tensile Strength	ASTM D 638	2000 psi (13.78 Mpa) min.
Low Temperature Brittleness	ASTM D 746	No Failure @ -35° F (-37° C)
Stiffness in Flexure	ASTM D 747	600 psi (4.13 Mpa) min.
Specific Gravity	ASTM D 792	1.45 max.
Hardness, Shore A	ASTM D 2240	79 ±3
Tensile Strength after accelerated extraction	CRD-C 572	1850 psi (11.03 Mpa) min.
Elongation after accelerated extraction	CRD-C 572	300% min.
Effect of Alkalies after 7days: Weight Change/ Hardness Change	CRD-C 572	Between -0.10% / +0.25% +/- 5 points

5. Provide factory made waterstop fabrications for all changes of direction, intersections, and transitions leaving only straight butt joint splices for the field.

6. Provide hog rings or grommets spaced at 12 inches on center along length of waterstop.

7. Provide Teflon coated thermostatically controlled waterstop splicing irons for field butt splices.

C. Underslab Vapor Retarder Membrane

1. 15-mil sheet type plastic membrane meeting all requirements of ASTM E1745 Classes A, B & C.

2. Water Vapor Permeance Rating (ASTM F 1249): 0.018

3. Tensile Strength (ASTM E 154, Section 9): 84 lbs.Force/inch.

4. Puncture Resistance (ASTM D 1709, Method B): 4,335 grams

5. Manufacturers

a. W.R. Meadows, Hampshire, IL: Perminator Underslab Vapor-Mat

b. Reef Industries, Houston, TX: Griffolyn 15 mil

c. Raven Industries, Sioux Falls, SD: Vapor Block 15

D. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.

E. Moisture-Retaining Cover: Waterproof paper, polyethylene film or polyethylene-coated burlap, complying with ASTM C 171. Use this method for all slabs on grade. Seal all joints, penetrations and perimeters. Retain and protect cover from damage for a minimum of seven days. Add moisture daily to maintain surface in a damp condition.

F. Membrane-Forming Curing Compound: ASTM C-1315 Type I, Class A. Moisture loss not more than 0.40 kg/sq. meter when applied at 300 sq. ft./gal.

1. Concrete Contractor to coordinate with and receive approval of Finish Flooring Contractor, of compatibility of curing compound with flooring materials and adhesives prior to application.

2. Products: Subject to compliance with requirements, provide one of the following:

a. Kure-N-Seal 25LV by BASF Incop.

b. Dayton J-22UV by Dayton-Superior

c. Kure and Seal 1315 by TK Products

G. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Aqua-Cure, Euclid Chemical Co.

b. VoComp-20, W.R. Meadows, Inc.

c. Dayton J-18 Safe Cure & Seal.

d. TK-Kure and Seal WB, TK Products

H. Evaporation Control: Monomolecular film-forming compound applied to exposed concrete slab surfaces for temporary protection from rapid moisture loss.

1. Tri-Film by TK Products

2. Dayton J-74 Sure-Film.

I. Sealer: Where sealer (“sealed slab”) is noted on Room Finish Schedule. Apply per Manufacturers instructions and at manufacturers recommended application rates. Provide manufacturers five (5) year guarantee against dusting.

1. Products: Subject to compliance with requirements, provide one of the following:

a. TK-5329 Floor Hardener and Densifier by TK-Products

b. Ashford Formula by Curecrete Chemical Company

c. Sealhard by WR Meadows

2.8 MIX PROPORTIONING

A. Ready-Mix Concrete: Measure, mixed and delivered according to ASTM C-94.

B. Mix Design Schedule:

Use	Min. Compress. Strength @ 28 days	Slump Max (Before plasticizer)	Min lbs Aggr Size	Air Entrain. of cement per C.Y.	W/C% +/- ½% Ratio
Footings	3,000 PSI 5”	1 1/2”	423 lb.	4.5%	.68
Walls/Piers	4,000 PSI 4”	3/4”	541 lb.	None	.57
Interior Office Slab-On-Grade	4,000 PSI 3”	1 1/2”	541 lb.	None	.57
Interior Traffic Slab-On-Grade	4,000 PSI 3”	1 1/2”	541 lb.	6.0%	.45
Exterior Slab-On-Grade	3,500 PSI 3”	3/4”	517 lb.	6.0%	.48
Bond Beams	3,000 PSI 4”	3/8”	517 lb.	None	.68

C. Air entrained concrete: Use for all exterior walls, exterior slabs, walks, platforms, ramps, steps and all other concrete exposed to freezing and thawing.

D. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement as follows:

1. Concrete without admixtures: 3 and 4 inch slump plus 1 inch and minus 1/2 inch.

2. Concrete without admixtures: 5 inch slump plus or minus 1 1/2 inch and minus 1 inch.

3. Concrete containing high-range water-reducing admixture (superplasticizer): Not more than 8 inches plus or minus 1 1/2 inches.

E. Cement Content: 1.5 parts of Class C flyash may be substituted for 1.0 parts of cement up to a maximum of 20% of the cement content or 100 pounds of flyash, whichever is most restrictive of flyash content.

F. Adjustment to Concrete Mixes: Mix design adjustments may be requested by contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by architect. Laboratory test data for revised mix design and strength results must be submitted to and accepted by architect before using in Work.

G. Use water-reducing, accelerating, and retarding admixtures that have been tested and accepted in mix designs in strict compliance with manufacturer's directions.

H. Job-Site Mixing: Use drum-type batch machine mixer, mixing not less than 1-1/2 minutes for 1 cu. yd. or smaller capacity. Increase mixing time at least 15 seconds for each additional cu. yd.

PART 3 – EXECUTION

3.1 FORMWORK

A. Construct formwork so that concrete members and structures are of correct size, shape, alignment, elevation, and position. Select form materials to obtain required finishes.

1. Maintain formwork tolerances and surface irregularities within ACI 347 limits, Class A tolerances for concrete exposed to view and Class C tolerances for other concrete surfaces.

2. Provide openings in formwork to accommodate work of other trades. Accurately place and securely support items built into forms.

3. Clean and adjust forms prior to concrete placement. Apply form-release agents or wet forms as required. Retighten forms during concrete placement, if required, to eliminate mortar leaks.

3.2 REINFORCEMENT

A. Accurately position and support reinforcement. Locate and support reinforcement to maintain minimum cover with metal chairs, runners, bolsters, spacers, and hangers as required. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

1. Install welded wire fabric in lengths as long as practicable; lap at least one full mesh and lace splices with wire.

3.3 JOINTS

A. Locate and install construction, isolation, and control joints as indicated or required. Locate construction joints so they do not impair strength and appearance of structure. Place isolation and control joints in slabs-on-ground to stabilize differential settlement and prevent random cracking. Provide compressible expansion joint filler material where slabs abut walls, columns or other vertical surfaces.

3.4 INSTALLATION OF EMBEDDED ITEMS

A. Set and build anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates, and instructions provided by others for locating and setting.

3.5 CONCRETE PLACEMENT:

A. Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete," for placing concrete in a continuous operation within planned joints or sections. Do not begin concrete placement until other affected work is completed.

1. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping so that concrete is worked around reinforcement and other embedded items and into forms.

2. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.

a. In cold weather comply with ACI 306.

b. In hot weather comply with ACI 305.

I. Place no concrete when temperatures exceed 90 degrees F.

3. Protect adjacent finished materials/surfaces from concreting operations. Repair/replace any damaged surfaces/materials at no cost to owner.

3.6 CONCRETE SLAB FLATNESS AND LEVELNESS TOLERANCES

A. Finish and measure surface so gap at any point between concrete surface and an unleveled freestanding 10-foot long straightedge, resting on two high spots and placed anywhere on the surface, does not exceed 1/4 inch.

B. Concrete floor slabs surrounding floor drains shall be sloped 1/4” per foot from “finished floor elevation” unless noted otherwise.

3.7 FINISH OF FORMED SURFACE

A. Smooth-Formed Finish: Fill voids and rub smooth all concrete surfaces exposed to view and surfaces to be covered with a coating or covering material applied directly to concrete. Repair and patch defective areas, remove fins and other projections completely and rub smooth.

B. Trowel Finish: Apply trowel finish to monolithic slab surfaces to be exposed to view and slab surfaces to be covered with resilient flooring, carpet, paint, or other thin film-finish coating system.

1. After floating, begin first trowel-finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface.

2. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance, and with surface leveled to tolerances listed under par. 3.06 above. Grind smooth surface defects that would telegraph through applied floor covering system.

C. Trowel and Fine Broom Finish: Where ceramic tile is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.

D. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route.

3.8 CURING / SEALING

A. Moist Curing

1. All slabs shall be sheet cured per ACI 308 2.3.1 Plastic Film or 2.3.2 Reinforced Paper only for 7 days after placement. Curing system joints shall be sealed and moisture added daily to maintain concrete surface in a damp condition.

2. Insulating blankets used during cold weather do not need sealed joints as long as concrete surface is damp.

3. After 7 days of moist curing, apply liquid membrane system.

B. Liquid Membrane Curing

1. All concrete surfaces not specified to receive other curing shall be liquid membrane cured per ACI 308 2.3.3. If no rate of coverage is indicated by the manufacturer, apply at a minimum rate of 200 square feet per gallon. The maximum rate of coverage, even if manufacturer’s recommendation indicated greater coverage, shall be 300 S.F. per gallon.

2. Upon substantial completion, clean floors and apply one additional coat of Liquid Membrane Type 2 concrete hardener to floors not scheduled to receive floor coverings.

3.9 FIELD QUALITY CONTROL

A. Coordinate sampling and testing during concrete placement by General Building Contractor’s independent testing agency as follows:

B. Site Testing

1. Testing firm will take cylinders and perform slump and air entrainment tests according to ACI 301. Refer to Section 03 30 00 – Cast-In-Place Concrete for testing requirements.

2. Three concrete test cylinders will be taken for every 50 or less cu. yds. of concrete placed every day. One additional test cylinder will be taken during cold weather and be cured on site under same conditions as concrete it represents.

3. One slump test will be taken for each set of test cylinders taken.

C. Contractor Responsibilities

1. Cooperate with laboratory personnel and provide access to the Work. Notify testing laboratory in advance of work to be tested to schedule field inspection and material sampling.

2. This testing does not relieve contractor of responsibility of providing concrete in compliance with specifications. Contractor may perform additional testing as necessary to ensure quality of concrete.

3. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.

   a. Slump: ASTM C 143; one test at point of discharge for each load of each type of concrete. Conduct test prior to the addition in the field of any super-plasticizer. If a slump test fails, immediately retest same batch. If second test fails, concrete is rejected. Conduct additional tests when concrete consistency seems to have changed.

   b. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231, pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete. If air content test fails, immediately retest same batch. If second test fails, concrete is rejected.

   c. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and one testfor each set of compressive-strength specimens.

   d. Compression Test Specimen: ASTM C 31; one set of four standard cylinders for each compressive-strength test, unless otherwise directed. Mold and store three (3) cylinders for laboratory-cured test specimens and one (1) for field-cured test specimen.

   e. Compressive-Strength Tests: ASTM C 39; one set for each day's pour exceeding 5 cu. yd. plus additional sets for each 50 cu. yd. more than the first 25 cu. yd. of each concrete class placed in any one day; one specimen tested at 7 days, two specimens tested at 28 days, and one field cured specimen retained in reserve for later testing if required.

4. When frequency of testing will provide fewer than five strength tests for a given class of concrete, conduct testing from at least five randomly selected batches or from each batch if fewer than five are used.

5. When total quantity of a given class of concrete is less than 50 cu. yd., architect may waive strength testing if adequate evidence of satisfactory strength is provided.

6. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, evaluate current operations and provide corrective procedures for protecting and curing the in-place concrete.

7. Strength level of concrete will be considered satisfactory if averages of sets of three consecutive strength test results equal or exceed specified compressive strength and no individual strength test result falls below specified compressive strength by more than 500 psi.

8. Tests shall include compression yield, air content and slump. Results shall be reported in writing to architect, ready-mix producer, and contractor within 24 hours after tests. Reports of compressive strength tests shall contain the Project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.

9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.

10. Additional Tests: The testing agency shall take additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by architect. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed.

END OF SECTION 03 30 00

Section 03 41 00 – Precast Concrete Hollow Core Plank

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applicable provisions of Division 1 shall govern all work under this section.

B. Section Includes:

1. Precast concrete hollow core plank.

2. Connections and bearing strips.

3. Grouted precast plank joints.

1.2 RELATED SECTIONS

A. Section 04 20 00- Unit Masonry.

B. Section 05 10 00 – Structural Steel

1.3 REFERENCES

A. Reference Specifications: Comply with recommended practices and procedures of the referenced specification standards and with the modification as specified herein.

B. Prestressed Concrete Institute (PCI):

1. MNL-116S Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products.

2. MNL-118 Manual for Inspection of Prestressed Concrete.

3. MNL-123 Manual on Design of Connections for Precast Prestressed Concrete.

4. MNL-124 Design for Fire Resistance of Precast Prestressed Concrete.

6. MNL-126 Manual for Design of Hollow Core Slabs.

6. MNL-120 Handbook – Precast and Prestressed Concrete

C. American Concrete Institute (ACI):

1. ACI 318-Building Code Requirements for Reinforced Concrete.

2. ACI 301-Specifications for Structural Concrete in Buildings.

D. American Welding Society (AWS):

1. AWS D1.1-Structural Welding Code for Structural Steel.

2. AWS D1.4-Structural Welding Code for Reinforcing Steel.

3 AWS B2.1 – Specification for Welding Procedure & Performance Qualifications

1.4 SUBMITTALS

A. Shop Drawings: Showing layout, dimensions, and identification of precast units; details of inserts, connections, joints, superimposed design loads, camber for each unit mark and special reinforcement and lifting devices necessary for handling and erection.

B. Prepare calculations and shop drawings under the direct supervision of a structural engineer experienced in the design of products specified and registered in the State of Wisconsin.

1. State Submittals: Provide one electronic copy of shop drawings and design calculations that have been signed and stamped by a professional engineer licensed in the State of Wisconsin. Precast plank manufacturer shall include ‘component submittal’ review Fee made out to ‘DSPS’.

C. Fabricator’s Installation Instruction: Indicate special procedures required for installation and or temporary shoring requirements.

1.5 DESIGN REQUIREMENTS

A. Design Standards: Comply with ACI 318-Building Code Requirements for Reinforced Concrete and MNL-126 Manual for Design of Hollow Core Slabs.

B. Quality Control Standards: Comply with PCI MNL-116S Manual for Quality Control for Plants and Production of Precast and Prestressed Concrete Products, except that camber tolerance shall be not more than or less than 1/4 inch of the camber indicated on the approved shop drawings.

C. Fire-resistance Rated Precast Units: Where precast concrete units are shown or scheduled as requiring fire-resistance classification, provide units tested and listed by PCI MNL-124 Design for Fire Resistance of Precast Prestressed Concrete.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast units to project site in such quantities and at such times to assure continuity of installation. Store units to prevent cracking, warping, staining, or other damage. Lift and support precast units only at designated lifting or supporting points.

PART 2 – PRODUCTS

2.1 FABRICATORS

A. Fabricator Qualifications: A qualified fabricator firm shall participate in PCL's Plant Certification program and is designated a PCI plant for Group C, Category C1. Approved fabricators included but are not limited to the following:

1. County Concrete
2. Spancrete Industries, Inc.
3. Mid-States Concrete Industries, Inc.

2.2 MATERIALS

A. Form Materials: Provide formwork of sufficient strength to withstand pressures due to concrete operations and, when prestressed, pretensioning and detensioning operations. Maintain formwork to provide precast units of the size, shape, lines, and dimensions indicated, with continuous, straight, smooth surfaces free of honeycomb or other deficiencies.

1. Provide formed openings in precast units for holes larger than 10" in diameter.

B. Reinforcing Materials: As follows:

1. Reinforcing Bars: ASTM A 615, Grade 60.
2. Galvanized Reinforcing Bars: ASTM A 767, Class 2.
3. Steel Wire: ASTM A 82.
4. Prestressing Tendons: ASTM A 416, uncoated, 7-wire stress-relieved strand, Grade 270 or 250 unless otherwise indicated.
5. Steel Inserts and Connections: ASTM A 36, galvanized after fabrication where exposed to weather.

C. Concrete Materials: As follows:

1. Portland Cement: ASTM C 150, type as required.
2. Aggregates: ASTM C 33, except local aggregates of proven durability may be used when acceptable to architect.
3. Water: Potable.

D. Air-Entraining Admixture: ASTM C 260.

E. Water-Reducing Admixture: ASTM C 494, type as required.

F. Mix Proportions and Design: Proportion mixes by either laboratory trial batch or field experience method.

1. Submit written report to architect for each proposed concrete mix at least 15 days prior to start of work. Do not begin precast concrete production until mixes have been reviewed and are acceptable to architect.

2. Mix designs may be adjusted when material characteristics, job conditions, weather, test results, or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by architect.

3. Use air-entraining admixture in concrete.

4. Cure compression test cylinders by same procedures as used in manufacturing process for precast units.

G. Produce standard-weight concrete consisting of Portland cement, aggregates, admixtures, and water to produce the following properties.

1. Compressive strength not less than 5000 psi at 28 days. Total air content not less than 4 percent, nor more than 6 percent.

2.3 FABRICATION

A. Installation of Embedded Items: Set and build into precast units anchorage and connection devices, and other items required for other work that is attached to or supported by precast units.

B. Concrete Placement: Comply with PCI MNL 116.

C. Place concrete in continuous operation to prevent formation of seams or planes of weakness in precast units, using internal and external vibration for consolidation.

D. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into forms.

E. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placing, and curing.

F. Provide permanent markings in precast units to identify pickup points and orientation in structure. Imprint date of casting on each unit where it will not show in finished structure.

G. Cure precast units by low-pressure stream, steam vapor, radiant heat and moisture, or other similar process.

H. Delay detensioning of prestressed units until concrete has attained at least 75 percent of design ultimate compressive strength.

PART 3 – EXECUTION

3.1 PREPARATION

A. Prepare support devices for the erection procedure and temporary bracing.

3.2 ERECTION

A. Erection: Do not erect precast units until concrete has attained its design ultimate compressive strength.

B. Place units plumb, level, and in alignment. Provide temporary supports and bracing as required to hold units in position until permanently connected. Set units on appropriate bearing pads where required.

C. Provide necessary bolts, clips, hangers, and other accessories required for installation of precast units, galvanized after fabrication.

D. Anchor units in final position by bolting, welding, and grouting, as indicated.

1. At bolted connections, use lock washers or other acceptable means to prevent loosening of nuts.

2. At welded connections, apply touch-up coat of primer on painted surfaces and galvanizing repair material on galvanized surfaces.

E. Performance Evaluation: In addition to Quality Control tests and evaluations, precast units may be rejected for any of the following:

1. Defects as listed in PCI MNL-116.
2. Damaged during construction operations.
3. Excessive dimensional variations.

F. Repair or replace unacceptable precast units as directed by architect.

END OF SECTION 03 41 00

END OF DIVISION 03 – CONCRETE

DIVISION 04 – MASONRY

Section 04 05 13 – Masonry Mortar & Grout

PART 1 – GENERAL

1.1 SUMMARY

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Section Includes:

1. Mortar
2. Grout
3. Non-shrink grout

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry: Unit Strength Tests

B. Section 05 12 00 – Structural Steel: Column Base Plates

1.3 REFERENCES

A. Mortar:

1. ASTM C91 Standard Specification for Masonry Cement.
2. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
3. ASTM C150 Standard Specification for Portland Cement.
4. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purpose.
5. ASTM C270 Standard Specification for Mortar for Unit Masonry.
6. ASTM C595 Standard Specification for Blended Hydraulic Cements.
7. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
8. ATM C926 Standard Specification for Application of Portland Cement-Based Plaster.
9. ASTM C979 Standard Specification for Pigments for Integrally Colored Concrete.
10. ASTM C1329 Standard Specification for Mortar Cement.

B. Grout:

1. ASTM C143/C143M Standard Test Method for Slump of Hydraulic Cement Concrete
2. ASTM C150 Standard Specification for Portland Cement.
3. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purpose.
4. ASTM C260 Standard Specification for Air-Entraining Admixtures for Concrete
5. ASTM C404 Standard Specification for Aggregates for Masonry Grout
6. ASTM C476 Standard Specification for Grout for Masonry.
7. ASTM C595 Standard Specification for Blended Hydraulic Cements.
8. ASTM C1019 Standard Test Method for Sampling and Testing Grout
9. ASTM C1157 Standard Performance Specification for Hydraulic Cement

C. Non-Shrink Grout:

1. ASTM C 1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)
2. ASTM C 109/C 109M Test Method for Compressive Strength of Hydraulic Cement Mortars.
3. ASTM C 138 Test Method of Unit Weight, Yield and Air Content of Concrete.

4. ASTM C 157 Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

5. ASTM C 185 Test Method for Air Content or Hydraulic Cement Mortar.

6. ASTM C 305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency.

D. American Concrete Institute (ACI):

1. ACI 530-05/ASSCE 50-5/TMS 402/05 Building Code Requirements for Masonry Structures.

2. ACI 530.1 -05 /ASCE 6-05/TMS 602/05 Specifications for Masonry Structures.

1.4 SYSTEM DESCRIPTION

A. Design and Performance Requirements: Provide mortar and grout mixes which have been selected, manufactured, mixed and installed to comply with the standards referenced herein.

B. Quality Control Testing: Refer to Section 04 20 00 for testing requirements.

1.5 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures:

1. Product Data: Submit manufacturer's product data and installation instructions.

2. Samples: Submit two samples of selected mortar color.

1.6 DELIVERY, STORAGE AND HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection:

1. Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.

2. Store materials in a dry location, on palettes of other above ground platform set on top of tarp or similar vapor barrier plastic membrane. Wrap with a waterproof tarp or other suitable covering.

1.7 PROJECT/SITE CONDITIONS

A. Environmental Requirements:

1. Do not build or apply mortar products on frozen substrates.

a. Remove and replace unit masonry damaged by frost or freezing conditions.

2. Take special care when constructing in extremely hot or cold weather. Comply with the following standards:

a. ACI 530-05/ASSCE 50-5/TMS 402/05 Building Code Requirements for Masonry Structures.

b. ACI 530.1 -05 /ASCE 6-05/TMS 602/05 Specifications for Masonry Structures.

PART 2 – PRODUCTS

2.1 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or Type II, except Type III may be used for cold-weather construction.

B. Hydrated Lime: ASTM C207, Type S.

C. Mortar Cement: ASTM C 1329.

D. Masonry Cement: ASTM C 91.

E. Aggregate for Mortar: ASTM C 144, Fine Type, except for joints less than ¼ inch use aggregates graded with 100 percent passing a No. 16 sieve.

F. Mortar Type:

1. Type ‘M’ use for below grade masonry.
2. Type ‘S’ use for exterior and interior bearing walls.
3. Type ‘N’ use for interior partitions.

G. Mortar Compressive Strength:

1.	Type M	28 day	2,500 psi
2.	Type S	28 day	1,800 psi
3.	Type N	28 day	750 psi

H. Pigmented Mortar

1. Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use at ground faced CMU locations.
2. Manufacturers
   a. Solomon Colors, Inc.
   b. LaFarge Corp.
   c. Western Lime & Cement Co.
3. Color(s): To be selected by architect from manufacturer’s standard range of colors.

I. Aggregates for Grout: ASTM C 404, Course Type grout may be used in grout spaces in brick masonry, 2” or more in horizontal dimensions where no steel is in the grout space, and in the cells in block construction that are 4” or more in both horizontal dimensions. Fine Type grout should be used if the cavity space is smaller than noted above.

J. Grout Compressive Strength: Grout shall have minimum compressive strength of 3000 psi at 28 days when proportion according to ASTM C 1019.

K. Grout Slump: The grout shall be mixed to a slump of 8 to 11 inches as determined by ASTM C 143/C 143M.

L. Non-Shrink Grout: ASTM C1107, nonmetallic aggregate grout, shrink-resistant, factory packaged, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30 minute working time.

1. Performance Specifications:
   a. Flow: ASTM C939
   b. Setting Time: ASTM C191
   c. Compressive Strength: ASTM C109.

1 day	1,000 psi
3 day	2,500 psi
7 day	3,500 psi
28 day	5,000 psi

2. Manufacturers:
   a. The QUIKRETE Companies, Atlanta, GA; Commercial Grade FastSet Non-Shrink Grout #1585-09
   b. CTS Cement Manufacturing Corp., Cypress, CA; ‘Rapid Set Cement All’

M. Integral Liquid Polymeric Water-repellent Mortar Admixture:

1. Description: Integral liquid polymeric admixture, mixed with mortar during mixing, capable of achieving a Class E Rating when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria found in ASTM E 514-74: no decrease in concrete masonry bond strength or compressive strength of prisms when compared to a control when tested according to ASTM C1357 and ASTM C 1314 respectively.

2. Locations: Provide water repellent mortar admixture at all locations of exterior exposures and/or where water-repellent units are specified.

N. Water: Potable.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions:

1. Verify that site conditions are acceptable for use of mortar mixes.

2. Do not proceed with use of mortar mixes until unacceptable conditions are corrected.

3.2 MIXING

A. Mix mortar using a mechanical mortar mixer to ensure homogeneity and workability. Hand mixing of the mortar is permitted only with written approval of the architect.

B. Use clean, potable water, add the maximum amount consistent with optimum workability. Maintain a uniform water/cement ratio.

C. Rinse out mixer following each batch and at the end of the day, thoroughly rinse the mixer to avoid contamination of future mortar batches.

D. Retemper mortar by adding mixing water only to replace water lost due to evaporation. Do not retemper colored mortars.

E. Discard mortar 2.5 hours after initial mixing.

3.3 INSTALLATION

A. Mortar:

1. Tool mortar joints when surface is thumbprint hard.

2. Keep tooling time consistent.

3. Do not strike joint too early or too late in order to maintain color consistency.

4. Mortar Joint Profiles: Refer to Section 04 20 00.

5. Cure mortar a minimum of 28 days.

B. Grout:

1. Install grout according to manufacturer’s instructions.

2. Work grout into masonry cores and cavities to eliminate voids.

3. Grout hollow metal door and borrowed lite frames where installed in masonry openings.

4. For masonry core fill grout applications, comply with the requirements of ASTM C926.

C. Non-Shrink Grout:

1. Place non-shrink grout using traditional methods. Place, consolidate and screed quickly to allow maximum finishing time. Consolidate to eliminate air voids. Do not wait for bleed water, apply finish as soon as possible.

2. On flat work, install full depth sections and progress horizontally, do not install in layers.

3. Do not install on frozen surfaces.

4. Curing: Water cure as soon as the surface has lost its' moist sheen. Keep exposed surfaces wet for a minimum of 1-hour.

3.5 CLEANING

A. Cleaning Method:

1. Clean mortar only with potable water or dry brush.

2. Clean masonry with the least aggressive cleaning solution and technique possible.

3. Comply with cleaning procedure and recommendations of the manufacturers of both the cleaning solution and the unit masonry.

4. Utilize the same cleaning procedure on the sample panel at selection and during construction.

3.6 PROTECTION

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

END OF SECTION 04 05 13

Section 04 20 00 – Unit Masonry

PART 1 – GENERAL

1.1 SCOPE OF WORK

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

B. Section Includes

1. Concrete masonry units
2. Reinforcement, anchorage, flashings and masonry accessories
3. Cavity wall insulation
4. Mortar and grout placement.
5. Field applied sealer over ground faced CMU surfaces.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 03 41 00 – Precast Concrete Hollow Core Plank

B. Section 04 05 13 – Masonry Mortar & Grout

C. Section 05 50 00 – Metal Fabrications: Loose Steel Lintelsleisdiggs@centurytel.net

D. Section 07 21 19 – Foamed Masonry Core Fill

E. Section 08 11 13 – Metal Doors & Frames: Door frames set in masonry openings.

1.3 REFERENCES

A. Unit Masonry Standard: Comply with recommended practices and procedures of the referenced specification standards and with the modifications as specified herein.

B. American Concrete Institute (ACI):

1. ACI 530-05/ASSCE 50-5/TMS 402/05 Building Code Requirements for Masonry Structures.
2. ACI 530.1 -05 /ASCE 6-05/TMS 602/05 Specifications for Masonry Structures.

C. American Society for Testing and Materials (ASTM)

1. ASTM C 140 Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
2. ASTM C 90 Specification for Load Bearing Masonry Units.
3. ASTM A 615/A 615/M Specification for Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
4. ASTM A 951 Specification for Masonry Joint Reinforcement.
5. ASTM A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement.
6. ASTM A 653/A 653/M Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

1.4 SUBMITTALS

A. Submit the following I accordance with Section 01 33 00 – Submittal Procedures:

1. Shop drawings for reinforcing detailing fabrication, bending, and placement of unit masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete Reinforcement" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of masonry reinforcement.
2. Product Data: For each different masonry unit, accessories, integral mortar water repellant and other manufactured product specified.

3. Samples for selection of the following:

   a. Full-sized unit masonry samples showing the full range of colors and textures available for each different exposed masonry unit required.

   b. Colored masonry mortar samples showing the full range of colors available.

   c. Weep holes/vents.

   d. Through-wall flashing.

4. Mix Designs: From the Material Supplier, submit mix designs in compliance with the strength requirements of the construction documents, for the following:

   a. Mix designs for each mortar type, indicating the proportions of ingredients in compliance with the proportion specification of ASTM C 270.

   b. Mix designs for each grout type, indicating the proportion of ingredients in compliance with the proportion requirements of ASTM C 476.

5. Material Test Reports: From a qualified independent Testing Agency, verification of compliance with the compressive strength requirements for concrete masonry, mortar bed joints and grout mixes according to the Unit Strength Method as follows;

   a. Concrete Masonry Test: Determine the compressive strength of masonry based on the strength of the unit and the type of mortar specified using Table 2 of the Specifications for Masonry Structures, with the following articles to be met;

   b. Units conform to ASTM C 90 and are sampled and tested according to ASTM C 140.

   c. Thickness of the bed joints does not exceed 5/8 inches.

   d. For grouted masonry, the grout compressive strength equals f'm, but is not less than 3,000 psi and is tested to verify compressive strength according to ASTM C 1019.

1.5 FIRE PERFORMANCE CHARACTERISTICS

A. Where indicated, provide materials and construction identical to those of assemblies whose fire resistance has been determined per ASTM E 119 by a testing and inspecting organization, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.

1.6 STRUCTURAL PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops the following installed compressive strengths (f'm) at 28 days.

   1. For Concrete Unit Masonry: f'm = 2,000 psi.(based on net area)

1.7 QUALITY ASSURANCE

A. The General Building Contractor shall hire an independent testing agency to assure quality assurance compliance as stated in ACI 530.1 -05 /ASCE 6-05/TMS 602/05 Specifications for Masonry Structures, Table 4 – Level 2 Quality Assurance and as specified herein.

B. Field-Constructed Mock-Ups: Prior to installation of unit masonry, erect sample wall panels to further verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of Work:

   1. Locate Mock-ups on site in locations as directed by Supervising Professional.

2. Build mock-ups for the following types of masonry in sizes of approximately 6 feet long by 4 feet high by full thickness, including face and backup wythes as well as accessories.

    a. Typical exterior concrete masonry wall with window opening return and banding course.

3. Notify Supervising Professional one week in advance of the dates and times when mock-ups will be erected.

4. Protect mock-ups from the elements with weather-resistant membrane.

C. Testing Agency Services: Sample and test according to the Unit Strength Method as specified for the project to determine the compressive strength of clay masonry and concrete masonry. Conduct one set of test prior to the start of construction and one set of tests for each addition 5,000 square feet of masonry walls.

D. Inspection Agency Services: Prepare inspection reports to verify the following items are in compliance. Prepare one inspection report as masonry construction begins and one additional report for each 5,000 square feet of masonry walls.

1. Proportions of site prepared mortar types, complies with approved mix designs.

2. Construction of mortar joints comply with specified thickness.

3. Location of reinforcement complies with approved shop drawings, including bar lap length and bar spacing.

4. Proportion of site prepared grout types, complies with approved mix designs.

5. Observe grout space to be free of obstructions for grout placement.

6. Observe consolidation of grout placement to ensure that methods used will produce cores grouted solid and without voids throughout the height of the masonry unit.

7. Observe preparation of grout specimens, mortar specimens and or prisms.

1.8 PROJECT CONDITIONS

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

1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

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

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

1. Protect base of walls from rain-splashed mud and mortar splatter by coverings spread on ground and over wall surface.

2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt on completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Cold-Weather Construction: Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602. When the ambient temperature is within the limits indicated, use the following procedures:

    a. 40 to 32 deg F (4 to 0 deg C): Heat mixing water or sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C).

    b. 32 to 25 deg F (0 to -4 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry.

    c. 25 to 20 deg F (-4 to -7 deg C): Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C) if grouting. Use heat on both sides of walls under construction.

    d. 20 deg F (-7 deg C) and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F (4 and 49 deg C). Heat grout materials to produce grout temperatures between 40 and 120 deg F (4 and 49 deg C). Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F (4 deg C). Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F (0 deg C) within the enclosures.

2. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection:

    a. 40 to 25 deg F (4 to -4 deg C): Cover masonry with a weather-resistant membrane for 48 hours after construction.

    b. 25 to 20 deg F (-4 to -7 deg C): Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h (25 km/h).

    c. 20 deg F (-7 deg C) and Below: Provide enclosure and heat to maintain temperatures above 32 deg F (0 deg C) within the enclosure for 48 hours after construction.

E. Hot-Weather Requirements: Protect unit masonry work when temperature and humidity conditions produce excessive evaporation of water from mortar and grout. Provide artificial shade and wind breaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and above.

PART 2 – PRODUCTS

2.1 MANUFACTURERS – CONCRETE MASONRY UNITS

A. County Materials, Eau Claire, WI

B. Premier Block Corporation, Eau Claire, WI

C. Anchor Block, Minnetonka, MN

D. Trenwyth Industries, Inc.

2.2 MATERIALS – CONCRETE MASONRY UNITS

A. Standard Concrete Masonry Units:

1. Hollow Load-Bearing Concrete Masonry Units: ASTM C 90, Grade N and as follows:

a. Weight Classification:

I. Normal weight with calcareous or siliceous gravel aggregate.

II. Where required for fire resistive ratings, provide light weight masonry units with expanded slag or pumice aggregate.

b. Provide Type II, non-moisture-controlled units.

2. Specialty Shapes: Provide special shapes where indicated and as follows:

a. For lintels, corners, jambs, stools, control joints, headers, bonding, and other special conditions.

b. Sash block shall be produced with vertical slot for use with extruded rubber control joint insert equal to H & B #RS – Standard.

c. Provide bullnose units for outside corners where masonry units are left exposed (building interior).

3. Size: Manufactured to specified dimensions of 3/8 inch less than nominal widths by nominal heights by nominal lengths indicated on drawings.

B. Ground Face Concrete Masonry Units (GFCMU)

1. Basis of Design: “Ultra” Burnished Masonry Units as manufactured by Premier Block Corporation, Eau Claire, WI, or approved equal. All units shall conform to ASTM C90-00 moisture controlled and shall have a high density polished ground face finish.

2. All burnished ground face masonry shall receive a field applied coating of an all-acrylic waterborne sealer to provide a “wet look” gloss as recommended by the burnished masonry manufacturer.

a. Manufacturer:

I. TK-Products ‘Bright Kure & Seal’ (gloss finish)

II. Quickcrete (gloss finish)

III. Sherwin Williams (gloss finish)

b. Application: Two coats, spray apply, 6 mil WFT (2 mil DFT). Application shall be conducted in the presence of block manufacturer’s representative.

C. Schedule of CMU Exposed Faces:

MARK	FACE TEXTURE	NOM.FACE SIZE (HT.x W)	COLOR*	BOND PATTERN
CMU-1	Smooth Face	8” x 16” and 4” x 16”	Standard Gray	Stacked Bond
CMU-2	Single Sided Ground Face CMU w/Single Score	8” x 16”	‘North Star’	Stacked Bond
CMU-3	Single Sided Ground Face CMU w/o Score	8” x 16” and 4” x 16”	‘North Star’	Stacked Bond
CMU-3A	Double Sided Ground Face CMU w/o Score	8” x 16”	‘North Star’	Stacked Bond
CMU-4	Ground Face CMU	8” x 16”	‘Firebrush’	Running Bond
CMU-5	Spit-Face CMU	4” x 16”	‘Desert Castle’	Running Bond

*(Colors are based on GFCMU as manufactured by Premier Block.)

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

2.3 MORTAR AND GROUT MATERIALS: Refer to Section 04 05 13 – Masonry Mortar & Grout

2.4 REINFORCING STEEL: As follows:

A. Steel Reinforcing Bars: Grade 60, Billet steel complying with ASTM A 615.

2.5 JOINT REINFORCEMENT

A. General: Provide joint reinforcement formed from the following:

1. Galvanized carbon-steel wire, ASTM A 153, Class B-2, hot-dipped galvanized at interior and exterior walls.

B. Manufacturers

1. Hohmann & Barnard, Hauppauge, NY
2. Heckman Building Products, Inc., Melrose Park, IL
3. Wire-Bond, Memphis, TN

C. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet, with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.1483 inch (9 gage).
2. Wire Diameter for Cross Rods: 0.1483 inch (9 gage).

D. For single-wythe masonry, provide ladder or truss configured type with single pairs of side rods. Use only ladder configured type for multi-wythe masonry walls.

E. For multi-wythe masonry cavity wall assemblies, provide ladder design with eye hooks and adjustable rectangular pintel equal to HB Lox-All® adjustable Eye-Wire #270 or Wire-Bond Series 600 Adjustable Tab Ladder.

2.6 FACE VENEER ANCHORS

A. Description: 1-1/2" wide, hot-dipped galvanized corrugated buck anchors with 1-1/2" long standard bend and 5/16" predrilled holes.

2.7 ADJUSTABLE ANCHORS FOR CONNECTING TO STEEL FRAME

A. 3/4" wide x 12 ga. thick x 7 long, hot dipped galvanized 'offset strap' for field welding to steel column used in conjunction with 3/16" dia. wire, hot-dip galvanized 'vee wall tie'.

B. Manufacturers

1. Hohmann & Barnard, Hauppauge, NY: #359FH Offset Strap w/ #VWT
2. Heckman Building Products, Inc., Melrose Park, IL: #315-B weld on strap anchors with #316 triangular ties.
3. Wire-Bond, Memphis, TN: Type 1 weld on anchor #1000 with #1100 Series triangular ties.

2.8 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Steel bolts complying with A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of diameter, length, and configuration indicated.

B. Post-installed Anchors: Anchors as indicated, with capability to sustain, without failure, load imposed within factors of safety indicated, as determined by testing per ASTM E 488, conducted by a qualified independent testing laboratory.

C. Corrosion Protection: Carbon steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5 for Class SC 1 service condition (mild).

2.9 EMBEDDED FLASHING MATERIALS – CAVITY WALL/MULTI-WYTHE MASONRY WALLS

A. Composite Membrane through-wall Flashing (See drawings for type/locations):

1. Manufacturers

a. Carlisle Coatings & Waterproofing, Wylie, TX: 'CCW-705-TWF'

b. W.R. Grace & Co., Cambridge, MA: 'Perm-A-Barrier'

c. W.R. Meadows, Inc., Hampshire, IL: 'Air-Shield'

2. Type: 40 mil, self-adhesive, cold-applied sheet consisting of 32 mils of rubberized asphalt integrally bonded to an 8 mil high-density, cross-laminated polyethylene film. Apply with manufacturer recommended mastic consisting of a rubberized, asphalt-based mastic designed to be used on all laps, seams, top edges and cuts in the flashing, and around all penetrations through the flashing.

3. Surface Conditioner: Prepare all substrate surfaces behind flashing with water-based surface conditioner as recommended by flashing manufacturer.

4. Provide dam at ends, inside and outside corners of flashing per manufacturers details.

5. Termination Bar: High strength, plastic strip with pre-drilled holes spaced 6 inches apart. Profile to be trapezoidal design to provide continuous trough for caulks or mastic bead.

B. Metal Flashings

1. Provide Type 304 stainless steel drip edge flashing underneath composite flashing as indicated on the drawings. Metal drip flashing to be 3" wide with 3/8", 135 degree hemmed edge drip.

2.10 WEEP VENTS

A Weep Vents: Provide weep vents in head joints of the first masonry unit course immediately above flashing.

1. Weep Hole Vents: Non-absorbent polymer mesh made from 100% recycled plastic available in three colors.

B. Manufacturers

1. Archovations, Inc. *'CavClear Weep Vents'*

2. Mortar Net® USA Ltd.

3. Sandel Construction Solutions

2.11 CAVITY WALL INSULATION

A. Where indicated on the drawings, provide rigid cavity wall insulation as follows;

1. Closed cell polyisocyanurate rigid foam core with acrylic coated aluminum foil facer per ASTM C1289, Type I, Class 1.

2. NFPA 285 tested for the exterior wall assembly specified.

3. Thickness: As shown on drawings

4. R-Value (Aged), ASTM C 1298: 6.5 per inch (min)

5. Compressive Strength (ASTM D1621): 20 psi

6. Water Absorption (ASTM C209): <0.1% by volume

7. Flame Spread (E84): <25

8. Smoke Developed (E84): >450

B. Manufacturers

1. Atlas Wall CI Board - EnergyShield® PRO
2. Hunter Panels Xci Foil
3. Firestone Building Products Enverge™ CI Foil

2.12 ACCESSORIES

A. Manufacturers

1. Hohman & Barnard, Inc. *'Mortar Net'*
2. Archovations, Inc. *'CavClear Masonry Mat'*
3. Sandel Construction Solutions

B Mortar/Grout Screen: 1/4" square monofilament screen fabricated from high strength, non-corrosive polypropylene polymers for isolating flow of grout where indicated on the drawings. Furnish in roll form.

C. Mesh Type Mortar Stop

1. 1" high density polyethylene joint filler

D. Closed Cell Neoprene Sponge

1. 3" wide x 1/2"thick sponge strips conforming to ASTM D-1056 Grade 2A1 with adhesive backing.
2. For use at vertical expansion/control joints in masonry veneer.

2.13 SAND FILLED or FOAM FILLED CORES

A. Where indicated on the drawings, fill CMU cores with clean mason's sand or 'Corefill 500' Foam or equal.

2.14 DATE STONE

A. Where indicated on the drawings, provide cut stone unit with recessed painted date numerals. Comply with recommendations of Indiana Limestone Institute of America "Indiana Limestone Handbook.

B. Cut Stone Source Options

1. Indiana Limestone, smooth finish, cut to profiles shown.
2. Winona Dolomite limestone as detailed, quarried and fabricated by Biesanz Stone Co., 4600 Goodview Road, Winona, MN 55987.
3. Anamosa Limestone, Weber Stone Co., Anamosa, IA

C. Color: Light Buff (submit sample)

2.15 MASONRY CLEANERS

A. Manufacturers:

1. Prosoco, Inc. *Sure Klean 600* Detergent
2. Diedrich Technologies 222
3. Chemical Products Industries, Inc.

B. Application must receive prior approval from concrete block manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.

B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 PRE-INSTALLATION CONFERENCE

A. At least two weeks before the start of above-grade masonry work, the contractor shall schedule a pre-installation conference at the jobsite to discuss compliance with the requirements of the Contract Documents. Two weeks advance notice shall be given to the participants, who shall include the General Building Contractor, Masonry Contractor, Flashing Installer, CMU Producer and/or the manufacturer of the CMU/Mortar Integral Water-Repellent Admixture. Advise the Supervising Professional of the scheduled meeting date.

3.3 INSTALLATION, GENERAL

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

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

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

D. Cut masonry units with motor-driven saws to provide clean, sharp, unchipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

F. All penetrations (pipe, conduit, wiring, etc.) of fire rated walls shall be properly fire stopped with a U.L. listed "Through-penetration Fire Stop Assembly."

3.4 CONSTRUCTION TOLERANCES

A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arises, do not exceed 1/4 inch in 10 feet, nor 3/8 inch in 20 feet, nor 1/2 inch in 40 feet or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet, nor 1/2 inch in 40 feet or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet, nor 1/2 inch maximum.

B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet (12 mm in 6 m), nor ¾ inch in 40 feet (19 mm in 12 m) or more.

D. Variation in Cross-Sectional Dimensions: For columns and thickness of walls, from dimensions shown, do not exceed minus 1/4 inch (6 mm) nor plus 1/2 inch (12 mm).

E. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary head-joint thickness from adjacent head-joint thickness by more than 1/8 inch (3 mm). Do not vary from collar-joint thickness indicated by more than minus 1/4 inch (6 mm) or plus 3/8 inch (10 mm).

3.5 LAYING MASONRY WALLS

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

B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.

C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

1. Match pattern indicated on drawings.

D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.

F. Built-in Work: As construction progresses, build-in items specified under these special provisions and other appropriate Sections of the Standard Specifications. Fill in solidly with masonry around built-in items.

G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.

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

I. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

J. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above and as follows:

1. Install compressible filler in joint between top of partition and underside of structure above.

3.6 INSTALLATION – MORTAR & GROUT

A. Mortar

1. Tool mortar joints when surface is thumbprint hard.

2. Keep tooling time consistent.

3. Do not strike joint too early or too late in order to maintain color consistency.

4. Cure mortar a minimum of 28 days.

5. Tool mortar joints to profile listed below when surface is thumbprint hard. Scored joints in burnished ground face CMU shall also be tooled with mortar to match head joint profile.'

6. Mortar Joint Profiles

a. Exterior Ground Face CMU: Raked joint

b. Interior Ground Face CMU: Raked joint

c. Standard gray CMU: Concave

B. Grout

1. Install grout according to manufacturer's instructions.

2. Work grout into masonry cores and cavities to eliminate voids.

3. Grout hollow metal door and borrowed lite frames where installed in masonry openings.

4. For masonry core fill grout applications, comply with the requirements of ASTM C926.

C. Grout spaces less than 2 inches in width with fine grout. Grout spaces 2 inches or greater in width with course grout. Use low lift grouting techniques.

D. When grouting is stopped for more than one hour, terminate grout 2 inches below top of upper masonry unit to form a positive key for subsequent grout placement.

E. Low Lift Grouting: Place first lift of grout to a height of 16 inches and rod for grout consolidation. Place subsequent lifts in 8 inch increments and rod for grout consolidation.

3.7 HORIZONTAL JOINT REINFORCEMENT

A. Placement of horizontal joint reinforcement with truss or ladder type joint reinforcement shall comply with the 2015 International Building Code. Vertical spacing shall not exceed 16" o.c.

3.8 ADJUSTABLE VENEER TIES

A. Bonding with adjustable wall ties shall comply with the 2015 International Building Code. There shall be at least one tie for each 1.77 square feet of wall area. Neither the vertical nor horizontal spacing of the adjustable wall ties shall exceed 16 inches. The maximum vertical offset of bed joints from one wythe to the other shall be 1 1/4".

3.9 WEEPS AND VENTS

A. Install weep holes in veneer at 24 inches on center horizontally above through wall flashing at bottom of walls.

B. Install cavity vents at top of each cavity space, below shelf angles and at the same spacing in veneer at on center horizontally.

3.10 CAVITY BEHIND VENEER

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes.

B. Build outer wythe to permit installation of cavity insulation and air/vapor barrier adhesive.

3.11 MASONRY FLASHINGS

A. Extend flashings under veneer, turn up minimum 8 inches seal to sheathing over wood stud back-up.

B. Lap end joints minimum 6 inches and seal watertight.

C. Use flashing manufacturer's recommended adhesive and sealer.

3.12 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.

B. Form CMU control joints with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant elliptical core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.

3.13 PROTECTION

A. Protect top of masonry walls daily.

3.14 FINAL CLEANING:

A. After mortar is thoroughly set and cured, clean exposed masonry by first removing large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels. Wet wall surfaces with water. Clean concrete block surfaces by means of bucket and brush hand-cleaning method. If stain persists, consult architect and brick/block manufacturer before proceeding.

END OF SECTION 04 20 00

Section 04 72 00 – Architectural Cast Stone

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Provide all labor, materials and equipment to necessary to plant cast and shape all components indicated on the drawings and indicated as ‘cast stone’.

C. Design and furnish cast stone anchoring and wall tie components.

D. Installing contractor shall unload, store, furnish all anchors, set, patch, clean and seal the cast stone as required.

1.2 RELATED SECTIONS

A. Section 04 05 13 – Masonry Mortar & Grout

B. Section 04 20 00 – Unit Masonry

C. Section 07 90 00 – Joint Sealants

1.3 REFERENCES

A. ACI 318 – Building Code Requirements for Reinforced Concrete

B. ASTM A 185 – Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

C. ASTM A 615/A 615M – Standard Specification for Deformed and Plain Billet-Steel Bars for Reinforced Concrete

D. ASTM C33-Standard Specification for Concrete Aggregates

E. ASTM C 150 – Standard Specification for Portland Cement

F. ASTM C 173 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Volume Method

G. ASTM C 231 – Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

H. ASTM C 260 – Standard Specification for Air Entrained Admixtures for Concrete

I. ASTM C 270 – Standard Specification for Mortar for Unit Masonry

J. ASTM C 426 – Standard Test Method for Linear Shrinkage of Concrete Masonry Units

K. ASTM C 494/C 494M – Standard Specification for Chemical Admixtures for Concrete

L. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Possolan for use as a Mineral Admixture in Concrete

M. ASTM C 666 – Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing

N. ASTM C 979 – Standard Specification for Coloring Pigments for Integrally Pigmented Concrete

O. ASTM C 989 – Standard Specification for Ground Granulated Blast-furnace Slag for Use in Concrete

P. ASTM C 1194 – Standard Test Method for Compressive Strength of Architectural Cast Stone

Q. ASTM C 1195 – Standard Test Method for Absorption of Architectural Cast Stone

R. ASTM C 1364 – Standard Specification for Architectural Cast Stone

S. ASTM C 2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.

T. Cast Stone Institute® Technical Manual (Current Edition)

1.4 DEFINITIONS

A. Cast Stone – a refined architectural concrete building unit manufactured to simulate natural cut stone, used in unit masonry applications.

1. Wet Cast Concrete Products – manufactured from measurable slump concrete.

a. Wet casting method: manufactured from measurable slump concrete and vibrated into a mold until it becomes densely consolidated.

1.5 SUBMITTAL PROCEDURES

A. Comply with Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: Submit manufacturers shop drawings including profiles, cross-sections, reinforcement, exposed faces, arrangement of joints (optional for standard or semi-custom installations), anchoring methods, wall ties, anchors, annotation of stone types and their location.

2. Samples: Submit pieces of the Cast Stone that are representative of the general range of finish and color proposed to be furnished for the project.

3. Test Results: submit manufacturers test results of Cast Stone previously made by manufacturer.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. A current producer member of Cast Stone Institute, with a minimum of 10 years of experience in producing cast stone of types required for project.

2. Manufacturer shall have sufficient plant facilities to produce the shapes, quantities and size of Cast Stone required according to project schedule.

3. Manufacturer shall submit a written list of project similar in scope and at least three (3) years of age, along with owner, architect and contractor references.

B. Standards: Comply with the requirements of the Cast Stone Institute® Technical Manual and the project specifications. Where a conflict may occur, the contract documents shall prevail.

C. Mock-up: Provide full size unit(s) for use in construction of sample wall. The approved mock-up shall become the standard for appearance and workmanship for the project.

PART 2 – PRODUCTS

2.1 ARCHITECTURAL CAST STONE

A. Manufacturers

1. American Artstone Company, New Ulm, MN 56073; Phone: (800) 967-2076

2. MidCon Products, Inc., Hortonville, WI; Phone: (920) 779-4032

3. Architectural Cast Stone, Inc., Wichita, KS; Phone: (316) 262-5543

B. Comply with ASTM C 1364

C. Physical Properties: Provide the following:

1. Compressive Strength – ASTM C 1194: 6,500 psi (45 Mpa) minimum for products at 28 days.

2. Absorption – ASTM C 1195: 6% maximum by the cold water method, or 10% maximum by the boiling method for products at 28 days.

3. Air Content-ASTM C173 or C 231, for wet cast product shall be 4-8% for units exposed to freeze-thaw environments. Air entrainment is not required for VDT products.

4. Freeze-Thaw-ASTM C 1364: The CPWL shall be less than 5% after 300 cycles of freezing and thawing.

5. Linear Shrinkage – ASTM C 426: Shrinkage shall not exceed 0.065%.

D. Job Site Testing – One sample from production units may be selected at random from the field for each 500 cubic feet delivered to the job site.

1. Three field cut cube specimens from each of these samples shall have an average minimum compressive strength of not less than 85% with no single specimen testing less than 75% of design strength as allowed by ACI 318.

2. Three field cut cube specimens from each of these samples shall have an average maximum cold-water absorption of 6%.

3. Field specimens shall be tested according to ASTM C 1194 and C 1195.

2.2 MATERIALS

A. Portland cement – Type 1 or Type 111, white and/or grey, ASTM C 150.

B. Coarse aggregates – Granite, quartz or limestone, ASTM C 33, except for gradation.

C. Fine aggregates – Manufactured or natural sands, ASTM C 33, except for gradation.

D. Colors – Inorganic iron oxide pigments, ASTM C 979 except that carbon black pigments shall not be used.

E. Admixtures – Comply with the following:

1. ASTM C 260 for air-entraining admixtures.

2. ASTM C 494/C 495M Types A-G for water reducing, retarding, accelerating and high range admixtures.

3. Other admixtures: integral water repellents and other chemicals, for which no ASTM Standard exists, shall be previously established as suitable for use in concrete by proven field performance or through laboratory testing.

4. ASTM C 618 mineral admixtures of dark and variable colors shall not be used in surfaces intended to be exposed to view.

5. ASTM C 989 granulated blast furnace slag may be used to improve physical properties. Tests are required to verify these features.

F. Water – Potable

G. Reinforcing bars:

1. ASTM A 615/A 615M. Grade 40 or 60 steel galvanized or epoxy coated when cover is less than 1.5 in.

2. Welded Wire Fabric: ASTM A 185 where applicable for wet cast units.

H. Wall Ties, Anchors and Dowels

1. The cast stone manufacturer shall be responsible for the complete design of wall ties and anchorage required for this project.

2. All anchors, dowels and other anchoring devices and shims shall be standard building stone anchors commercially available in a non-corrosive material such as zinc plated, hot-dipped galvanized steel, brass, or stainless steel Type 302 or 304. Field bending of anchors/wall ties shall be provided as necessary for project conditions. Hot-dip galvanized ties damaged by field modifications shall be repaired, regalvanized or re-zinc plated to maintain complete corrosion resistant finish protection.

3. Anchors shall include split-tail, L-anchors, strap anchors, side anchors : Custom sized pre-bent and pre-punched flat plate anchors designed for connecting cast stone panels and components back to masonry backup wythe.

4. Dowel Pins: Plain-steel bars, ASTM A615, Grade 60, threaded for coil inserts cast into cast stone.

2.3 CAST STONE SHAPES

A. Wall Cap: Custom shaped as indicated on drawings.

2.4 COLOR AND FINISH

A. Color: Selected from manufacturer's standard range of colors.

B. Finish: Medium Acid Etch

C. All surfaces intend to be exposed to view shall have a fine-grained texture similar to natural stone, with no air voids in excess of 1/32 in. and the density of such voids shall be less than 3 occurrences per any 1 in. and not obvious under direct daylight illumination at a 5 foot distance.

D. Units shall exhibit a texture approximately equal to the approved sample when viewed under direct daylight illumination at a 10 foot distance.

1. ASTM D 2244 permissible variation in color between units of comparable age subjected to similar weathering exposure.

a. Total color difference – not greater than 6 units.

b. Total hue difference – not greater than 2 units.

E. Minor chips shall not be obvious under direct daylight illumination from a 20-ft distance.

F. Remove cement film, if required, from exposed surfaces prior to packaging for shipment.

2.5 REINFORCING

A. Reinforce the units as required by the drawings and for safe handling and structural stress.

B. Minimum reinforcing shall be 0.25 percent of the cross section area.

C. Reinforcement shall be non-corrosive where faces exposed to weather are covered with less than 1.5 in. of concrete material. All reinforcement shall have minimum coverage of twice the diameter of the bars.

D. Panels, soffits and similar stones greater than 24 in. in one direction shall be reinforced in that direction. Units less than 24 in. in both their length and width dimension shall be non-reinforced unless otherwise specified.

2.6 CURING

A. Cure units in a warm curing chamber approximately 100°F at 95% relative humidity for approximately 12 hours, or cure in a 95% moist environment at a minimum 70°F (21.1°C) for 16 hours after casting. Additional yard curing at 95% relative humidity shall be 350 degree-days (i.e., 7 days @ 50°F (10°C) or 5 days @ 70°F prior to shipping. Form cured units shall be protected from moisture evaporation with curing blankets or curing compounds after casting.

2.7 MANUFACTURING TOLERANCES

A. Cross section dimensions shall not deviate by more than ±1/8 in, whichever is greater, not to exceed ±1/4 in.

B. Length of units shall not deviate by more than length/360 or ± 1/8 in., whichever is greater, not to exceed ±1/4 in.

1. Maximum length of any unit shall not exceed 15 times the average thickness of such unit unless otherwise agreed by the manufacturer.

C. Warp, bow or twist of units shall not exceed length/360 or ±1/8 in. (3 mm), whichever is greater.

D. Location of dowel holes, anchor slots, flashing grooves, false joints, and similar features – On formed sides of unit, 1/8 in., on unformed sides of units, 3/8 in. maximum deviation.

2.9 DELIVERY, STORAGE AND HANDLING

A. Mark production units with identification marks as shown on the shop drawings.

B. Package units and protect them from staining or damage during shipping and storage.

C. Provide an itemized list of product to support the bill of lading.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Installing contractor shall check Cast Stone materials for fit and finish prior to installation. Do not set unacceptable units.

3.2 SETTING TOLERANCES

A. Comply with Cast Stone Institute ® Technical Manual.

B. Set stones 1/8 in. or less, within the plane of adjacent units.

C. Joints, plus – 1/16 in., minus -1/8 in.

3.3 JOINTING

A. Joint size:

1. At stone/brick joints 3/8 in.
2. At stone/stone joints in vertical position 3/8”.
3. Stone/stone joints exposed on top 3/8 in.

B. Joint materials:

1. Mortar, Type N, ASTM C 270.
2. Use a full bed of mortar at all bed joints.
3. Flush vertical joints full with mortar.
4. Leave all joints with exposed tops or under- relieving angles open for sealant.
5. Leave head joints in copings and projecting components open for sealant.

C. Locations of joints;

1. As shown on shop drawings.
2. At control and expansion joints unless otherwise shown.

3.4 SETTING

A. Drench units with clean water prior to setting.

B. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.

C. Set units in full bed of mortar, unless otherwise detailed.

D. Rake mortar joints 3/4” in. for pointing.

E. Remove excess mortar from unit faces immediately after setting.

F. Tuck point unit joints to a slight concave profile.

3.5 JOINT PROTECTION

A. Comply with requirements of Section 07 90 00 – Joint Sealant.

B. Prime ends of units, insert properly sized backing rod and install required sealant.

3.6 REPAIR AND CLEANING

A. Repair chips with touchup materials furnished by manufacturer.

B. Saturate units to be cleaned prior to applying an approved masonry cleaner.

C. Consult with manufacturer for appropriate cleaners.

3.7 INSPECTION AND ACCEPTANCE

A. Inspect finished installation according to Bulletin #36.

B. Do not field apply water repellant until repair, cleaning, inspection and acceptance is completed.

END OF SECTION 04 72 00

END OF DIVISION 04 – MASONRY

DIVISION 05 – METALS

Section 05 12 00 – Structural Steel

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Applicable provisions of Division 1 shall govern all work under this section.

B. Section Includes:

1. Structural steel framing members
2. Base plates, anchor bolts
3. Grouting under base plates
4. Shop primer paint and surface preparation

1.2 WORK SPECIFIED ELSEWHERE BUT PROVIDED UNDER THIS SECTION

A. Section 04 05 00 – Masonry Mortar and Grout: Non-shrink grout

1.3 PRODUCTS FURNISHED BUT INSTALLED BY OTHERS

A. Section 03 30 00 – Concrete: Anchors for casting into concrete.

1.4 RELATED SECTIONS

A. Section 05 22 00 – Steel Joists

B. Section 05 31 00 – Steel Deck

C. Section 05 50 00 – Metal Fabrications

1.5 SUBMITTALS

A. Submit the following with accordance Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: Detail fabrication of structural steel components, include the following
   a. Include details of cuts, connections, splices, cambers, holes, and other pertinent data.
   b. Provide templates for anchors and bolts for installation.
   c. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
   d. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify high-strength bolted slip-critical, direct-tension, or tensioned shear/bearing connections.
   e. Shop drawings shall be signed and sealed by a qualified professional engineer registered in the State of Wisconsin and responsible for their preparation.
2. Certificates: Mill test reports signed by manufacturers certifying that their products, including the following, comply with requirements.
   a. Structural steel, including chemical and physical properties.
   b. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
   c. Direct-tension indicators.
   d. Shop primers

1.6 REFERENCED STANDARDS

A. Referenced Specifications: Comply with recommended practices and procedures of the referenced specification standards and with the modifications as specified herein.

B. American Society for Testing and Materials (ASTM).

1. ASTM A36 – Structural Steel.
2. ASTM A53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
3. ASTM A108 – Steel Bars, Carbon, Cold-Finished, Standard Quality.
4. ASTM A123 – Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products.
5. ASTM A153 – Zinc Coating (Hot Dip) on Iron and Steel Hardware.
6. ASTM A307 – Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.
7. ASTM A325 – Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
8. ASTM A490 – Heat-Treated Steel Structural Bolts, 150 KSI Minimum Tensile Strength.
9. ASTM A500 – Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
10. ASTM A501 – Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
11. ASTM A563 – Carbon and Alloy Steel Nuts (Heavy Hex).
12. ASTM A572 – High Strength Low Alloy Structural Steel.
13. ASTM A992 – Steel for Structural Shapes for use in Building Framing.
14. ASTM F436 – Hardened Steel Washers.
15. ASTM F1554 – Steel Anchor Rods, Grades 36, 55, and 105.

C. American Welding Society (AWS).

1. AWS A2.0 – Standard Welding Symbols.
2. AWS D1.1 – Structural Welding Code.

D. American Institute of Steel Construction, Inc (AISC).

1. AISC – Specification for Structural Steel Buildings, Allowable Stress Design.
2. AISC – Load and Resistance Factor Design Specification for Structural Steel Buildings.
3. AISC – Code of Standard Practice for Steel Buildings and Bridges.
4. AISC – Specification for Architectural Exposed Structural Steel.

E. RCSC – Research Council on Structural Connections.

1. RCSC – Specification for structural joints using ASTM A325 or A490 bolts.

1.7 QUALITY ASSURANCE

A. Standards: Comply with the applicable provisions of the Referenced Standards specified herein.

B. Fabricator Qualifications: A qualified fabricator who participates in the AISC Quality Certified Program and is designated an AISC Certified Plant, Category Sbd.

C. Welding: Qualify procedures and personnel according to AWS D1.1, Structural Welding Code, Steel.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Fabricate for delivery sequence which will expedite erection and minimize field handling. Identify pieces with suitable mark conforming to erection drawings.

B. Protect steel against corrosion or deterioration. Store material, so as to avoid damage and distortion. Materials damaged due to mishandling shall be replaced at no additional cost to the owner.

1.9 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Structural Steel Shapes, Plates, Angles and Bars: As follows;

1. Carbon Steel: ASTM A 36, unless otherwise shown on structural plans.

2. Stainless Steel: ASTM A 572 (ASTM A 572M)

B. Rolled Wide Flange W shapes and channel C shapes: ASTM A572, Fy = 50 KSI.

C. Cold-Formed Steel Tubing: ASTM A 500, Grade B, Fy = 46 KSI

D. Steel Pipe: ASTM A 53, Type E or S, Grade B, Fy = 35 KSI.

E. Fasteners: High-strength bolts and nuts, ASTM A 325 or A 490, unfinished bolts and nuts, ASTM A 307, Grade A.

F. Welding Electrodes: AWS E70XX Electrodes.

2.2 PRIMER

A. Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS TT-P-664.

B. Zinc Coated: Apply G90 coating according to ASTM A 123. Apply to all structural steel exposed to weather.

C. Shop Painting: Paint structural steel work, except members or portions of members embedded in concrete or mortar, steel shown to be fireproofed, and contact areas to be welded or riveted. Clean steel free of loose mill scale, rust, oil, and grease. Apply prime paint to provide a minimum dry film thickness of 2.0 mils.

D. Galvanizing Repair Paint: High-zinc-dust-content paint for re-galvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21035A or SSPC-Paint 20.

2.3 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to the greatest extent possible. Comply with AISC Code of Standard Practice for Steel Buildings and Bridges and final shop drawings. Mark and match-mark units for field assembly.

B. Bolted Connections: Install high strength bolts according to RCSC Specification for Structural Steel Joists. Connection type shall be Snug Tight except as otherwise indicated.

C. Welded Connections: Comply with AWS Code for procedures, appearance, and quality of welds.

D. Provisions for Other Work: Fabricate structural steel members to provide holes for securing other work and for passage of other work through steel framing as indicated.

2.04 SOURCE QUALITY CONTROL

A. Contractor will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports. Comply with testing and inspection requirements of this section specified for Field Quality Control.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements of AWS D1.1 for stud welding.

PART 3 – EXECUTION

3.1 ERECTION

A. Comply with AISC Code and Specifications and maintain work in safe and stable condition during erection. Provide temporary bracing and shoring as required, until final connections are installed. Maintain erection tolerances.

B. Set base plates on cleaned bearing surfaces, using wedges or other adjustments as required. Solidly pack open spaces with commercial non-shrink grout material per Section 04 05 13.

C. Splice members only where shown on final shop drawings.

3.2 FIELD CONNECTIONS

A. Bolted Connections: Install and tighten high-strength bolts according to RCSC Specification for Structural Joints Using ASTM A 325 or A 490 Bolts. All connections to be Snug Tight type joints unless noted otherwise.

B. Weld Connections: Comply with AWS D1.1 for procedures, appearance and quality of welds, and methods used in correcting welding work.

1. Comply with AISC specifications referenced in this Section for bearing, adequacy of temporary connections, alignment, and removal of paint on surfaces adjacent to field welds.

3.3 TOUCH-UP PAINTING

A. After installation, promptly clean, prepare, and prime paint or re-prime field connections, rust spots and abraded surfaces.

B. Clean and prime welds, bolt and rivet heads, abrasions of prime coat, and surfaces not previously shop primed, except surfaces to be in contact with concrete after erection.

C. Clean all surfaces of dirt, mud, oil, or grease that would impair bonding of fireproofing, concrete, or paint.

3.4 FIELD QUALITY CONTROL

A. The General Building Contractor shall hire a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

1. Test Field Bolted Connections: Checking at least 2 bolts per high strength bolted connection with a calibrated torque wrench for tension at least 5 percent higher than that shown, or as required by ASTM A325, by the method as outlined in the "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts". Tension after nuts are re-torqued shall be at least equal to that shown, or as required by ASTM A325.

2. Test Shop Bolted Connections: Checking at least 2 bolts of every second high strength bolted connection with a calibrated torque wrench for tension at least 5 percent higher than that shown, or as required by ASTM A325, by the method as outlined in the "Specifications for Assembly of Structural Joints Using High Strength Steel Bolts".

3. Welded Connections: Field welds will be visually inspected according to AWS D1.1. Where indicated on Drawings, perform the following tests inspection methods.

   a. Liquid Penetrate Inspection: ASTM E 165.

   b. Magnetic Particle Inspection: ASTM E 709, performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.

   c. Ultrasonic Inspection: ASTM E 164.

   d. Radiographic Inspection: ASTM E 94.

B. Correct deficiencies in work that test reports and inspections indicate does not comply with the Contract Documents.

END OF SECTION 05 12 00

Section 05 22 00 – Steel Joists

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Section Includes:

1. Open web K Series steel joists.
2. Open web LH Series steel joists.
3. Bridging and bracing.
4. Joist accessories.

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel

B. Section 05 31 00 – Steel Roof Deck

C. Section 05 50 00 – Metal Fabrications

1.3 REFERENCES

A. Reference Standards: Comply with Steel Joist Institute (SJI) "Standard Specifications for Open Web Steel Joists, and Joist Girders" for types of joists indicated. Comply with American Welding Society (AWS) Structural Welding Code – Steel.

1.4 SUBMITTALS

A. Shop Drawings: Submit complete plans, details and schedules for fabrication and erection, including layout, camber, special connections, jointing and accessories.

B. Welders' Certificates: Submit manufacturer's certificates that welders employed on the Work have met AWS Standard Qualification Procedure within the previous 12 months.

1.5 QUALIFICATIONS

A. Manufacturer Qualifications: A firm experienced in manufacturing joists similar to those indicated for this project and with a record of successful in service performance. Manufacturer shall be certified by SJI to manufacture joists complying with SJI standard specifications.

B. Erector: Company specializing in performing the work of this Section with a minimum 5 year's experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to the site under the provisions of SJI requirements. Store and protect products from distortion or damage.

1.7 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel: Comply with ASTM standards as referenced in the SJI "Specifications."

B. Fasteners: High-strength bolts and nuts, ASTM A 325 or A 490, unfinished bolts and nuts, ASTM A 307, Grade A.

C. Accessories: Provide applicable accessories, complying with SJI "Specifications", necessary to complete the installation, including but limited to bridging, bridging connectors, side wall anchors, top or bottom chord extensions and special depth bearing seats.

D. Shop Paint: Rust inhibitive paint complying with SJI "Specifications".

2.2 STEEL JOISTS

A. Manufacture steel joists according to SJI's "Specifications," with steel-angle top- and bottom-chord members, and as follows:

B. Comply with AWS requirements and procedures for shop welding, appearance, quality of welds, and methods used in correcting welding work.

C. Furnish special bearing seats and special extended ends.

2.3 JOIST ACCESSORIES

A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span.

B. Bridging: Schematically indicated. Detail and fabricate according to SJI “Specifications”.

C. Supply miscellaneous accessories, including splice plates and bolts required by joist manufacturer to complete joist installation.

2.4 FINISH

A. Shop Painting: Paint structural steel work, except members or portions of members embedded in concrete or mortar, steel shown to be fireproofed, and contact areas to be welded or riveted. Clean steel free of loose mill scale, rust, oil, and grease. Apply prime paint to provide a minimum dry film thickness of 2.0 mils.

PART 3 – EXECUTION

3.1 ERECTION

A. Comply with SJI “Specifications,” and maintain work in safe and stable condition during erection. Do not apply construction loads until bridging and anchorages are completed.

B. Provide sufficient temporary bracing to maintain framing safe, plumb, and true alignment until completion of erection and installation of permanent bridging and bracing.

C. Coordinate placement of anchors on masonry construction for securing bearing plates and angles.

D. After joist alignment and installation of framing, field weld joist seat to bearing plates.

E. Do not field cut or alter structural members without approval of joist fabricator.

F. After erection, prime welds, abrasions, and surfaces not shop primed.

3.2 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼ inch

B. Maximum Offset From True Alignment: ½ inch

3.3 FIELD QUALITY CONTROL

A. Testing Agency: General Building Contractor shall engage a qualified independent testing and inspection agency to perform field tests and inspections and prepare test reports. Field welds will be subject to inspection according to AWS D1.1. Testing agency will report inspection results promptly and in writing to contractor and architect.

END OF SECTION 05 22 00

Section 05 31 00 – Steel Deck

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Section Includes:

1. Steel roof deck and accessories

1.2 RELATED SECTIONS

A. Section 05 12 00 – Structural Steel

B. Section 05 22 00 – Steel Joists & Girders

C. Section 05 50 00 – Metal Fabrications

1.3 REFERENCES

A. Codes and Standards:

1. American Iron and Steel Institute (AISI) "Specification for the Design of Cold-Formed Steel Structural Members"

2. American Welding Society (AWS) "Structural Welding Code – Sheet Steel"

3. Steel Deck Institute (SDI) "Design Manual for Composite Decks, Form Decks and Roof Decks"

1.4 SUBMITTALS

A. Shop Drawings: Include layout plans, deck type, deck gauge, anchorage details, and accessories.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver to site, store and protect decking on dry wood sleepers.

1.6 FIELD MEASUREMENTS

A. Verify that field measurements are as shown on shop drawings.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

A. Provide steel deck as fabricated by one of the following:

1. Epic Metals Corp.

2. United Steel Deck, Inc.

3. Vulcraft/Div. Nucor Corp.

4. Wheeling Corrugating Co.

2.2 MATERIALS

A. Steel Roof Deck: Comply with SDI requirements for type of sections, gauge, width and depth as shown on the structural drawings.

B. Sheet Steel for Painted Units: ASTM A 611, Grade C or D.

C. Sheet Steel for Galvanized Units: ASTM A 653, Grade A.

D. Power Actuated Fasteners: Provide fasteners as manufactured by Hilti model X-EDN19 or X-EDNK22 nails or approved equal.

E. Side Lap Fasteners: Provide screws as manufactured by Hilti No. 10 self tapping screws or approved equal.

2.3 ACCESSORIES

A. Metal Accessories: Steel deck manufacture's standard accessory materials, including closure strips, roof sump pans and cant strips to match adjoining metal deck finish coating.

B. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the decking.

2.4 FABRICATION

A. Fabrication: Form deck units in lengths to span at least 3 supports; flush, telescoped, or nested 2-inch end laps; nested or interlocked side laps, unless otherwise indicated.

B. Deck Units: Comply with SDI requirements for type of sections, of metal thickness, width, and depth indicated on drawings.

2.5 SHOP PRIMING

A. Shop Painted: Roof deck units shall receive manufacturer's standard baked-on acrylic medium gray primer applied to chemically cleaned and pre-treated steel, except units exposed to weather or to be fireproofed.

B. Zinc Coated: Galvanized coating to comply with ASTM A 653 Class G-90 coating. Apply to all metal roof deck exposed to weather or to be fireproofed.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

B. Beginning of installation means installer accepts existing conditions.

3.2 INSTALLATION

A. Erect metal decking according to SDI Design Manual for Composite Decks, Form Decks, and Roof Decks.

B. Roof Deck Panels: Place deck panels on supporting framing and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Deck panels shall be continuous over three spans with not less than 1-1/2 inch minimum bearing on steel supports.

C. Metal Roof Deck Fasteners: Furnish and install power actuated or pneumatically driven fasteners according to deck manufacturers' instructions.

D. Side Lap Fasteners: Secure roof deck units at side laps with metal screws installed according to manufacturer's instructions.

E. Accessories: Place accessory units according to manufacturer's recommendations unless otherwise shown.

F. Install single row of foam flute closures above walls and partitions perpendicular to deck flutes.

3.3 TOUCH-UP PAINTING

A. After installation, promptly clean all surfaces of dirt, mud, oil or grease that would impair bonding of touch-up coating.

B. Repair Painting: Wire brush and clean all rust spots and abraded areas of prime painted deck and apply repair paint.

C. Galvanized Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's instructions.

3.4 FIELD QUALITY CONTROL

A. Field Quality Control: All deck fasteners and side lap fasteners shall be inspected by a qualified testing agency prior to installation of insulation materials.

B. Correct any defects in fastener installation work as directed by testing agency.

END OF SECTION 05 31 00

Section 05 50 00 – Metal Fabrications

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Loose bearing and leveling plates.
2. Loose steel lintels.
3. Aluminum diamond plate pit cover
4. Steel pipe bollards with thermoplastic bollard sleeve covers.
5. Safety net trolley track & rub-rail assembly
6. Bent plate O.H. sectional door jamb protectors
7. Overhead door control station
8. Removable aluminum planks (Inspection pits)
9. Movable inspection pit bridges

1.2 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-place Concrete: Placement of metal fabrications in concrete.

B. Section 04 20 00 – Unit Masonry: For installation of loose lintels and steel jambs

C. Section 05 12 00 - Structural Steel: For connection to steel framing.

D. Section 05 52 13 – Pipe and Tube Railings

E. Section 06 40 00 – Interior Architectural Woodwork: Countertop support brackets

F. Section 09 90 00 - Painting

G. Section 32 31 19 – Decorative Metal Gates

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – SUBMITTAL PROCEDURES:

1. Shop Drawings: Showing details of fabrication, assembly and installation including templates for anchor bolt placement.
2. Samples of Materials and finished products as may be requested by architect.

PART 2 – PRODUCTS

2.1 MATERIALS

A. General: For work exposed to view use materials selected for their smoothness and freedom from surface blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36.

C. Cold-formed steel tubing : ASTM A 500, Grade B.

D. Wide Flange Shapes: ASTM A 572 Grade 50.

E. Steel Pipe: ASTM A 53, Type E or S, Grade B.

F. Stainless Steel Bars and Shapes: ASTM A 276, Type 304.

G. Stainless Steel Rods and Bolts: ASTM A 276, Type 304 or Type 316.

H. Pit Covers: Aluminum Diamond Plate

I. Steel Pipe Bollards: ASTM A 53, Grade B, Schedule 40, galvanized.

1. Bollard Sleeves

a. Provide smooth vinyl post sleeves in caution yellow color of steel pipe bollard sizes indicated on the drawings.

b. Supplier: AbsorbentsOnLine (800) 869-9633 or equivalent.

J. Non-shrink Nonmetallic Grout: Premixed, factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C 1107.

K. Fasteners: Provide bolts, nuts, lag bolts, machine screws, toggle bolts, masonry anchorage devices, lock washers as required for application indicated and complying with applicable Federal standards. Hot-dip galvanize fasteners for exterior applications to comply with ASTM A 153. Provide stainless steel fasteners for exterior use where specified to comply with ASTM A 276 Type 304 or Type 316.

L. Shop Primer for Ferrous Metal: Manufacturer's or Fabricator's standard, fast curing, lead-free, universal modified alkyd primer; resistant to normal atmospheric corrosion, compatible with finish paint systems indicated, capable of providing a sound foundation for field-applied topcoats despite prolonged exposure; complying with performance requirements of FS TT-P-645.

M. Zinc Coated: Apply G90 coating according to ASTM A 123. Apply to all structural steel exposed to weather.

N. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint 12 except containing no asbestos fibers.

2.2 FABRICATION

A. General: Use materials of size and thickness shown, or, if not shown, of required size, grade and thickness to produce strength and durability in finished product. Shop-paint all items not specified to be galvanized after fabrication.

B. Weld corners and seams continuously to comply with AWS recommendations. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.

1. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.

C. Rough Hardware: Furnish custom-fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes for framing and supporting and anchoring woodwork.

1. Galvanize, unless otherwise indicated.

D. Loose Bearing and Leveling Plates: Provide for steel items bearing on masonry or concrete, as indicated. Drill plates to receive anchor bolts, weld anchor studs where shown, furnish unfinished.

E. Loose Steel Lintels: Fabricate from shapes and to sizes indicated. Prime paint materials after fabrication.

F. Cast-in-Place Angles: Fabricated from shapes and sizes indicated, weld anchor studs to embed face. Galvanize assembly after fabrication.

G. Miscellaneous Framing and Supports: Provide as required to complete work and not included with structural steel framework. Fabricate of welded construction in as large units as possible. Drill and tap as required to receive hardware and similar items. Include required anchors for building into other work spaced not more than 23 inches o.c.

H. Miscellaneous Steel Trim: Fabricate to shapes and sizes as required for profiles shown; continuous welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages; coordinate assembly and installation with other work.

I. Steel Pipe Railings: See Section 05 52 13 – Pipe and Tube Railings

J. Safety Net Trolley Track & Rub-Rail Assembly

1. The trolley track assembly shall consist of a shop fabricated steel angle and tube section ‘rub-rail” running the length of the recessed inspection pits. The rub rail frame assembly shall be fabricated with embedment headed stud anchors.

2. The steel trolley tube shall be of a high quality 1-5/8” OD steel tubing with squared ends deburred for precise matching points. Standard factory finish is Blue Industrial Enamel. Stock lengths are 10’-0”; weight is 2 pounds per foot. Weld sleeves are required at each junction to connect track sections.

3. Trolley: Tube track manual trolley, 120 lb. load rating, dual rollers with connector plate predrilled at bottom.

4. The steel tube shall be shop welded to a steel ‘tee’ as indicated on the drawings. The steel tee is intended to be field welded to the vertical face of the embedded steel angle after alignment of the tube track.

   a. Mock-Up Section: Prior to field welding of the steel tee to the embedded rub-rail assembly, the contractor shall attach 10’ long sections on both sides of the inspection pit for testing and adjustments to the steel tube and trolley assembly.

5. The rub-rail assembly and steel tee brackets (connecting the trolley tube) shall be finished per par. 2.03 – Finishes below.

K. Removable Aluminum Planks (Inspection pits): Where indicated on the plans of the recessed inspection pits, provide 72”L x 12”W x 2”H sections of 0.125” aluminum 5052-H32 planks. For basis of design, the removable aluminum planks are based on McNichols Co. Model M7122012 ‘Perf-O Grip’.

L. Movable Inspection Pit Bridges: Where indicated on the plans of the recessed inspection pits, provide shop fabricated pit ‘bridges’ consisting of side by side 18” wide x 2” high aluminum plank of 0.125” aluminum 5052-H32 with four (4) bent plate metal (or stock) handles. The ends of the pit bridges shall have a full width 1/4” thick aluminum plates for fitting over rub-rail assembly as shown on the drawings. For basis of design, the removable aluminum planks are based on McNichols Co. ‘Perf-O Grip’ Plank, Model M718201212

2.3 BOLLARD SLEEVES

A. Supplier: Post Guard or equivalent.

B. Manufacturer: Encore Commercial Products, Inc.

1. Contact: Customer Service 37525 Interchange Dr. Farmington Hills, MI 48335 1-866-737-8900; 248-354-4090; Fax: 248-354-4095; website: www.postguard.com. Manufactured in the United States of America.

C. Provide HDPE polyethylene dome top post sleeves of steel pipe bollard sizes indicated on the drawings. Color to be selected.

2.4 FINISHES

A. Shop Painting: Apply shop primer to surface of metal fabrications except those embedded in Concrete or galvanized; comply with SSPC-PA 1 and requirements indicated below:

1. Surface Preparation: Comply with SSPC-SP6” Commercial Blast Cleaning” for exterior work, and with SSPC-SP3 “Power Tool Cleaning” for interior work.

2. Strip paint edges, corners, crevices, bolts, welds and sharp edges.

B. Galvanizing: ASTM A 123 for fabricated and un-fabricated steel products made of un-coated rolled, pressed and forged steel shapes, plates, bars and strip 0.0229 inch and thicker.

C. Galvanizing Repair Paint: High zinc-dust content paint with dry film containing not less than 94 percent zinc dust by weight, complying with DOD-P-21035 or SSPC-Paint-20.

D. Powder Coating (Shop Applied)

1. Where indicated on the drawings, finish fabrications with powder coating.

a. AAMA 2604-05 Super Durable Powder Coating

b. Manufacturer: Polyester based Tiger Drylac Super Durable Series 38 or approved equal.

2. Product Description: Two-coat process consisting of zinc rich primer (Tiger Drylac 69/90500) with electrostatic polyester topcoating (Tiger Drylac Series 38.

3. Finish: Smooth Matte

4. Selected by architect from manufacturer's list of standard colors.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Perform cutting, drilling and fitting required for installation; set work accurately in location, alignment and elevation, measured from established lines and levels. Provide anchorage devices and fasteners where necessary for installation to other work.

B. Set loose items on cleaned bearing surfaces, using wedges or other adjustments as required. Solidly pack open spaces with bedding mortar, consisting of 1-part Portland cement to 3-parts sand and only enough water for packing and hydration, or use commercial non-shrink grout material.

C. Touch-up shop paint after installation. Clean field welds, bolted connections and abraded areas, and apply same type paint as used in shop. Use galvanizing repair paint on damaged galvanized surfaces.

END OF SECTION 05 50 00

Section 05 52 13 – Pipe and Tube Railings

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Steel pipe and tube handrails, railings, and guardrails.

B. Related Sections include the following:

1. Section 05 50 00 – Metal Fabrications
2. Section 09 90 00 – Painting
3. Section 32 31 19 – Decorative Metal Gates

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railings: Provide handrails and railings complying with requirements of ASTM E 985 and Wisconsin Administrative Code for structural performance, based on testing performed according to ASTM E 894 and ASTM E 935.

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – SUBMITTAL PROCEDURES:

1. Shop Drawings: Show fabrication and installation of handrails and railings. Include plans, elevations, sections, component details, and attachments to other work.
2. Design Calculations: For fabricated items, requiring design calculations to substantial design and installation conditions, prepared, sealed, and signed by a State of Wisconsin Licensed Structural Engineer. Submit design calculations for handrails, guardrails, and railings.

1.5 PERFORMANCE REQUIREMENTS

A. Structural Performance of Handrails and Railing Systems: Provide handrails and railing systems capable of withstanding the following structural loads without exceeding the allowable design working stress of materials involved:

1. Top Rails of Guardrail Systems: Concentrated load of 200 lb applied at any point and in any direction and a uniform load of 50 lb per linear ft. applied horizontally and concurrently with uniform load of 100 lb per linear feet applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
2. Handrails Not Serving as Top Rails: concentrated load of 200 lb applied at any point and uniform load of 50 lb per linear ft. applied in any direction. Concentrated and uniform loads need not be assumed to act concurrently.
3. In-fill Area of Guardrail Systems: Horizontal concentrated load of 200 lb applied to one sq. ft. at any point in this system, including panels, intermediate rails, balusters, or other elements composing the in-fill area. Load on infill area need not be assumed to act concurrently with load on top rails.

1.6 QUALITY ASSURANCE

A. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of handrails and railings that are similar to those indicated for this Project in material, design, and extent.

B. Source Limitations: Obtain each type of handrail and railing through one source from a single manufacturer.

1.7 STORAGE

A. Store handrails and railings in a dry, well-ventilated, weathertight place

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify handrail and railing dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1.8 COORDINATION

A. Coordinate installation of anchorages for handrails and railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.9 SCHEDULING

A. Schedule installation so handrails and railings are mounted only on completed walls. Do not support temporarily by any means that does not satisfy structural performance requirements.

PART 2 – PRODUCTS

2.1 METALS

A. General: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.

B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:

1. Steel Tubing:

a. Schedule 40 hot-dipped galvanized, ASTM A135/A795.

b. Pipe O.D.: 1.90”

c. Nominal Wall Thickness: .145”

d. Weight per Foot: 2.84 lbs.

2. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

3. Iron Castings: Malleable iron complying with ASTM A 47, Grade 32510 (ASTM A 47M, Grade 22010).

C. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.

2.2 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Handrails and Railings to Other Construction:

1. For steel handrails, railings, and fittings, use Type 304 stainless steel stud anchors equal to Hilti Kwik Bolt II. Size and embedment to be determined by railing fabricator for conditions indicated on the drawings.

2.3 FABRICATION

A. General: Fabricate handrails and railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less that that required to support structural loads.

B. Assemble handrails and railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

C. Form changes in direction of railing members as follows:

1. By bending.

2. By flush radius bends.

3. By any method indicated above, applicable to change in direction involved.

D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of handrail and railing components.

E. Welded Connections: Fabricate handrails and railings for connecting members by welding. Cope components at perpendicular and skew connections to provide close fit, or use fittings designed for this purpose. Weld connections continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

2. Obtain fusion without undercut or overlap.

3. Remove flux immediately.

4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing members to other work, unless otherwise indicated.

G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

H. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless Otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing the Work.

I. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

J. Close exposed ends of handrail and railing members with prefabricated end fittings.

K. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

L. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

M. Cut, reinforce, drill, and top components as required to receive stainless steel cable system.

2.4 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Provide exposed fasteners with finish matching appearance, including color and texture, of handrails and railings.

C. Fill vent and drain holes that will be exposed in finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

D. For nongalvanized steel handrails and railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.

E. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed handrails and railings.

1. Exteriors (SSPC Zone 1B): SSPC-SP 6, "Commercial Blast Cleaning."

2. Interiors (SSPC Zone 1A): SSPC-SP 7, "Brush-off Blast Cleaning."

F. Apply shop primer to prepared surfaces of handrail and railing components, unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

2.5 STEEL FINISHES

A. PAINT

1. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664; selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoat despite prolonged exposure.

B. POWDER COATING (Shop Applied)

1. Where indicated on the drawings, finish fabrications with powder coating.

a. AAMA 2604-05 Super Durable Powder Coating

b. Manufacturer: Polyester based Tiger Drylac Super Durable Series 38 or approved equal.

2. Product Description: Two-coat process consisting of zinc rich primer (Tiger Drylac 69/90500) with electrostatic polyester topcoating (Tiger Drylac Series 38.

3. Finish: Smooth Matte

4. Selected by architect from manufacturer's list of standard colors.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION GENERAL

A. Fit exposed connections together to form tight, hairline joints.

B. Perform cutting, drilling, and fitting required to install handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

1. Do not weld, cut, or abrade surfaces of handrails and railings. Set handrails and railings accurately in location, alignment, and elevation; measured from established lines and levels and free from rack.

2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).

3. Align rails so variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (5 mm in 3 m).

C. Adjust handrails and railings before anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated, but not less than that required by structural loads.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections tin “Fabrication” Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ANCHORING RAILING ENDS

A. Anchor posts to metal surfaces with oval flanges bolted to metal surfaces.

1. Weld flanges to railing ends.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

3.7 CLEANING

A. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 Section “Painting.”

3.8 PROTECTION

A. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 05 52 13

Section 05 73 16 – Stainless Steel Metal Railing System

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Furnish and install post supported stainless steel railings, wire rope and components necessary for a complete installation.

1.2 WORK BY OTHERS

A. Section 09 90 00 – Painting: Steel posts

1.3 REFERENCE

A. American National Standards Institute (ANSI)

1. A17.1 Accessible and Usable Buildings and Facilities
2. A21.1 Safety Requirements for Floor and Wall Openings, Railings and Toe Boards
3. A58.1 Minimum Design Loads in Buildings and Other Structures.

B. American Society for Testing and Materials (ASTM)

1. A555 – Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods.
2. E 894 – Standard Test Method for Anchorage of Permanent Metal Railing Systems and Rails for Buildings
3. E 935 – Standard Test Methods for Performance of Permanent Metal Railing Systems and Rails for Buildings.
4. E 985 – Standard Specification for Permanent Metal Railing Systems and Rails for Buildings

C. Americans with Disabilities Act Accessibility Guidelines (ADA).

D. National Association of Architectural Metal Manufacturers (NAAMM)

1. Metal Finishes Manual
2. Pipe Railing Manual
3. Stair Manual

1.4 STRUCTURAL REQUIRMENTS

A. Handrail and Guardrail assemblies and attachments shall withstand a minimum concentrated load of 200 pounds applied horizontally or vertically down at any point on the top rail. Infill area of guardrail system capable of withstanding a horizontal concentrated load of 200 pounds applied to one square foot at any point in the system. Load not to act concurrently with loads on top rail of system in determining stress on guardrail. Handrail assemblies and guards shall be designed to resist a load of 50 pounds per linear foot (pound per foot) applied in any direction at the top and to transfer this load through the supports to the structure.

1.5 SUBMITTALS

A. Submit the following according to Section 01 33 00 – SUBMITTAL PROCEDURES:

1. Shop Drawings: Drawings showing fabrication and installation of handrails including plans, elevations, sections, details of components, anchor details and attachment to adjoining units of work.
2. Product Data: Manufacturer to submit approval drawings to include the following:
    a. Section-through details
    b. Mounting methods
    c. Typical Elevations
    d. Key plan layouts

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials to be delivered to the job site in good condition and adequately protected against damage.

B. Store on site in a location and manner to avoid damage. Stacking should be done in a manner that will prevent bending.

C. Store material in a clean, dry location away from uncured concrete and masonry. Any protection on the railings during transportation should remain until installed.

D. Keep handling on a site to minimum. Exercise caution to avoid damage to finishes of material.

1.7 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railings are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication of products to not delay fabrication, delivery and installation.

B. Where field measurements cannot be made without delaying the railing fabrication and delivery, obtain guaranteed dimensions in writing by the contractor and proceed with fabrication of products to not delay fabrication, delivery and installation.

C. Coordinate fabrication and delivery schedule of handrails with construction progress and sequence to avoid delay of railing installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Architectural Railings & Grilles. Inc.: Fort Mill, SC

B. Q-Railing, Tustin CA

C. AGS Stainless Inc., Bainbridge Island, WA

2.2 MATERIALS AND FINISHES

A. All stainless steel tube and fittings to be 316 welded stainless steel.

B. Support Posts: 2” square x .08” wall thickness stainless steel tubing cut to length from manufacturer’s stock tubing.

C. Weld Flange Base Plate: Manufacturer’s sleeve type weld flange base plate pre-drilled for anchoring bolts. Shop weld to support posts. Provide stainless steel 0.06” gauge escutcheon cover, for concealment of weld flange base plate.

D. Post Caps: Manufacturer’s standard 2” x 2” slip-in post cap.

E. End Fitting: 4” x 4” (nominal) plate flange predrilled at corners with 1.18” tube sleeve projection.

2.3 STAINLESS STEEL CABLE RAILING SYSTEM

A. Cables

1. Material: ASTM A276, Type 316 stainless steel strand.

2. Diameter: 1/4”

3. Finish: Mill

4. Swaging: Swage hardware onto ends of cables using manufacturer’s recommended methods.

B. Cable Components

1. Swaging Ferrule: Retains nonadjustable and adjustable clevis fittings onto cables.

2. Swaging Stud: Use with receiver to provide a means of tensioning cables. Use with welded receiver to connect to end post, non-tensioning end. Threaded surface treatment to prevent galling and sticking.

3. Receiver: Allows tensioning hardware to be hidden within end posts.

2.4 FINISHES

A. All machined stainless steel fittings will receive a #8 polish.

2.5 FASTENERS

A. All mechanical fasteners used shall be manufactured from stainless steel.

2.6 FABRICATION

A. All mitered and welded corners shall be ground smooth to match finish.

B. Make exposed joints butt tight and flush.

C. Interior sleeves shall be used for typical splices.

D. Fasteners are allowed at splice connection

E. Verify dimensions on site prior to shop fabrication

PART 3 – EXECUTION

3.1 PREPARATION

A. Coordinate post setting drawings, diagrams, templates, instructions and directions for installation of anchorages. These include items such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete and masonry construction.

1. Coordinate delivery of anchorages to project site.

2. Coordinate that blocking is in place for all mounting fasteners

B. Clean debris and dust from surfaces and embed holes thoroughly prior to installation.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.

3.2 INSTALLATION

A. Install according to manufacturer's drawings and direction.

B. Fit exposed connections accurately together to form tight joints except as necessary for expansion.

C. Perform cutting, drilling and fitting required for installation of handrails. Accurately set handrails in location, alignment, and elevation, measured from established lines and levels.

D. Set posts plumb within a tolerance of 1/8 inch (3 mm).

E. When fastening to in-place construction, provide anchorage devices and fittings to properly secure rail to in-place construction. Examples of such devices include threaded fittings (for concrete inserts), toggle bolts and through-bolts. Separate dissimilar materials with bushings, grommets or washers to prevent electrolytic corrosion.

3.3 PROTECTION

A. Upon delivery railing may have protective wrapping. At completion of railing installation, immediately remove any protective wrapping and clean all work for inspection and approval.

B. After installation, General Contractor or owner shall be responsible for protection of railings during the balance of construction.

C. When cleaning stainless steel surfaces use plain water containing a mild soap or detergent. No abrasive agents or harsh chemicals shall be used.

END OF SECTION 05 73 16

END OF DIVISION 05 – METALS

DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

Section 06 10 00 – Rough Carpentry

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Applicable provisions of Division 1 shall govern the work under this section. This work under this section includes the furnishing and installation of all rough carpentry items.

B. Work includes:

1. Treated wood blocking (where indicated)
2. Laminated Strand Lumber (LSL) subfascia
3. Wood blocking, furring
4. Fasteners, anchors

1.2 RELATED SECTIONS

A. Section 06 20 00 – Finish Carpentry

B. Section 06 40 00 – Interior Architectural Woodwork

1.3 SUBMITTALS

A. Product Data: Engineered wood products, sheathing, framing connectors, and construction adhesives.

PART 2 – PRODUCTS

2.01 FRAMING MATERIALS

A. Lumber, General: Furnish grade stamped lumber that is dressed S4S and complies with PS 20 and applicable grading rules of inspection agencies certified by ALSC's Board of Review.

1. Provide seasoned lumber with 19 percent moisture content at time of dressing and shipment, for sizes 2 inches or less in thickness.

B. Lumber for Miscellaneous Uses: Unless otherwise indicated, provide "Standard" grade light-framing-size lumber of any species for support of other construction, including rooftop equipment and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping and similar members.

1. Provide all miscellaneous wood blocking not indicated as provided by other trades/Sections.

C. Preservative pressure treat lumber and plywood with water-borne preservatives to comply with AWPA C2 and C9, respectively, and with requirements indicated below. Mark each treated item with the AWPB or SPIB Quality Mark Requirements.

1. Pressure-treat above ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:

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

b. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.

c. Wood framing members less than 18 inches above grade.

d. Wood floor plates installed over concrete slabs directly in contact with earth.

2. Complete fabrication of treated items prior to treatment, where possible. If cut after treatment, coat cut surfaces to comply with AWPA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

2.2 LAMINATED STRAND LUMBER

A. Engineered laminated strand, 1,300,000 psi modulus of elasticity

B. Manufacturers

1. Weyerhaueser
2. Louisiana Pacific
3. Vandermeer Forest Products

2.3 FASTENERS:

A. Rough Framing: Provide fasteners of size and type indicated on the drawings or as recommended by manufacturers that comply with the following requirements. Where rough carpentry is exposed to weather, in ground contact, or in areas of high relative humidity, provide hot-double dipped zinc-coated fasteners per ASTM A 153 or AISI Type 304 stainless steel fasteners.

1. Nails, Wire, Brads, and Staples: FS FF-N-105.
2. Power Driven Fasteners: National Evaluation Report NER-272.
3. Wood Screws: ANSI B18.6.1.
4. Lag Bolts: ANSI B18.2.1.
5. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install rough carpentry work to comply with N.F.P.A. "Manual of House Framing, Form E30," "APA Design/Construction Guide - Residential & Commercial," and the following:

1. Recommendations of engineered wood products manufacturer.
2. Recommendations of manufacturer of sheathing, underlayment and other products not covered in above publications.

B. Set rough carpentry to required levels and lines, with members plumb and true and cut to fit.

C. Securely attach carpentry work to substrates and supporting members using fasteners of size that will not penetrate members where opposite side will be exposed to view or receive finish materials.

D. Install fasteners without splitting wood; fasten panel products to allow for expansion at joints unless otherwise indicated.

END OF SECTION 06 10 00

Section 06 20 00 – Finish Carpentry

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work includes:

1. Hardware and attachment accessories
2. Installation of architectural woodwork
3. Door assembly installation
4. Toilet room accessories installation

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry

B. Section 06 40 00 – Interior Architectural Woodwork

C. Section 08 11 13 – Steel Doors & Frames

D. Section 08 71 00 – Finish Hardware

E. Section 10 28 00 – Toilet and Bath Accessories

PART 2 – PRODUCTS

2.1 MATERIALS

A. Softwood Lumber: Comply with PS 20 and applicable grading rules of respective grading and inspecting agency for species and product indicated. Manufacture to sizes and patterns using seasoned lumber. Use pieces made from solid lumber for transparent finished work, and glued-up or solid, at contractor's option for painted work.

B. Fasteners and Anchorages: Provide nails, screws and other anchoring devices of type, size, material and finish suitable for intended use and required to provide secure attachment, concealed where possible. All fasteners shall be hot-dip galvanized fasteners to comply with ASTM A 153.

PART 3 – EXECUTION:

3.1 INSTALLATION

A. Install finish carpentry work plumb, level, true and straight with no distortions. Shim as required using concealed shims, scribe and cut finish carpentry items to fit adjoining work. Anchor finish carpentry work securely to supports and substrates, using concealed fasteners and blind nailing where possible. Use fine finishing nails for exposed nailing except as indicated, countersunk and filled flush with finished surface.

1. Door Assemblies: Refer to Section 08 11 13.
2. Hardware Installation: Refer to Section 08 71 00.
3. Toilet Room Accessories Installation: Refer to Section 10 28 00.

END OF SECTION 06 20 00

Section 06 40 00 – Interior Architectural Woodwork

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work includes:

1. Plastic laminate cabinets, countertops, shelves, coat hooks, cabinet hardware.
2. Countertop support brackets
3. Solid surface fabrications (countertops, vanity tops, sink bowls, window stools).

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry

B. Section 06 20 00 – Finished Carpentry

1.3 REFERENCES

A. ANSI / BHMA A156.9 – Cabinet Hardware

B. AWI – Quality Standards

1.4 SUBMITTALS

A. Shop Drawings: Submit shop drawings for each item of architectural woodwork.

B. Samples: Submit finished samples of each plastic laminate; and of each type of cabinet hardware.

1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacturing the products specified in this section with a minimum of five (5) years of experience.

1.6 FIELD MEASUREMENTS

A. The cabinet manufacturer shall be responsible for confirming all field measurements prior to fabrication.

PART 2 – PRODUCTS

2.1 PLASTIC LAMINATE MATERIALS

A. Manufacturers

1. The color selections listed in the Color Schedule is based on plastic laminates manufactured by Formica. The following manufacturer's will be accepted subject to approval by the architect.
   a. Wilsonart
   b. Nevamar
   c. Pionite

B. Sheet Materials

1. Formaldehyde Emission Levels: Comply with formaldehyde emission requirements of each voluntary standard referenced below:
   a. Particleboard: NPA 8.
   b. Medium-Density Fiberboard: NPA 9.
   c. Hardwood Plywood: HPMA FE.
2. All particle board and fiberboard core material shall be moisture-resistant M-3 Core.

C. Laminated Plastics/Finishes:

1. High-pressure plastic laminate, .030" in thickness, for exterior cabinet surfaces shall exceed NEMA LD3-1991 GP28 standards including thickness.

a. All exposed vertical panels to be laminated using a natural setting hybrid P.V.A. Type III water resistant adhesive that cures through a cold chemical process under pressure. Methods requiring heat or contact methods are not allowed.

b. Exterior Color Selection Available:

I. Standard finish vertical surface laminate from standard stock colors consisting of wood grain patterns and solid colors.

II. Direction of wood grain to be vertical on door, end panels, fascia panels, and exposed backs; horizontal on drawer faces, aprons, and top rails.

c. Plastic Laminate Balancing Sheet: High-pressure cabinet liner, .020" in thickness shall meet NEMA LD3-1991 CL 20 standards. Use for balancing exterior surface laminates. Use at all sink cabinet interior surfaces and concealed exterior surfaces. Color: Selected by architect from manufacturer's standard range of colors.

d. Countertop High Pressure Plastic Laminate:

I. High-pressure plastic laminate, textured finish .050" thickness or .042" post-forming grade as detailed.

II. Heavy gauge neutral colored backing sheet for balanced construction.

e. Melamine Laminate:

I. Melamine resin impregnated, 80 gram PSM minimum, surface laminated to core under pressure.

II. Shall meet NEMA LD3.3-1991 GP28 standards and NEMA LD3-1991 CL20 standards.

III. Pressure fused laminate for cabinet interiors behind doors and drawers. Color: Beige interior of open cabinets to be high-pressure laminate. Underside of wall cabinets to be high-pressure laminate.

IV. Shall be balanced at all concealed surfaces with phenolic backer. Unsurfaced core board not allowed.

2. Particleboard Core:

a. Particleboard to be 45 lb. density, of balanced 3-ply construction with moisture content not to exceed 8%. Particleboard shall conform to ANSI A208.1-1993, type M-3. Shall meet the following minimum standards:

II. Face screw-holding power–370 lbs.

II. Edge screw-holding power–315 lbs.

a. Particleboard cabinet components to be of the following minimum core thicknesses prior to lamination:

I. 3/8": cabinet backs.

II. 1/2": dividers, as detailed.

III. 3/4": base and tall cabinet tops and bottoms, cabinet sides, drawer spreaders, door/drawer, cabinet back rear hang-strips, dividers as detailed, expose cabinet backs.

IV. 1": wall cabinet tops and bottoms, all shelving in cabinets.

3. Fiberboard Core:

a. Uniform, medium density conforming to ANSI A208.2. Shall meet the following minimum standards:

II. Screw holding, face: 355 lbs.

II. Screw holding, edge: 300 lbs.

III. Modulus of rupture: 4,500 psi.

IV. Modulus of elasticity: 500,000 psi.

V. Internal bond: 100 psi.

b. Fiberboard components to be of the following minimum core thicknesses prior to lamination:

I. 1/4": drawer bottom.

II. 1/2": drawer sides, sub-front and back. Drawer under bottom stiffeners.

III. 3/4": framed glass door.

4. Plywood Core:

a. Plywood to be 3/4", exterior grade, of the ply and grade as follows:

I. 7 ply Fir, A/B grade: sink cabinet body, door, sink apron.

II. 5 ply, pressure treated to .40 retention, C/C plug and touch sanded: sub-base platform at base and tall cabinets.

5. Edging types. Provide one or more of the following according to Paragraph 2.01.C, 6., "Edging Locations":

a. PVC, .020". Solid, high impact, purified, color-through, acid resistant PVC edging.

b. 3mm thick PVC. Solid, high impact, purified, color-through, acid resistant, pre-lamination primed edging, machine-applied with hot melt adhesives. A "full line" of solid colors, patterns and woodgrains for exterior high-pressure decorative laminate color selections shall be available (Wilsonart "Color Quest", Formica "Color Portfolio", or equals by Pionite & Nevamar, or approved equal).

6. Edging Locations. Provide the above-specified edging types at the following locations, of the following colors:

a. Door/Drawer-Front Edging: 3mm PVC

b. Cabinet body edge, including door/drawer front spacer rail: .020" PVC, color matched to door/drawer face.

c. Interior body component edging, interior dividers, drawer body, shelf: .020" PVC to match cabinet interior surface color.

2.2 CABINET HARDWARE

A. Hinges:

1. Concealed heavy-duty European style self-closing hinge. Fully adjustable for Clockwise counterclockwise, toe in and out door alignment with 170 degree swing. Provide base plates to maintain 1/8” (32 mm) reveals between doors/drawers within the same cabinet and between doors/drawers on adjoining cabinets. Provide lifetime materials warranty/guarantee by hinge manufacturer.

2. One pair per door to 48" height. One and one-half pair over 48" in height. Hinge to accommodate 13/16" thick laminated door and allow 170-degree swing.

B. Pulls:

1. Manufacturers

a. Amerock

b. Hafele

c. Stanley

2. 4” Wire design

3. Provide two at drawers over 29".

4. Finish to be available in Chrome Powder Finish, Black, Beige, Dove Gray, or White epoxy coated.

C. Drawer Slides:

1. Standard Drawers: To be of self-closing design, epoxy powder coated to match drawer body color, with positive in-stop, out-stop, and out-keeper to maintain drawer in 80% open position. Captive nylon rollers, front and rear. Minimum 100 lb. dynamic load rating at 50,000 cycles. Fulterer #FR2021, or K&V #1286.

D. Catches

1. Provide one top-mounted magnetic catch for base and wall cabinet door. Provide two at each tall cabinet door. Catch housing to be molded in White. EPCO #1000, or approved equal.

2. Roller catch for mobile cabinets. J.G. Edelen #248, or approved equal.

E. Adjustable Shelf Supports: To be twin pin design with antitip-up shelf restraints for both 3/4" and 1" shelves. Load rating to be minimum 300 lbs. each support without failure. Cabinet interior sides shall be flush, without shelf system permanent projection..

F. Locks: Hinged doors and drawers to be provided with disc tumbler lock keyed alike and master keyed. Dull chrome finish.

1. Manufacturers

a. National Cabinet Lock, Atlanta, GA., #M4-7054.

b. Timberline

c. Best

2.3 COUNTERTOP SUPPORT BRACKETS

A. Countertop support brackets shall be shop fabricated from ¼” thick x 2-1/2” wide flat stock steel bent to profiles indicated on the drawings with diagonal brace. Pre-drill holes for anchor bolts and countertop fasteners.

B. Finish: Shop applied powder coat finish as specified under Section 05 50 00 – Metal fabrications. Color to be selected by architect.

2.4 SOLID SURFACE FABRICATIONS

A. Manufacturers

1. Meganite™ Acrylic Solid Surface

2. Avonite

3. Corian

B. Colors: Refer to Color Schedule.

C. Vanity Tops: Fabricate to width indicated on plan. Vanity countertops shall be 25” deep with 6” high dropped front apron and 4” high backsplash (include backsplash returns at end walls). Include all countertop substrates, countertop support brackets, wall cleats and related accessories necessary for a complete installation.

1. Vanity Sink Bowls: Provide solid surface manufacturer's standard oval shaped integral bowl.

a. Basis of Design: Meganite™ Model 1613-VO LAV

b. Color: Selected from manufacturer's standard range of colors.

c. Inside Dimensions: 16.3" x 13" x 5.3" deep

E. Window Stools: Fabricate from 1/2" thick solid surface to stool depth indicated on the plan with a 1-1/4" dropped edge and 1 inch "ear" extensions at window jamb openings.

2.5 SHELF STANDARDS

A. Heavy-duty 12-gauge steel, 7/8" wide with anochrome finish equal to Knape & Vogt #187 Series. Provide shelf brackets of matching KV #187 series with anochrome finish. Refer to drawings for bracket depths.

2.6 COAT RACK SHELVING

A. 1-1/16" O.D. stainless steel heavy-duty tubing equal to Knape & Vogt 660 Series with end caps and wall mounted support brackets. Shelving to be 1" thick x 12" deep plastic laminate finished particle board cores with 3 mm PVC edging.

2.7 FABRICATION

A. Components:

1. Sub-Base:

a. Cabinet Sub-base: To be separate and continuous (no cabinet body sides-to-floor), with concealed fastening to cabinet bottom. Ladder-type construction, of front, back, and intermediates.

2. Base to be recessed 3/4" at finished end conditions for (Division 9) vinyl base.

3. Cabinet Top and Bottom:

a. Solid sub-top to be furnished for all base and tall cabinets. Sub-top to be 3/4" thick.

b. Wall cabinet and library stack bottoms and tops to be 1" thick.

c. Exterior exposed wall cabinet bottoms to be high pressure laminate, both sides. Assembly devices to be concealed on bottom side of wall cabinets.

4. Cabinet Ends:

a. Holes drilled for adjustable shelves 1-1/4" on center.

b. Exposed exterior cabinet ends to be laminated with high-pressure plastic laminate, balanced with high-pressure cabinet liner interior surface.

5. Fixed and Adjustable Shelves:

a. Shelf Thickness Behind doors: 1" thick up to 27" wide, 1" thick 28" wide and over.

b. Shelf Thickness at Open Cabinets: 1" thick for all widths.

6. Cabinet Backs:

a. Cabinet back to be fully housed into sides, top, and bottom. Rear, unexposed, side of back to receive continuous bead of hot melt adhesive at joints. Back shall be a minimum 3/8" thick and fully inset in rear of body. Back to be recessed 7/8" from cabinet rear.

b. Hang rails shall be 3-3/4" high, glued to rear of cabinet back and mechanically fastened to cabinet sides. Provide minimum of 2 at base, 2 at wall, and 3 at tall cabinets.

7. Door and Drawer Fronts:

a. Laminated door and drawer fronts to be 13/16" thick for all hinged and sliding doors. Drawer fronts and hinged doors are to overlay the cabinet body and fitted with silencer bumpers. Maintain a maximum 1/8" reveal between pairs of doors, between door and drawer front, or between multiple drawer fronts within the cabinet.

b. Stile and Rail doors to be 13/16" thick with full 1/4" plate glass (hinged or sliding). All exposed lite-opening edges to be trimmed and glazed with extruded vinyl glazing bead.

8. Drawers:

a. Drawer fronts shall be applied to separate drawer body component sub-front.

b. Drawer sides shall be dadoed and glued to receive front and back.

c. Drawer bottom to be housed into front, sides, and back. Underside of drawer to receive continuous bead of hot melt adhesive at joints. Reinforce drawer bottoms with 1/2 " x 4" front-to-back intermediate underbody stiffeners, hot melt glued and fastened. One at 24", two at 36", four at 48".

d. Paper storage drawers fitted with full width hood at back.

e. All drawers shall have roller guides as specified herein.

f. All exposed edges shall be 3mm PVC in a color selected from manufacturer's standard.

g. Vertical and Horizontal Dividers: One of the following as indicated by cabinet number:

h. Natural hardboard 1/4" thick, smooth both faces. Secured in cabinet with molded plastic clips.

i. Pressure Fused laminate 3/4" thickness. Secured in cabinet with molded plastic clips or dowels.

j. Door/Drawer Front Rail: Provide minimum 3/4" x 6" x full width cabinet body rails immediately behind all door/drawer and multiple drawer horizontal joints.

B. Plastic Laminate Countertops

1. High-pressure plastic laminate bonded to particleboard core. Thickness as shown on plans. Underside to be properly balanced with heavy gauge backing sheet. Furnish countertops with edge treatment and design profile as shown on drawings. Provide tops in as long as practical continuous lengths.

2. Provide field glued splines at joints. No joints closer than 24" either side of sink cutout.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.

3.2 INSTALLATION

A. Set and secure casework in place; rigid, plumb, and level.

B. Install woodwork to comply with AWI Section 1700 for same grade specified in Part 2 of this section for type of woodwork involved.

C. Tops: Anchor securely to base units/brackets/wall.

END OF SECTION 06 40 00

END OF DIVISION 06 – WOOD, PLASTICS, AND COMPOSITES

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

Section 07 13 53 – Elastomeric Sheet Waterproofing

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Section Includes:

1. The work includes installation of a waterproof membrane system to the concrete foundation walls where the finished grade extends above the interior finished floor level, and under slab at the recessed inspection pits.

2. Surface preparation.

3. Application of rolled, self-adhering waterproofing membrane system.

4. Rigid insulation protection board.

1.2 RELATED SECTIONS

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

B. Section 07 21 13 – Board Insulation: Protection board

1.3 REFERENCES

A. ASTM D 146-97 - Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Fabrics Used in Roofing and Waterproofing.

B. ASTM D 412-98a(2002)e1 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

C. ASTM D 570-98 - Standard Test Method for Water Absorption of Plastics.

D. ASTM E 96-00e1 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.

E. ASTM E 154-99 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Product Data: Submit manufacturer’s product data.

2. Manufacturer’s Instructions: Application instructions.

3. Manufacturer’s Field Reports: Submit field report of manufacturer’s representative at the jobsite following installation.

1.5 QUALITY ASSURANCE

A. Manufacturer: Sheet membrane waterproofing system shall be manufactured and marketed by a firm with a minimum of 20 years’ experience in the production and sales of sheet membrane waterproofing. Manufacturers proposed for use but not named in these specifications shall submit evidence of ability to meet all requirements specified, and include a list of projects of similar design and complexity completed within the past 5 years.

B. Installer: A firm which has at least 3 years’ experience in work of the type required by this section.

C. Materials: For each type of material required for the work of this section, provide primary materials which are the products of one manufacturer.

D. Pre-Installation Conference: A pre-installation conference shall be held prior to commencement of field operations to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work. Agenda for meeting shall include review of special details and flashing.

E. Schedule Coordination: Schedule work such that membrane will not be left exposed to weather for longer than that recommended by the manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Store materials in a clean dry area according to manufacturer's instructions.

C. Store adhesives and primers at temperatures of 40°F (5°C) and above to facilitate handling.

D. Store membrane cartons on pallets.

E. Do not store at temperatures above 90°F (32°C) for extended periods.

F. Keep away from sparks and flames.

G. Completely cover when stored outside. Protect from rain.

H. Protect materials during handling and application to prevent damage or contamination.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Product not intended for uses subject to abuse or permanent exposure to the elements.

B. Protect rolls from direct sunlight until ready for use.

C. Do not apply membrane when air or surface temperatures are below 40°F (4°C).

D. Do not apply to frozen concrete.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Foundation Wall Membrane

1. Carlisle Coatings & Waterproofing; MiraDRI 860/861
2. Grace Construction Products; Bituthene 3000
3. W. R. Meadows, Inc., Hampshire, IL: Mel-Rol

B. Underslab Membrane

1. Grace 300 Preprufe
2. CETCO® 'Coreflex 60'

2.2 MATERIALS – FOUNDATION WALLS

A. Rolled, Self-Adhering Waterproofing Membrane: Polymeric waterproofing membrane protected by release paper on cross-laminated polyethylene carrier film with exposed polymeric membrane strips on both sides protected by pull-off release strips.

1. Performance Based Specification: Waterproofing membrane shall have the following characteristics:

a. Thickness:

I. Carrier Film: 4 mils.

II. Polymeric Membrane: 56 mils.

b. Tensile Strength, ASTM D 412, Die C:

I. Carrier Film: 5,900 psi (40.71 MPa) minimum.

c. Elongation, ASTM D 412, Die C: Polymeric Membrane: 455 percent minimum.

d. Peel Adhesion:

I. Dry: 7 to 11 pounds/inch (125 to 196 g/mm) width, minimum.

II. Wet: 7 to 12 pounds/inch (125 to 214 g/mm) width, minimum.

e. Pliability, ASTM D 146:

I. 180 Degree Bend: Unaffected.

II. 1 Inch (25.4 mm) Mandrel at -25°F (-32°C): Unaffected.

f. Water Vapor Permeance, ASTM E 96, Method B: 5.72 x 10^{-9} g/Pa-s-m^2.

g. Water Absorption, ASTM D 570: 0.1 percent, 72 hours maximum.

h. Resistance to Hydrostatic Head: Equivalent to 240 feet of water.

i. Puncture Resistance, ASTM E 154: 67 pounds.

j. Exposure to Fungi, Soil Test: Pass, 16 weeks.

k. Color:

I. Carrier Film: White.

II. Polymeric Membrane: Black.

2.3 MATERIALS – UNDERSLAB WATERPROOFING MEMBRANE

A. Pre-applied Integrally Bonded Sheet Waterproofing Membrane:1.2mm (0.046 in) nominal thickness composite sheet membrane comprising 0.8 mm (0.030 in.) of high density polyethylene film, and layers of specially formulated synthetic adhesive layers. The membrane shall form an integral and permanent bond to poured concrete to prevent water migration at the interface of the membrane and structural concrete. Provide membrane with the following physical properties:

1. Thickness: ASTM D3767, 0.046 in.

2. Lateral Water Migration Resistance: ASTM D5385, modified. Pass at 231 ft. of hydrostatic head pressure.

3. Low Temperature Flexibility: ASTM D1970. Unaffected at -20 deg. F.

4. Elongation: 500 %, ASTM D412, modified.

5. Tensile Strength: ASTM D412; 4,000 psi

6. Puncture Resistance: 221 lbs.; ASTM E154

7. Permeance to water vapor transmission: 0.01 perms; ASTM E96, method

2.4 ACCESSORIES

A. Primer:

1. Temperatures Above 40°F (4°C): Manufacturer’s recommended water base primer

2. Temperatures Above 20°F (-7°C): Manufacturer’s recommended VOC Compliant Solvent Base Primer or Standard Solvent Base Primer.

B. Flashing and Fillets: Manufacturer’s standard liquid membrane.

C. Pointing Mastic

E. Corner Tape: Detail Strip.

F. Waterproofing Protection Course: Refer to Section 07 21 13–Board Insulation

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive membrane. Notify architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

3.2 SURFACE PREPARATION

A. Protect adjacent surfaces not designated to receive waterproofing.

B. Clean and prepare surfaces to receive waterproofing according to manufacturer’s instructions.

C. Do not apply waterproofing to surfaces unacceptable to manufacturer.

D. Concrete surfaces must be clean, smooth and free of standing water.

E. Patch all holes and voids and smooth out any surface misalignments.

3.3 APPLICATION - VERTICAL SURFACES

A. Apply waterproofing membrane system according to manufacturer's instructions.

B. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.

C. Prime surfaces to be covered in one working day with applicable primer. Re-prime uncovered surfaces next day.

D. Prior to covering membrane and backfilling, allow and schedule inspection of membrane by membrane manufacturer's representative in presence of architect and installation contractor. Complete all corrective action as recommended by membrane manufacturer's representative. Seal edges of patches with pointing mastic.

E. Perform flood testing of horizontal applications, as required. Mark leaks and repair when membrane dries.

F. Avoid use of products that contain tars, solvents, pitches, polysulfide polymers, or PVC materials that may come into contact with waterproofing membrane system.

3.4 APPLICATION – HORIZONTAL UNDERSLAB SURFACES

A. Strictly comply with installation instructions in manufacturer's published literature, including but not limited to, the following:

1. Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build-up of layers.

2. Leave the plastic release liner in position until overlap procedure is completed.

3. Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap.

4. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

3.5 PROTECTION BOARD INSTALLATION

A. Prepare and clean waterproof membrane surface.

B. Apply rigid insulation boards with long edge horizontally.

C. Secure boards to foundation wall with adhesive prior to backfilling operations. Butt all edges tightly.

D. Backfill immediately using care to avoid damaging waterproofing membrane system.

END OF SECTION 07 13 53

Section 07 21 13 – Board Insulation

PART 1 – GENERAL

1.1 SCOPE OF WORK:

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

B. Section Includes:

1. Furnish all labor, materials, and equipment necessary for the installation of board insulation where indicated on the drawings.
2. Underslab insulation at interior floors.
3. Perimeter insulation at foundation walls.
4. Protection board applied over elastomeric sheet waterproofing.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete

B. Section 04 20 00 – Unit Masonry: Cavity wall insulation

C. Section 07 13 53 – Elastomeric Sheet Waterproofing: Protection board

1.3 REFERENCES

A. ASTM C578-92, standard specification for rigid, cellular polystyrene thermal insulation.

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Manufacturer's product data.

PART 2 – MATERIALS

2.1 MANUFACTURERS

A. Dow 'Styrofoam'

B. Owens Corning 'Foamular®

C. Diversifoam Products 'Certifoam'

2.2 MATERIALS

A. Extruded Polystyrene Insulation

1. Board Size: 48" x 96" x thicknesses indicated on drawings.
2. Thermal Resistance: R-5.4 @ 40° F, 5.0 @ 75° F per inch of thickness.
3. Minimum Compressive Strength: ASTM D1621
    a. Vertical Surface Perimeter Insulation: 25 psi
    b. Vertical Surface Protection Board: 25 psi
    c. Horizontal Surface Protection Board: 25 psi
    d. Underslab Insulation @ Operations Building: 40 psi
    e. Underslab Insulation @ Inspection Building (Truck lanes above inspection pits): 40 psi

B. Adhesive

1. Adhere insulation to concrete foundation walls adhesive as recommended by board manufacturer.

PART 3 – EXECUTION

3.1 PREPARATION

A. Underslab Base: Fine grade aggregate base to provide for a level and consistent base without voids, humps or depressions. Re-compact areas disturbed by grading operations.

B. Perimeter Insulation: Examine foundation wall surfaces to perimeter insulation. Notify architect if surfaces are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

1. If not indicated, extend insulation a minimum of 48 inches below exterior grade line.

3.2 INSTALLATION

A. Underslab Insulation

1. Butt end joints and edges tight to adjacent board.

B. Foundation Walls – Perimeter Insulation

1. Apply adhesive to adhere board insulation to face of foundation walls.

2. Butt end joints and edges tight to adjacent board with long edges horizontal.

3.3 CLEAN-UP: Remove all scraps and insulation debris from jobsite.

END OF SECTION 07 21 13

Section 07 21 16 – Batt Insulation

PART 1 – GENERAL

1.1 WORK INCLUDED

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

B. Work includes:

1. Fiberglass batt wall insulation.

2. Vapor retarder membrane barrier

1.2 RELATED SECTIONS

A. Section 09 22 16 – Metal Studs

1.3 REFERENCES

A. ASTM C665 – Mineral Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing

B. FS HH-I-521 – Insulation Blankets, Thermal

1.4 PERFORMANCE

A. Thermal resistivity or “R-value” represents the reciprocal of thermal conductivity (k-value), which is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one sq. ft. per hour at mean temperatures indicated.

B. Fire Performance Characteristics: Provide insulation materials identical to those whose indicated fire performance characteristics have been determined per ASTM E 119, ASTM E 84, and ASTM E 136, as applicable, by UL or other testing and inspecting organizations acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing and inspecting organization.

1.5 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Product Information: Submit manufacturer’s product data for each form and type of insulation indicated.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Fiberglass Batt Insulation

1. Johns Manville

2. Knauf

3. Owens Corning

4. CertainTeed

B. Reinforced-Polyethylene Vapor Retarders

1. Ravin Industries, Inc., Sioux Falls, SD; DURA-SKRIM 6WW

2. Reef Industries, Inc., Houston, TX: Griffolyn® Type-65

2.2 MATERIALS

A. Insulation

1. Friction Fit Mineral Fiber Blanket/Batt Insulation: ASTM C 665 for Type I, and as follows:

a. Mineral Fiber Type: Fibers manufactured from glass, formaldehyde-free.

b. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50.

2. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation or mechanical anchors securely to substrates indicated without damaging or corroding either insulation, anchors, or substrates.

B. Vapor Retarder Membranes

1. Reinforced-Polyethylene Vapor Retarder: 3-ply laminated 6 mils (0.15 mm) thick high-strength polyethylene film with reinforced scrim with a maximum permeance rating of 0.07 perms.

2. Vapor-Retarder Tape: Pressure sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation are dry and ready to receive insulation. Report any signs of potential air infiltration through exterior wall sheathing to the General Building Contractor prior to proceeding with installation of batt insulation.

3.2 INSTALLATION

A. Insulation

1. Install insulation according to manufacturer's instructions.

2. Trim insulation neatly to fit spaces.

3. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within the plane of insulation. Leave no gaps or voids.

B. Vapor-Retarder Membrane Barrier

1. Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure and seal in place with tape as recommended by manufacturer. Extend vapor retarder to cover miscellaneous voids in insulated substrates.

2. Seal vertical joints in vapor retarders over framing by lapping not less than two wall studs. Seal vapor retarders at perimeters, wall openings and at lap joints.

3. Firmly attach vapor retarders to substrates with mechanical fasteners or adhesives as recommended by vapor-retarder tape. Locate all joints over framing members or other solid substrates.

4. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with tape to create an airtight seal.

5. Repair any tears or punctures in vapor retarders immediately before concealment by other work.

END OF SECTION 07 21 16

Section 07 21 19 – Foamed-In-Place Insulation

PART 1 – GENERAL

1.1 SCOPE OF WORK

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

B. Work includes:

1. Foamed-in-place masonry insulation

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry

B. Section 07 27 26 – Fluid Applied Membrane Air Barrier: Spray-applied polyurethane foam (air barrier application).

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Product Data

2. Certified Test Reports: With product data, submit copies of certified test reports showing compliance with specified performance values, including R-values, fire performance characteristics and sound abatement characteristics.

3. Material Safety Data Sheet: Submit Material Safety Data Sheet complying with OSHA Hazard Communication Standard, 29 CRF 1910 1200.

1.4 QUALITY ASSURANCE

A. Manufacturing Standards: Provide Insulation produced by a single and approved manufacturer.

B. Installer qualifications for Foamed-in-place Masonry Insulation: Engage an experienced dealer/applicator who has been trained and licensed by the product manufacturer and which has not less than three years direct experience in the installation of the product used.

C. Fire Performance Characteristics: Provide insulation materials which are identical to those whose fire performance characteristics, as listed for each material or assembly of which insulation is a part, having been determined by testing, per methods indicated below, by a testing agency acceptable to authorities having jurisdiction.

1. Fire Resistance Ratings: ASTM E-119

2. Surface Burning Characteristics: ASTM E-84

3. Combustion Characteristics: ASTM E-136

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Foamed-in-place masonry insulation

1. Tailored Chemical Products, Hickory, N.C.: “Core-Fill 500”.

2. Thermco™, Thermal Cororation of America, Mt. Pleasant, IA

3. CoreFoam, Inc., Knoxville, TN

2.2 INSULATING MATERIALS

A. Foamed-in-Place Masonry Insulation: Two component thermal insulation produced by combining a plastic resin and catalyst foaming agent surfactant which, when properly rationed and mixed, together with compressed air produce a cold-setting foam insulation in the hollow cores of hollow unit masonry walls.

1. Fire-Resistance Ratings; Minimum four (4) hour fire resistance wall rating (ASTM E-119) for 8” and 12” concrete masonry units when used in standard two (2) hour rated CMUs.

2. Surface Burning Characteristics; Maximum flame spread, smoke developed and fuel contributed of 15, 75 and 0 respectively.

3. Combustion Characteristics; Must be noncombustible, Class A building material.

4. Thermal Values; “R” Value of 4.9/inch @ 32 degrees F mean; ASTM C-177. “R” values for block as follows: 8” CMU – 14.2, 12” CMU – 20.0 (values based on 80 lb. density block).

5. Sound Abatement; Minimum Sound Transmission Class (“STC”) rating of 53 and a minimum Outdoor Indoor Transmission Class (“OITC”) rating of 44 for 8” wall assembly (ASTM E 90-90)

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify that work by other trades to be embedded in CMU walls has been completed and ready to be encapsulated with foam.

B. Coordinate scheduling of foaming work with General Building Contractor to prevent delays of subsequent work by other trades.

3.2 INSTALLATION OF FOAMED-IN-PLACE INSULATION

A. Install foamed-in-place insulation from top of wall as laying of masonry wall coursing progresses. Fill cores in approximately 5 foot lifts around the entire wall area.

B. Fill all open CMU cores.

END OF SECTION 07 21 19

Section 07 22 00 – Nailbase Roof Insulation

PART 1 – GENERAL

1.1 WORK INCLUDES

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

B. Work includes:

1. The work shall consist of covering all areas shown on the drawings with nailbase roof insulation.

1.2 RELATED WORK

A. Section 05 31 00 – Steel Decking

B. Section 07 41 00 - Standing Seam Metal Roof System

1.3 QUALITY ASSURANCE

A. Each bundle of nonventilated panels shall bear an Underwriters Label (see below). The manufacturer will be subject to regular inspection by U.L. to confirm that the approved materials are used in the panel.

B. The insulation shall be classified by Underwriters Laboratories Inc. as Shingle Decking Accessories for use with any Class A, B or C asphalt glass-mat or asphalt organic shingles.

1.4 REFERENCES

A. Foam insulation shall comply with FMRC Std. 4450/4470.

1.5 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Manufacturer’s product data.

2. Samples: Submit sample of nail base insulation at T & G edging.

1.6 DELIVERY STORAGE AND HANDLING

A. The nail base insulation shall be protected in transit by stretch wrapping and by truck tarps.

B. Material stored at the jobsite shall be covered with tarps.

1.7 PROJECT/SITE CONDITIONS

A. If material is stored at the jobsite, a reasonable level, drained storage area shall be provided.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the plans are based on Atlas Roofing Corp, non-vented, nail base, fire rated, insulated roof panels.

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications.

1. Johns Manville, Denver, CO

2. Cornell Corp. ThermaCal

2.2 MATERIALS

A. Description of System:

1. The insulation shall be a factory assembled panel consisting of a 5/8” oriented strand board top surface, polyisocyanurate insulation and a layer of felt on the bottom.

2. The overall thickness of the roof insulation shall be 6-5/8” with a ‘Long Term Thermal Resistance’ (LTTR) R value = 36.6.

3. Panels shall be a nominal 48” x 96” and shall be accurately trimmed to length and width after assembly.

4. Foam insulation edges shall be to tongue and groove.

5. OSB topside sheathing shall be fire rated and rabbetted to allow clearance between the wood on adjoining panels.

B. Insulation fasteners shall be as recommended by the insulation manufacturer for use with the supporting structural roof deck shown in the plans.

PART 3 – EXECUTION

3.1 PREPARATION

A. The structural roof deck shall be smooth and level and free of water or debris before the ventilated insulation is installed.

3.2 INSTALLATION

A. Installation shall follow the manufacturer’s written installation instructions shipped with the material. Protect work from exposure to moisture damage and deterioration, primarily by prompt installation of the roofing, sheet metal and waterproofing work.

END OF SECTION 07 22 00

Section 07 27 26 – Fluid Applied Membrane Air Barrier

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. This Section specifies a water-resistant fluid-applied air and vapor barrier in exterior masonry wall assemblies.

C. Spray-applied polyurethane foam.

1.2 RELATED WORK BY OTHERS

A. Section 04 20 00 – Unit Masonry

1.3 PERFORMANCE REQUIREMENTS

A. Air Barrier Membrane Material Performance: Provide materials which have an air permeance not to exceed 0.004 cubic feet per minute per square foot under a pressure differential of 0.3 in. water (1.57 psf) when tested according to ASTM E 2178.

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Requirements.

1. Product Data: Submit manufacturer's product data, installation instructions, and manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.

2. Quality Assurance Program: Submit evidence of current accreditation and certification under the Air Barrier Association of America's (ABAA) Quality Assurance Program. Submit accreditation number of manufacturer and certification number of installers.

3. Manufacturer's Instructions.

4. Field Reports: Submit reports indicating that manufacturer's field representative has inspected and verified that the air barrier membrane has been applied according to the manufacturer's recommendations.

1.5 QUALITY ASSURANCE

A. Air Barrier Installer Qualifications: Currently accredited by the Air Barrier Association of America (ABAA) whose applicators are certified according to the ABAA Quality Assurance Program.

B. Manufacturer: Obtain primary materials from a single manufacturer regularly engaged in manufacturing air and vapor barrier membranes. Obtain secondary materials from a source acceptable to the primary materials manufacturer.

C. Accredited Laboratory Testing for Materials: Laboratory accredited by International Accreditation Service Inc. (IAS), American Association for Laboratory Accreditation (A2LA), or the Standards Council of Canada (SCC).

D. VOC Regulations: Provide products which comply with applicable regulations controlling the use of volatile organic compounds for the specific authority having jurisdiction.

1.6 QUALITY CONTROL

A. The contractor shall engage and pay for the services of an experienced air barrier inspector to oversee the sequencing and installation of the air barrier component materials and assemblies, to oversee the proper joining and sealing of the materials and assemblies, to oversee the sealing of penetrations of the air barrier materials and assemblies, and to instruct the subcontractors on the above.

B. Documentation and Reporting

1. Installers shall document the entire installation process on daily job site reports. These reports include information on the Installer, substrates, substrate preparation, products used, ambient and substrate temperature, the location of the air barrier installation, the results of the quality control procedures, and testing results.

1.7 CONTRACTOR RESPONSIBILITIES

A. Coordination of Sub-Contractor(s)

1. The contractor shall provide coordination between the sub-contractors involved in the construction of the air barrier system, coordinate the sequence of construction to ensure continuity of the air barrier system joints, junctures, penetrations, and transitions between materials and assemblies of materials and products from substructure to walls to roof. The contractor shall provide quality assurance procedures, testing and verification as specified.

B. Pre-Construction Conferences

1. The contractor shall organize pre-construction conferences between the sub-contractors involved in the construction of or penetration of the air barrier system and the air barrier inspector to discuss where each sub-contractor begins and ends, the sequence of installation, and each sub-contractor's responsibility to ensure airtight joints, junctures, penetrations and transitions between materials, products, and assemblies of products specified in the different sections to be installed by the different sub-contractors.

C. Construction Mock-Up

1. The contractor shall apply air barrier membrane to masonry mock-up panel provided by others.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer’s name, product, date of manufacture, and directions for storage.

B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air and vapor barrier membrane manufacturer. Protect stored materials from direct sunlight.

C. Handle materials according to manufacturer’s recommendations.

1.9 PROJECT CONDITIONS

A. Temperature: Install air and vapor barrier within range of ambient and substrate temperatures recommended by air and vapor barrier manufacturer.

B. Field Conditions: Do not install air and vapor barrier in snow, rain, fog, or mist without temporary protection and supplemental heat as required. Do not install air and vapor barrier when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer. Apply membrane to a surface dry substrate, or according to manufacturer’s recommendations.

1.10 WARRANTY

A. Material Warranty: Provide manufacturer’s standard product warranty, for a minimum 3 years from date of Substantial Completion.

B. Installation Warranty: Provide air barrier subcontractor’s 2 year warranty from date of Substantial Completion, including all components of the air and vapor barrier assembly, against failures including loss of air tight seal, loss of watertight seal, loss of adhesion, loss of cohesion, failure to cure properly.

PART 2 – PRODUCTS

2.1 MATERIALS – GENERAL

A. Fluid-Applied Air and Vapor Barrier: Fluid-applied proprietary materials as specified. Use regular or low-temperature formulation depending on site conditions, within temperature ranges specified by manufacturer. Provide related accessories including primer, seam tape, mastic, fluid and sealant recommended by manufacturer.

B. Spray-Applied Polyurethane Foam: ASTM E-84, quick curing, two component spray polyurethane foam insulation containing no CFC's, VOC's, formaldehyde or Penta-BDE's.

2.2 MANUFACTURERS

A. Fluid-applied air and vapor barrier: Subject to compliance with requirements, provide one of the following:

1. Carlisle Coatings and Waterproofing:

a. Fluid-Applied Air and Vapor Barrier Membrane: Barriseal, 40 mils thick (dry).

b. Water-Based Primer: CCW-AWP Water-Based Primer.

c. Solvent-Based Primer: CCW-702 Solvent-Based Primer.

d. Solvent-Based Aerosol Primer: CAV-GRIP.

e. Mastic: CCW-704 Solvent-Based Rubberized Asphalt Mastic.

f. Sealants: CCW-703 Vertical Grade Liquiseal membrane or CCW-201 two component polyurethane sealant.

g. Counterflashing for Masonry Through-Wall Flashings: CCW-705.

h. Website: www.carlisle-ccw.com.

2. Grace Construction Products:

a. Fluid-Applied Air and Vapor Barrier: Perm-A-Barrier Liquid, 60 mils thick (wet).

b. Water-Based Primer for Flashing, Transition Strip and Detail Membrane: Perm-A-Barrier WB Primer.

c. Solvent-Based Primer for Flashing, Transition Strip and Detail Membrane: Bituthene Primer B-2 and Bituthene Primer B2 LVC.

d. Through-Wall Flashings or Shelf Angle Flashings: Perm-A-Barrier Wall Flashing.

e. Mastics, Adhesives and Tapes: As recommended by Grace Construction Products.

f. Transition Strip: Perm-A-Barrier Detail Membrane and Perm-A-Barrier Wall Flashing.

g. Termination Mastic: Bituthene Liquid Membrane and as recommended by Grace Construction Products.

h. Window Flashing and Detail Membrane: Perm-A-Barrier Detail Membrane and Perm-A-Barrier Wall Flashing.

i. Website: www.na.graceconstruction.com.

3. Hohmann & Barnard, Inc:

a. Fluid-Applied Air and Vapor Barrier Membrane: Textroflash Liquid Air and Vapor Barrier, 60 mils (wet), 40 mils (dry) approximately 25 square feet per gallon.

b. Flashing and Transition Membrane: Hohmann and Barnard Textroflash Green, Spun-bonded polypropylene membrane with adhesive and release paper, 40 mils.

c. Base Flashing: Hohmann and Barnard Flex-Flash Flashing, 40 mil with pressure sensitive adhesive.

d. Primers: As recommended by manufacturer.

e. Mastics: As recommended by manufacturer.

f. Website: www.h-b.com.

4. Protective Coatings Technology, Inc.:

a. Fluid-Applied Air and Vapor Barrier Membrane: Poly-Wall AirLok or AirLok Flex as recommended by manufacturer, 8-12 mils (dry) (50-80 square feet per gallon inversely related to texture and porosity of wall surface).

b. Water-Based Primer: As recommended by manufacturer.

c. Solvent-Based Primer: Poly-Wall AirLok or AirLok Flex as recommended.

d. Counterflashing for Masonry Through-Wall Flashings: Poly-Wall CrackGuard.

e. Mastics, Adhesives and Tapes: As recommended by manufacturer.

f. Website: www.poly-wall.com.

5. Tremco, Inc.:

a. Fluid-Applied Air and Vapor Barrier Membrane: ExoAir 120SP/R (spray-applied and ExoAir 120R (roller-grade), 60 mils (wet) (25 square feet per gallon for sheathing panels and 20 square feet per gallon for unparged masonry walls). ExoAir 220R (roller-grade), 70 mils (wet).

b. Water-Based Primer: ExoAir 10 WB Primer.

c. Solvent-Based Primer: ExoAir 10 Primer.

d. Transition Strips: ExoAir 110/110 LT.

e. Counterflashing for Masonry Through-Wall Flashings: ExoAir TWF, Proglaze ETA.

f. Mastics, Adhesives and Tapes: ExoAir Termination Mastic.

g. Detail Sealants: Tremflex 834 acrylic latex sealant, Dymonic FC polyurethane sealant, or Spectrem 1 silicone sealant.

h. Adhesives and Tapes: As recommended by manufacturer.

i. Website: www.tremcosealants.com.

6. W. R. Meadows, Inc.:

a. Fluid-Applied Air and Vapor Barrier: Air-Shield LM and Air Shield LM All Season (for cold temperature applications), 60 mils (wet), 45 mils (dry).

b. Detailing Strips: Air-Shield Self-Adhering Air Barrier.

c. Water-Based Primer: Mel-Prime WB.

d. Solvent-Based Primer: Mel-Prime VOC and Mel-Prime NE.

e. Counterflashing for Masonry Through-Wall Flashings: Air-Shield Thru-Wall Flashing.

f. Mastics, Adhesives and Tapes: Pointing Mastic.

g. Website: www.wrmeadows.com.

B. Spray Polyurethane Foam Insulation

1. Commercial Thermal Solutions, Inc., Spring Lake, NJ; 'Tiger Foam'
2. BASF
3. CertainTeed Saint-Gobain 'CertaSpray®Closed Cell Foam

2.3 AUXILIARY MATERIALS

A. Sealant at Transitions in Substrate and Connections to Adjacent Elements: Low-modulus pre-cured silicone extrusion and sealant for bonding extrusions to substrates; Tremco Silicone Extruded Sheet by Tremco, Proglaze ETA by Tremco, or Bondaflex Silbridge 300 by May National Associates.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions under which air and vapor barrier assemblies will be applied, with Installer present, for compliance with requirements.

B. Verify that surfaces and conditions are suitable prior to commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Do not proceed with installation until after minimum concrete curing period recommended by air and vapor barrier manufacturer.

D. Ensure that the following conditions are met:

1. Surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
2. Concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
3. Masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
4. Verify substrate is surface dry. Test for capillary moisture by plastic sheet method according to ASTM D 4263 and take suitable measures until substrate passes moisture test. Surface dry is an acceptable substrate condition if acceptable to the manufacturer.
5. Verify sealants used in sheathing are compatible with membrane proposed for use. Perform field peel-adhesion test on materials to which sealants are adhered.
6. Notify architect in writing of anticipated problems using air and vapor barrier over substrate prior to proceeding.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air and vapor barrier application. Mask off adjoining surfaces to prevent overspray and spillage.

B. Prime substrate for application of sheet membrane transition strips as recommended by manufacturer and as follows:

1. Prime masonry, concrete substrates with conditioning primer.
2. Prime glass-fiber surfaced gypsum sheathing an adequate number of coats to achieve required bond, with adequate drying time between coats.
3. Prime wood, metal, and painted substrates with primer.
4. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air and vapor barrier and at protrusions.

C. Prime substrate for application of fluid-applied air and vapor barrier if recommended by manufacturer based on project conditions and as follows.

3.3 INSTALLATION

A. Air and Vapor Barrier Installation: Install transition strip materials and fluid-applied air and vapor barrier to provide continuity throughout the building envelope. Install materials according to manufacturer's recommendations and as follows, unless manufacturer recommends other procedures in writing based on project conditions or particular requirements of their recommended materials:

B. Apply primer for transition strips at rate recommended by manufacturer. Allow primer to dry completely before transition strip application. Apply as many coats as necessary for proper adhesion.

C. Apply primer for fluid-applied air and vapor barrier as recommended by fluid-applied air and vapor barrier manufacturer. Based on manufacturer's recommendation, no primer may be required for the fluid-applied materials.

D. Apply fluid-applied air and vapor barrier using equipment and methods recommended by manufacturer, to achieve a dry film thickness as recommended by the manufacturer.

E. Apply fluid-applied air and vapor barrier and transition strips to shed water naturally without interception by a sheet edge, unless that edge is sealed with permanently flexible termination mastic.

F. Position subsequent sheets of transition strips applied above so that membrane overlaps the membrane sheet below by a minimum of 2 inches (50 mm), unless greater overlap is recommended by manufacturer. Roll into place with roller.

G. Overlap horizontally adjacent pieces of transition strips a minimum of 2 inch(5mm), unless greater overlap is recommended by manufacturer. Roll seams with roller.

H. Seal around all penetrations with termination mastic, extruded silicone sealant, membrane counterflashing or other procedure according to manufacturer's recommendations.

I. Connect air and vapor barrier in exterior wall assembly continuously to the air barrier of the roof, to concrete below-grade structures, to windows, curtain wall, storefront, louvers, exterior doors and other intersection conditions and perform sealing of penetrations, using accessory materials and according to the manufacturer's recommendations.

J. At changes in substrate plane, provide transition material (bead of sealant, mastic, extruded silicone sealant, membrane counterflashing or other material recommended by manufacturer) under membrane to eliminate all sharp 90 degree inside corners and to make a smooth transition from one plane to another.

K. Provide mechanically fastened non-corrosive metal sheet to span gaps in substrate plan and to make a smooth transition from one plane to the other. Membrane shall be continuously supported by substrate or as recommended by the manufacturer.

L. At through-wall flashings, provide an additional 6 inch wide strip of manufacturer's recommended membrane counterflashing to seal top of through-wall flashing to membrane or as recommended by manufacturer. Seal exposed top edge of strip with bead of mastic or as recommended by manufacturer.

1. At deflection and control joints, provide backup for the membrane to accommodate anticipated movement.

2. At expansion and seismic joints provide transition to the joint assemblies.

3. Apply a bead or trowel coat of mastic along membrane seams at reverse

4. Lapped seams, rough cuts, and as recommended by the manufacturer.

5. At end of each working day, seal top edge of the self-adhered membrane to substrate with termination mastic.

6. Do not allow materials to come in contact with chemically incompatible materials.

7. Do not expose membrane to sunlight longer than as recommended by the manufacturer.

8. Inspect installation prior to enclosing assembly and repair punctures, damaged areas and inadequately lapped seams with a patch of membrane lapped as recommended by manufacturer.

3.4 INSTALLATION OF SPRAY-APPLIED POLYURETHANE FOAM INSULATION

A. Apply spray polyurethane foam where indicated on the drawings as a component of the building air barrier system.

3.0 FIELD QUALITY CONTROL

A. Owner's Inspection and Testing: Cooperate with owner's testing agency. Allow access to work areas and staging. Notify owner's testing agency in writing of schedule for Work of this Section to allow sufficient time for testing and inspection. Daily inspection and testing may be required. Do not cover Work of this Section until testing and inspection is accepted.

3.06 PROTECTING AND CLEANING

A. Protect air and vapor barrier assemblies from damage during application and remainder of construction period, according to manufacturer's written instructions.

B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction and acceptable to the primary material manufacturer.

END OF SECTION 07 27 26

Section 07 41 00 – Standing Seam Metal Roof System

PART 1 – GENERAL

1.1 WORK INCLUDES

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

B. Work Includes:

1. Standing seam metal roof panels.
2. Fasteners, clips, furring channels, flashings, and miscellaneous accessories.
3. Gutters and downspouts
4. Ice Guards
5. Sheet underlayment.
6. Drip edge flashing and miscellaneous flashing components associated with the standing seam metal roofing.
7. Prefabricated vent pipe flashings
8. Sealants
9. Roof Tie-Off Devices

1.2 RELATED WORK

A. Section 07 22 00 – Nail Base Roof Insulation

B. Section 07 60 00 – Flashing & Sheet Metal

C. Section 07 71 23 –Manufactured Gutters & Downspouts

D. Division 22 – Plumbing: Roof vent penetrations

E. Division 23 – HVAC: Roof top mounted equipment and duct penetrations.

1.03 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: Submit shop drawings consisting of catalog outs, design and erection drawings, finish specification, and other data necessary to clearly describe design materials, sizes, layouts, construction details, fasteners, and erection.
2. Product Data: Submit manufacturer's specifications and installation instructions.
3. Samples: Submit full panel width, 12 inches long including mechanically seamed standing seam and in selected color.
4. Test Reports: Submit test reports prepared by (UL) Underwriters Laboratories, Inc. indicating wind uplift rating of proposed roof system.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Ten years minimum experience in factory fabrication of standing seam roofs.
2. All roof panels shall be roll-formed at the manufacturer's prime manufacturing location except where panels exceed maximum length permitted to truck panels to the jobsite.

B. Applicator Qualifications: Five years minimum experience in application of standing seam roofs.

1.5 PERFORMANCE REQUIREMENTS

A. No water penetration of the panel assembly shall be permitted when tested at 20 psf pressure for 15 minutes according to ASTM Test Procedure E331.

B. Deflection shall be limited to L/240 for positive loading.

1. The panels shall withstand a 250lb. concentrated load applied to a four square inch area at the center of the panel at mid-span between supports without panel deformation, rib buckling or panel side lap separation that will adversely affect the weather tightness of the system.

1.6 DELIVERY AND STORAGE

A. Materials shall be delivered to the site in a dry and undamaged condition and unloaded per the manufacturer's instructions. The installer shall inspect materials for damage and strain upon their arrival at the site. Materials shall be stored out of contact with the ground in weathertight coverings to keep them dry per the manufacturer's recommendations. Storage accommodations shall provide good air circulation and protection from surface staining.

1.7 WARRANTY

A. Furnish manufacturer's standard 20-year warranty stating architectural fluorocarbon finish will be;

1. Free of fading or color change in excess of 5 NBS units as measured per ASTM D 2244-68.

2. Will not chalk in excess of numerical rating of 7 when measured according to standard procedures specified in ASTM D 659-74.

3. Will not peel, crack, chip or delaminate.

B. Furnish manufacturer's full system No Dollar Limit (NDL) written warranty signed by applicator and manufacturer for 20-year period from date of substantial completion of building covering repairs required to maintain roof and flashings in watertight conditions. Warranty excludes gutters, downspouts and vented flashings.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the plans are based on Peterson Aluminum PAC-CLAD 'Tite-Loc'.

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate metal roofing products shall submit product data sheets and/or specifications.

1. Firestone Una-Clad

2. Berridge Manufacturing Co.; Houston, TX

3. AEP Span, Dallas, TX;

2.2 MATERIALS

A. Roof Panels

1. General: Metal roof panel system shall consist of a mechanically field-seamed to a 90 deg. lock.

2. Leg Height: 2 inches

3. Steel: AISI G90 hot dipped galvanized, extra-smooth primed and finished on one side.

4. Description: 24 gauge roll-formed panels with concealed anchor clips. There shall be no exposed fasteners except to fasten flashings, at fixing points or as indicated on the drawings.

5. Center to center panel width: 18 inches

6. Individual panels shall be removable for replacement of damaged material without disturbing adjacent panels.

7. Fabricate panels in full length with no end laps.

8. Provide factory eave notching where conditions require fascia returns.

9. Flashing and trim shall be of the same material, gauge, finish, and color as the panels.

B. Color: Match Peterson Aluminum ‘Colonial Red’

C. Accessories

1. Clip System: Provide manufacturer’s standard 18 gage hold-down clips.

2. Fasteners: Self-drilling, self-tapping pancake head Phillips drive screw, UL 90 rated fasteners as recommended by roof system manufacturer.

3. Closure Strips: Shop fabricated prefinished, 24-ga. galvanized steel drip edge and soffit channels as indicated on the drawings. Color to match metal panels.

4. Snowguard Retention Strips: Assembly shall consist of 1-1/2” high prefinished 24-gauge galvanized steel strips for mounting on top edge of standing seams with bolt-on fasteners.

5. Snowguard strips to be furnished in same color as standing seam roof.

   a. Manufacturer: Alpine Snowguards w/ ‘S-5’ Fastener Clips

6. Prefabricated Vent Pipe Flashings Systems

   a. Manufacturer: Portals Plus, Inc., Bensenville, IL: Deck-Mates

   b. Description: Vent pipe flashing shall consist of a stepped profile EPDM pipe boots designed for multiple pipe diameters attached to an aluminum flanged base plate.

   c. Aluminum base plate shall be shop painted with Kynar 500 coating to match color of standing seam metal roof panels.

D. Self-Adhering Sheet Membrane Roofing Underlayment

1. Manufacturers

   a. Carlisle Coatings & Waterproofing: CCW WIP 403HR

   b. Grace Co. Ice & Watershield

2. Description: ASTM D-1970, 40 mil sheet membrane comprised of a skid resistant polyethylene film laminated to a thick layer of highly adhesive rubberized asphalt with a silconized release sheet. Roofing underlayment shall meet or exceed UL-790 Tests for Fire Resistance of Roof Coating Materials Class A & C.

E. Gutters: Refer to Section 07 71 12 – Manufactured Gutters & Downspouts

E. Metal Flashing Accessories: Refer to Section 07 60 00 – Flashing & Sheet Metal.

F. Sealants

1. Must not contain oil, asbestos, or asphalt.

2. Factory-applied sidelap sealant: Non-drying, non-skinning, synthetic polymer-based designed for metal-to-metal concealed joints.

3. Field-applied panel end sealant: Extruded polymeric butyl tape, non-skinning and not easily displaced under compression. Webbed mastic by Tremco or equal.

4. Exposed Sealant: One component, skinning, polyurethane joint sealant. Color to be coordinated with that of panel. Dymonic by Tremco or equal.

G. Roof Tie-Off Devices: Re-usable Two-way Universal Standing Seam Clamp™, all steel construction with zinc electroplate finish.

1. Manufacturer: Preferred Safety Products, Inc., Denver, CO

2. Quantity: Provide three clamp units to be turned over to the owner as part of the project close-out requirements.

PART 3 – EXECUTION

3.1 INSPECTION

A. The installer shall examine the building to verify that the structure is ready for roofing installation.

B. All structural supports shall be in place and all sag rods, diagonal bracing and connections shall be tightened before work can proceed.

C. Field check dimensions and check support alignment with a taut string or wire; support misalignment will cause panel “oil-canning”.

D. Do not proceed until unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Self-Adhering Ice & Water Shield Sheet Membrane Underlayment Installation

1. Apply over all roof areas scheduled to receive standing seam metal roofing.

2. Overlap seams and joints minimum 6” as recommended by manufacturer.

B. Standing Seam Metal Roofing

1. Install metal panel system according to approved erection drawings and instructions.

2. All attachments shall allow for thermal expansion and contraction of the roofing panels.

3. Where permitted by roof manufacturer, install panels in one continuous length from ridge to eave.

4. Seal the top and bottom of the metal closures with butyl tape (7/8” x 1/8”) caulking or equal.

5. Protect installed panels from abuse by other trades. The general contractor shall be responsible for protecting the roofing from wet cement, plaster, and painting operations. The installer shall provide walkboards in heavy traffic areas to prevent damage to the panels.

C. Prefabricated Vent Pipe Flashings Systems

1. Prepare surface of metal roof panel as recommended by pipe flashing manufacturer. Apply watertight sealant and self-sealing stainless steel fasteners as recommended by manufacturer.

2. Install clamping ring and seal perimeter of pipe penetration.

3.3 DAMAGED MATERIAL AND CLEANING

A. Replace damaged panels and other components of work, which cannot be repaired by, finish touch-up or similar minor repair.

B. Wipe down each area after erection is complete for final acceptance.

3.4 WATERTIGHTNESS INSPECTIONS

A. Prior to project close-out, complete inspection of all work under this section to verify that installation of roof panels, trim, flashings and accessories comply with the manufacturer's requirements for warranty.

B. Test all roof penetration flashings for watertightness and repair installations where necessary.

END OF SECTION 07 41 00

Section 07 46 00 – Prefinished Metal Soffit Panels

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, material, tools, equipment and services for all preformed metal panels including:

1. Prefinished metal soffit panels
2. Trim accessories
3. Furring strips
4. Fasteners

1.2 RELATED SECTIONS

A. Section 07 60 00 – Flashing and Sheet Metal

B. Section 09 22 16 – Non-load Bearing Metal Wall Framing

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer to have a minimum of 3 years experience in manufacturing panels of this nature.

B. Installer's Qualifications: Installation of panels and accessories shall be performed by installers with a minimum of two years experience in panel projects of this nature.

1.4 SUBMITTALS

A. Shop Drawings: Submit complete shop drawings and erection details to architect for review prior to fabrication.

B. Samples: submit one 12" long sample panel of each color selected by architect.

1.5 WARRANTY

A. Metal panel manufacturer, upon final acceptance of the work, shall furnish a warranty covering bare metal against rupture, structural failure, and perforation due to normal atmospheric corrosion exposure for a period of 20 years.

B. Metal panel manufacturer to furnish warranty covering panels furnished with factory finish against cracking, checking, blistering, peelings, flaking, chipping, chalking, and fading for a period of 20 years.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Provide prefinished metal soffit panels from one of the following manufacturers:

1. Una-Clad by Copper Sales, Anoka, MN; UC-500
2. Pac-Clad (Peterson Aluminum Corp.), Elk Grove Village, IL: 'Soffit Flush' vented.
3. McElroy Metal Inc.; Bossier City, LA: Marquee Series
4. AEP/Span Metal Corporation; Dallas, TX

2.2 MATERIALS

A. Soffit Panels

1. Panel Profile: Vented 12" wide x 1" deep roll formed of .024" galvanized coil-coated steel with flanged panels for concealed fastening.
2. Finish: Kynar 500
3. Color: Match Peterson Aluminum 'Colonial Red'

B. Furring Channels

1. Roll-formed, 20-ga. hat-shaped corrosion resistant steel, 7/8" deep.

2.3 FABRICATION

A. Roll form panels in continuous lengths, full length of detailed runs.

B. Fabricate trim, flashing and accessories to detailed profile from same material as panel.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Install panels so that they are weathertight, without waves, warps, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.

B. Install panels according to manufacturer's instruction and shop drawings.

C. Provide concealed anchors at all panel attachment locations.

D. Install panels level and straight with seams conforming to design as indicated.

3.3 CLEANING, PROTECTION

A. Dispose of excess materials and remove debris from site.

B. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the architect, any work that becomes damaged prior to final acceptance.

C. Touch-up minor scratches and abrasions.

END OF SECTION 07 46 00

Section 07 60 00 – Flashing and Sheet Metal

PART 1 – GENERAL

1.1 SCOPE OF WORK

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

B. Conform to profiles and sizes shown on drawings and comply with "Architectural Sheet Metal Manual" by SMACNA, for each general category of work required.

1. Metal flashing and counter flashing as indicated on the drawings.

2. Roof edge fascia

3. Miscellaneous sheet metal accessories.

1.2 RELATED SECTIONS

A. Section 04 20 00 – Unit Masonry: Metal drip edge at through-wall flashing

B. Section 07 41 00 – Standing Seam Metal Roofing

C. Section 07 71 23 – Gutters & Downspouts

D. Section 08 84 00 – Insulated Translucent Panels: Sill Flashing

1.3 SUBMITTALS

A. Shop drawings showing layout, profiles, method of joining, anchorage details, etc.

1.4 PERFORMANCE

A. Performance: Watertight and weatherproof performance of flashing and sheet metal work is required.

1.5 WARRANTY

A. Provide manufacturers 20 year written guarantee covering film integrity, fading, chalking.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Prefinished Hot-Dipped Galvanized Steel:

1. ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality, mill phosphatized.

2. Gauge: 24-ga. unless indicated otherwise on the drawings.

3. Finished 1 side with Kynar based fluropolymer coating, (color as selected by architect from manufacturers standard Kynar color) and wash coat on back surface. Provide strippable plastic film on face.

4. Manufacturers

a. Petersen Aluminum Corporation "Pac-Clad".

b. Firestone "Una-Clad".

c. AEP Span

d. MetalEra, Inc.

B. Aluminum Sheet: ASTM B 209, alloy 3003-H14, 0.032 inch (20 ga.).

1. Finished 1 side with Kynar based fluropolymer coating, (color as selected by architect from manufacturers standard Kynar color) and wash coat on backsurface. Provide strippable plastic film on face.

C. Stainless Steel: ASTM A 240/A 240M, Type 304

2.2 FABRICATION

A. Fabricate sheet metal with flat-lock seams; solder with type solder and flux recommended by manufacturer, except seal aluminum seams with epoxy metal seam cement and, where required for strength, rivet seams and joints.

B. Coat backside of fabricated sheet metal with 15-mil sulfur-free bituminous coating, SSPC-Paint 12, where required to separate metals from corrosive substrates, including cementitious materials, wood or other absorbent materials; or provide other permanent separation.

C. Provide for thermal expansion of running sheet metal work by overlaps of expansion joints in fabricated work. Where required for watertight construction, provide hooked flanges filled with polyisobutylene mastic for 1-inch embedment of flanges. Space joints at intervals of not more than 50 feet for steel, 24 feet for copper or stainless steel, or 30 feet for zinc alloy or aluminum. Conceal expansion provisions where possible.

D. Provide joint covers at 10-foot intervals with no exposed fasteners on face.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Anchor work in place with non-corrosive fasteners, adhesives, setting compounds, tapes and other materials and devices as recommended by manufacturer of each material or system. Provide for thermal expansion and building movements. Comply with recommendations of "Architectural Sheet Metal Manual" by SMACNA.

B. Seal moving joints in metal work with elastomeric joint sealants, complying with requirements specified in Division 7 Section "Joint Sealants."

C. Clean metal surfaces of soldering flux and other substances which could cause corrosion.

D. Nail flanges of expansion joint units to substrates at spacing of 6 inches o.c.

E. Composition Stripping: Cover flanges (edges) of work set on bituminous substrate with two courses of glass fiber fabric (ASTM D-1668) set in and covered with asphaltic roofing cement.

END OF SECTION 07 60 00

Section 07 71 23 – Manufactured Gutters & Downspouts

THIS SECTION INCLUDES SHOP AND FIELD FABRICATED FLASHING AND SHEET METAL WORK RELATED TO OR USED IN CONJUNCTION WITH ROOFING WORK AND THE GENERAL WATERPROOFING INTEGRITY OF THE BUILDING.

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Work Includes: Shop fabricated, prefinished aluminum gutters and downspouts.

1.2 RELATED SECTIONS

A. Section 07 41 00 – Standing Seam Metal Roofing

B. Section 07 60 00 – Flashings and Sheet Metal

1.3 SUBMITTALS

A. Shop drawings showing layout, profiles, method of joining, anchorage details, etc

1.4 WARRANTY

A. Provide manufacturers 20 year written guarantee covering film integrity, fading, chalking.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Prefinished Aluminum: .063 inch aluminum, commercial quality, primed and finished one side with Kynar based fluropolymer coating. Provide strippable plastic film on face.

1. Peterson Aluminum Corporation "Pac-Clad".
2. Firestone's "Una-Clad".
3. Metal Era, Inc.

2.2 COMPONENTS

A. Provide all necessary components and accessories necessary for a complete installation including the following:

1. Gutters: Rectangular shaped as shown on drawings.
2. Downspouts: Rectangular with open face.
3. Gutter support brackets, downspout straps

2.3 FABRICATION

A. Fabricate gutters and downspouts to profiles indicated on drawings.

B. Field measure site conditions prior to fabricating work.

C. Hem all exposed sheet metal edges.

D. Coat backside of fabricated sheet metal with 15-mil sulfur-free bituminous coating, SSPC-Paint 12, where required to separate metals from corrosive substrates, including cementitious materials, wood or other absorbent materials; or provide other permanent separation.

E. Provide hard plastic spacers where downspout is anchored to steel column or masonry wall surface.

F. Where indicated on the drawings, fabricate downspouts with matching aluminum 'false back' interior liner to maintain continuous vertical downspout past masonry wall projections.

G. Provide for thermal expansion of running sheet metal gutters by watertight overlaps of expansion joints in fabricated work. Space joints at intervals of not more than 30 feet. Conceal expansion provisions where possible.

2.04 FINISH

A. Kynar 500 coating.

B. Color: Match Peterson Aluminum ‘Colonial Red’

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install gutters, collector heads and downspouts according to manufacturer’s instructions.

B. Seal moving joints in metal work with elastomeric joint sealants, complying with requirements specified in Division 7 Section "Joint Sealants."

C. Clean metal surfaces of soldering flux and other substances, which could cause corrosion.

END OF SECTION 07 71 23

Section 07 84 00 – Firestopping

PART 1 – GENERAL

1.1 SCOPE OF WORK

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 firestopping for the following:

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

4. Sealant joints in fire-resistance-rated construction.

1.3 RELATED SECTIONS:

A. Section 07 92 00 – Joint Sealers

B. Division 22 – Plumbing: Pipe penetrations through fire rated partitions

C. Division 23 – HVAC: Pipe and duct penetrations through fire rated partitions

D. Division 26 – Electrical: Conduit penetrations through fire rated partitions

1.4 SYSTEM PERFORMANCE REQUIREMENTS

A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.

B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.

C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:

1. Where firestop systems protect penetrations located outside of wall cavities.

2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.

3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.

4. Where firestop systems protect penetrating items larger than a 4 inch (100 mm) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.

E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.

1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.

2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.

3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.

F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

1. Product data for each type of product specified.

1.6 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:

1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems.

2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water (2.5 Pa) is maintained at a distance of 0.78 inch (20 mm) below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.

b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.

3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water (2.5 Pa), as measured 0.78 inch (20 mm) from the face exposed to furnace fire. Provide systems complying with the following requirements:

a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.

b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.

B. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

PART 2 – PRODUCTS

2.1 FIRESTOPPING

A. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to insulation, forming/damming materials, fire-rated formboard, joint fillers, primers, collars, and steel sleeves.

2.2 MANUFACTURERS

A. Fill materials for through-penetration firestop systems and fire resistive elastomeric sealants. Provide one of the following:

1. AD Fire Protection Systems Inc.
2. The Rectorseal Corporation.
3. Tremco Inc.
4. International Protective Coatings Corp.
5. 3M Fire Protection Products.
6. Dow Corning Corporation.
7. Hilti Construction Chemicals, Inc.
8. United States Gypsum Co.

B. Applications: Provide firestopping systems composed of materials listed in the UL Fire Resistance Directory that conform to the construction type, penetrant type, annular space requirements and fire rating involved in each separate condition, and that the system be symmetrical for wall applications.

1. Applications:

a. Metal pipe or conduit (sleeved or unsleeved):

I. Tremco Fyreshield

II. Hilti FS-One.

III. AD Firebarrier Silicone.

IV. Rectorseal "Metacaulk 1000

b. Insulated metal pipes (sleeved or unsleeved):

I. Tremco Tremstop 1A

II. Hilti FS-One.

III. AD Firebarrier Silicone.

IV. Rectorseal "Metacaulk 1000

c. Plastic pipes (closed, drain, waste, and vented piping systems):

I. Tremco Tremstop 1A, Tremstop WS, and Fyre-Can.

II. Hilti FS-One, Hilti CP 642 Intumescent collars.

III. AD Firebarrier Silicone, AD Firebarrier collars.

IV. Rectorseal "Metacaulk 1000", "BioStop 500+", "Metacaulk Wrap Strip", "BioStop Wrapstrip", Metacaulk fire rated pipe collars, BioStop fire rated pipe collars

d. Single and bundled cables (sleeved or unsleeved):

I. Tremco Tremstop 1A

II. Hilti FS-One, Hilti CP 642 Intumescent Collars.

III. AD Firebarrier Silicone.

IV. Rectorseal "Metacaulk 1000", "BioStop 500+".

e. Large openings for multiple penetrating items, cable trays and electrical busway:

I. Tremco Tremstop pillows.

II. Hilti FS 657 Fire Block, Hilti FS-One, Hilti FS 635.

III. AD Firebarrier Silicone.

IV. Rectorseal Metacaulk Mortar, Bio K-10 Mortar, Metacaulk Firestop Pillows, BioStop Firestop Pillows.

f. Construction joints:

I. Tremco Tremstop Acrylic, Fyre-Sil.

II. Hilti FS-One, FS 601, FS 604.

III. AD Firebarrier mortar.

IV. Rectorseal "Metacaulk 1000", "BioStop 500+", "Metacaulk 1100", "BioStop 700", "Metacaulk 1200", "BioStop 750".

g. Accessories:

I. Forming/Damming Materials: Mineral fiberboard of type recommended by manufacturer to maintain the hourly rating.

II. Primer, sealant and solvent cleaner as recommended by manufacturer.

h. Were subject to movement, firestop products used shall remain flexible to allow for normal movement of building structure and penetrating items without affecting the integrity of the firestop system.

2.3 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 – EXECUTION

3.1 PREPARATION

A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:

B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.2 INSTALLING THROUGH-PENETRATION FIRESTOPS

A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:

1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.

2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.3 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTMC 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.

B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.

C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.

D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.4 FIELD QUALITY CONTROL

A. Do not proceed to enclose firestopping with other construction until work has been inspected by authorities having jurisdiction, if required.

B. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.5 CLEANING

A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

B. Protect firestopping during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 07 84 00

Section 07 92 00 – Joint Sealants

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work included in this section includes, but is not necessarily limited to:

1. Expansion and control joints in masonry walls (interior and exterior).
2. Concrete slab movement joints.
3. Hollow metal frames to wall,
4. Mechanical pipe penetrations (where exposed or fire rated).
5. Exterior HVAC grilles and louvers to wall.
6. Plumbing fixtures to wall
7. Countertops to wall
8. Window stools to wall and aluminum window framing.
9. Caulking of miscellaneous joints as indicated on the drawings.

1.2 SUMMARY

A. This Section includes joint sealants for the applications indicated in the joint sealant schedule at the end of Part 3.

B. Related Sections: The following sections contain information related to this section:

1. Division 9 Section “Gypsum Board Assemblies” for partitions with STC ratings.
2. Division 9 Section “Tile” for sealants adjacent to tile.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

A. Provide elastomeric joint sealants that have been produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.

1.4 SUBMITTALS

A. General: Submit according to Division 1 procedures.

B. Product Data: Product Data for each specified sealant.

C. Samples For Initial Selection: Provide samples representing colors selected for products of types indicated.

D. Maintenance data for each product specified, to include in Operating and Maintenance Manual specified in Division 1.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.

B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle materials in compliance with manufacturer’s recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.

2. When joint substrates are wet.

B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 – PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Colors: Provide color of exposed joint sealants to comply with the following:

1. Provide selections made by Supervising Professional from manufacturer's colors indicated in joint sealant schedule for products of type indicated.

2.2 CHEMCALLY CURING ELASTOMERIC JOINT SEALANTS

A. Multicomponent Nonsage Urethane Sealant ES-1.

1. Available Products:

a. Sonneborn, Division of Chemrex Inc.; NP-2.

b. Tremco equivalent

c. Sealtex equivalent

d. Or approved equal

2. Type and Grade: M (Multicomponent) and NS (Non Sag).

3. Class 25

4. Uses Related to Exposure: NT (Non Traffic).

5. Uses Related to Joint Substrates: M,G,A, and O.

B. Multicomponent, gun grade, polyurethane sealant ES-2.

1. Available Products:

a. Tremco THC_901.

b. Sonneborn equivalent

c. Sealtex equivalent

d. Or approved equal

2. Type and Grade: M (Multi-component) Grade P.

3. Class 25.

4. Use Related to Exposure: T (Traffic).

5. Use Related to Joint Substrates: M, and O

C. Multicomponent, gun grade, polyurethane sealant ES-3.

1. Available Products:

a. Sonneborn, Division of Chemrex, Inc.: SL2.

b. Tremco equivalent

c. Sealtrex equivalent

d. Or approved equal

2. Type and Grade: M (Multicomponent); Grade P.

3. Class 25.

4. Use Related to Exposure: T (Traffic).

5. Use Related to Joint Substrate: M and O.

2.3 LATEX JOINT SEALANTS

A. General: Provide manufacturer's standard one-part, nonsag, mildew-resistant, paintable latex sealant of formulation indicated that is recommended for exposed applications on interior and protected exterior locations and that accommodates indicated percentage change in joint width existing at time of installation without failing either adhesively or cohesively.

B. Acrylic-emulsion Sealant: Provide product complying with ASTM C 834 that accommodates joint movement of not more than 5 percent in both extension and compression for a total of 10 percent.

C. Latex Sealant LS-1

1. Available Products:

a. Tremco; Tremflex 834

b. Sonolac, Sonneborn, Division of Chemrex, Inc.

c. Sealtex equivalent

d. Or approved equal

2. Type and Grade: Type P; Grade NF.

3. Class 12.5.

4. Use Related to Exposure: NT.

5. Use Related to Joint Substrate: O.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material and type that are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonwaxing, nonextruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

1. Closed-cell polyethylene foam, nonabsorbent to liquid water and gas, nonoutgassing in unruptured state.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean concrete, masonry, and similar porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.

3. Remove laitance and form release agents from concrete.

4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile, and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.

B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Acoustical Sealant Application Standard: comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications, and conditions indicated.

D. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:

1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

a. Do not leave gaps between ends of joint fillers.

b. Do not stretch, twist, puncture, or tear joint fillers.

c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.

E. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.

F. All joint sealants used on fire rated wall assemblies (3-hour occupancy separation) shall be U.L. listed materials suitable for use in a tested and listed assembly.

3.4 CLEANING

A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

B. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so that and installations with repaired areas are indistinguishable from original work.

3.6 JOINT SEALANT SCHEDULE

A. Joint Sealant Application JS-1, exterior vertical construction joints.

1. Joint Sealant: ES-1.

2. Joint Sealant Color: Match adjacent material color.

B. Joint Sealant Application JS-2, exterior horizontal traffic joints in cast-in-place concrete slabs.

1. Joint Sealant: ES-2.

2. Joint Sealant Color: Match color of concrete.

C. Joint Sealant Application JS-3, exterior butt joints between translucent fiberglass panels.

1. Joint Sealant: ES-1.

2. Joint Color: Match translucent panel frame color.

D. Joint Sealant Application JS-$, exterior perimeter joints at frames of doors, windows, and louvers.

1. Joint Sealant: ES-1.

2. Joint Color: Match adjacent frame color.

E. Joint Sealant Application JS-5, interior vertical joints.

1. Joint Sealant: LS-1.

2. Joint color: Match adjacent material color.

F. Joint Sealant Application JS-6, interior perimeter joints at frames of doors, windows, and louvers.

1. Joint Sealant: LS-1.

2. Joint Color: Match adjacent frame color.

G. Joint Sealant Application JS-7, interior expansion, control, contraction, and isolation joints in horizontal traffic tile surfaces.

1. Joint Sealant: ES-3.

2. Joint Sealant Color: Match grout color.

H. Joint Sealant Application JS-8, interior joints between plumbing fixtures and adjoining walls, floors, and counters.

1. Joint Sealant: LS-1.

2. Joint Sealant Color: Match adjacent material color.

END OF SECTION 07 92 00

END OF DIVISION 07 – THERMAL AND MOISTURE PROTECTION

DIVISION 08 – OPENINGS

Section 08 11 13 – Metal Doors and Frames

PART 1 – GENERAL

1.1 WORK INCLUDED

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

B. Work Includes:

1. Hollow metal door frames
2. Hollow metal borrowed lite frames.
3. Standard steel doors

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Section 04 06 50 – Masonry Mortar & Grout: Grout filling of hollow metal frames

B. Section 04 20 00 – Unit Masonry: Preparation of masonry openings

C. Section 08 71 00 – Door Hardware

D. Section 08 80 00 – Glass and Glazing

E. Section 09 90 00 – Painting: Painting of hollow metal doors and frames

1.3 REFERENCES

A. ASTM E152 – Methods of Fire Tests of Door Assemblies

B. DHI – Door Hardware Institute

C. NFPA 80 – Fire Doors and Windows

1.4 QUALITY ASSURANCE

A. Conform to requirements of SDI-100.

B. Fire rated doors and frames to conform to ASTM E152.

C. Standards: In addition to other specified requirements, comply with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" ANSI/SDI-100.

1.5 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: With manufacturer's standard details and specifications for steel doors and frames, submit shop drawings showing application to project, as required.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Hollow Metal Doors & Frames

1. Ceco Door Products, Brentwood, TN
2. Curries Company, Mason City, IA
3. Mesker Door Inc., Huntsville, AL
4. Steelcraft, Cincinnati, OH

2.2 HOLLOW METAL DOORS AND FRAMES

A. Cold-Rolled Steel Sheets: Commercial quality carbon steel, complying with ASTM A 366 and ASTM A 568.

B. Galvanized Steel Sheets: Zinc-coated carbon steel sheets of commercial quality, complying with ASTM A 526, or drawing quality, ASTM A 642, hot dipped galvanized according to ASTM A 525, with A60 or G60 coating designation, mill phosphatized.

C. Door Core: Foam-in-place polyurethane chemically bonded to all interior surfaces. Foam density shall be 1.8 pcf (min.) with a crush strength of 3,600 psf.

D. Fire-Rated Assemblies: Provide units that display appropriate UL or FM labels for fire-rating indicated.

E. Supports and Anchors: Fabricate of not less than 18-gage sheet steel; galvanized where used with galvanized frames.

F. Shop Applied Primer:

1. All doors and frames shall be provided with one coat of oven-cured rust-inhibitive enamel or paint suitable as a base for specified finish paints complying with ANSI A224.1.

2.3 FABRICATION – HOLLOW METAL DOORS & FRAMES

A. Fabricate units to be rigid, neat in appearance, and free from defects, warp or buckle.

1. Frames shall be all-welded construction. Weld exposed joints continuously, grind, dress, and make smooth, flush and invisible.

B. Prepare steel doors and frames to receive mortised and concealed finish hardware, including cutouts, reinforcing, drilling and tapping, complying with ANSI A 115 "Specifications for Door and Frame Preparation for Hardware."

1. Reinforce units to receive surface-applied finish hardware to be field applied. Where closer reinforcing is indicated/required, install reinforcing to allow closer to be applied to either face of door/frame.

2. Locate finish hardware as indicated or, if not indicated, per DHI "Recommended Locations for Builder's Hardware."

C. Doors: SDI grades and models specified below or as indicated on drawings or schedules:

1. Interior Doors: ANSI/SDI-100, minimum 16-gage cold-rolled steel faces.

2. Exterior Doors: ANSI/SDI-100, minimum 16-gage galvanized steel faces in compliance with SDI 112.

a. Provide thermal rated assemblies with U-factor of 0.09 BTU/hr./sq. ft./deg F. (polyurethane) or better.

b. Provide top and bottom closure caps.

D. Frames: Comply with ANSI/SDI-100, of the types and styles indicated, for materials quality, metal gages, and construction details.

1. Prepare frames to receive 3 silencers on strike jambs of single-door frames and 2 on heads of double-door frames. Plug holes temporarily with styrofoam to maintain opening and to maintain space behind frame (when filling with mortar) to allow silencers to be installed (after frames are painted).

2. Provide 26-gage steel plaster guards or mortar boxes, welded to frame, at back of hardware cutouts where installed in concrete, masonry or plaster openings.

3. Protect inside faces of frames in plaster or masonry wall construction which are placed with anti-freeze additives, using high-build fibered asphalt emulsion coating.

4. Form exterior frames from 14-gage galvanized steel.

5. Form interior frames from 16-gage galvanized steel.

6. Provide drip moulding on head of all exterior frames.

7. Provide "vandal-resistant" type screws for all glazing stops on exterior of building.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install hollow-metal doors and frames according to manufacturer's instructions and final shop drawings. Coordinate with masonry and stud wall construction.

1. Install frames according to SDI-105.

2. Install fire-rated units according to NFPA Std. No. 80.

3. Finish hardware is specified in Section 08 71 00.

B. Grout all hollow metal frames. Coordinate installation of electrical work routed through hollow metal door frames with electrical trade.

3.2 TOLERANCES (DOORS & FRAMES)

A. Fit doors to frames and floors with clearances specified in ANSI/SDI-100.

B. Maximum Diagonal Distortion: 1/8 inch measured with straight edge, corner to corner.

END OF SECTION 08 11 13

Section 08 14 16 – Flush Wood Doors

PART 1 – GENERAL

1.1 SCOPE OF WORK

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

B. Work Includes:

1. Prefinished Flush Wood Doors

1.2 RELATED WORK

A. Section 08 11 13 – Standard Steel Doors and Frames

B. Section 08 71 00 – Door Hardware

C. Section 08 80 00 – Glass & Glazing

1.3 QUALITY ASSURANCE

A. Quality Standards: Comply with NWWDA I.S.1 and AWI "Architectural Woodwork Quality Standards".

1. Comply with WIC "Manual of Millwork" for requirements in the door grade comparable to AWI grade indicated and exceeding those in other referenced standards.

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: Submit drawings and schedules indicating location, size, face material, and finishes of each door required.

2. Product Data

3. Samples: Submit two (2) 8” minimum square samples with type of core construction, face material and finish required.

1.5 WARRANTY

A. Manufacturers standard form, signed by manufacturer, supplier, and installer, agreeing to repair or replace defective doors (as defined by reference standards) for the life of the installation. Replacement shall include cost of finishing and installing replacement door.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide wood doors by one of the following:

1. Masonite Architectural

2. Eggers Industries.

3. Oshkosh

4. VT Industries

2.2 DOOR TYPES

A. General Wood Door Product Requirements: Provide doors with same exposed surface material on both faces and edges of each door, unless otherwise indicated.

B. Interior Solid Core Doors for Transparent Finish: As follows:

1. Faces: Red Oak rift cut veneer; pairs to be book matched.

2. AWI Grade: Premium, with A Grade veneers. No veneered edge stiles allowed.

3. Construction: PC-5 (Particleboard core, 5-ply), except provide GLC-5 (glued block core 5-ply) for full glass lite doors.

C. Interior Fire-Rated Solid Core Doors: Labeled and listed for rating indicated, by testing and inspection agency acceptable to authorities having jurisdiction, complying with the following requirements:

1. Faces and AWI Grade: Match faces of non-rated doors in same area of building, unless otherwise indicated.

2. Edge Construction: Manufacturer's standard laminated edge construction for improved screw-holding capability and split resistance.

   a. Provide fire-rated pairs with fire-retardant stiles which are labeled and listed for kinds of applications indicated without formed steel edges.

3. Wood Beads for Light Openings in Fire Doors: Manufacturer's standard lipped-type fire-rated wood-veneer beads matching veneer species of door faces.

4. For fire-rated doors/frames, provide tightly fitted, spring loaded, automatic closing louvers, with operable blades retained by fusible links. Rating label same as door units.

5. Concealed Intumescent (45 min. and 90 min. labeled doors): Where required per Positive Pressure standards, provide fire doors with intumescent concealed behind 1/4" matching hardwood stile edge.

D. Provide solid hardwood blocking with minimum screw pullout strength of 600 lbs. for attachment of all hardware. Through bolting of hardware is not acceptable. Where through bolting may be required by Underwriters Laboratory (UL) to maintain fire rating, solid hardwood blocking is still required.

2.3 VISION LITE FRAMES – FIRE RATED DOORS

A. Manufacturers

1. Air Louvers, Inc., Commerce, CA; Model VLF-EZ (single glazing)

2. Anemostat Door Products, Carson, CA; Model 'LoPro'

B. Description:

1. Beveled profile frame assembly manufactured from 20-ga. cold-rolled steel, degreased and phosphatized with a baked on powder coat finish to match door frame paint color. All frames shall be U.L. and W.H.I. listed for use in fire rated doors.

2. Factory prefit and pre-machine doors to fit frame opening sizes indicated and complying with AWI pre-fitting tolerances.

2.4 VISION PANEL CUTOUTS – NONRATED DOORS

A. Cutouts for vision panels and louvers shall be made at the factory.

B. Glass and louvers shall be held in place with factory finished matching wood veneer stops.

2.5 FINISH

A. Transparent Finish: Pre-finish wood doors at factory. Comply with requirements indicated for grade, finish system, staining effect and sheen. Doors are to be completely finished at the factory (point of manufacture) with finish warranty to be provided by the door manufacturer.

1. AWI Grade: Premium.

2. Finish: AWI System TR-6 catalyzed polyurethane.

3. Staining: Match approved sample for color.

4. Effect: Open grain finish.

5. Sheen: Satin-medium rubbed effect.

6. Seal top and bottom of door at factory.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install wood doors to comply with manufacturer's instructions and of referenced AWI standard and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA No. 80.

B. Align and fit door in frames with uniform clearances and bevels. Machine doors for hardware. Seal cut surfaces after fitting and machining.

C. Prefit Doors: Fit to frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at the job site.

E. Comply with manufacturer's instructions, and with "on-site-care" requirements of AWI Section 1300-6-8 "Care and Handling At Site".

END OF SECTION 08 14 16

Section 08 36 13 – Sectional Overhead Doors

PART 1 – GENERAL

1.1 WORK INCLUDED

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

B. Section includes:

1. Electrically operated overhead sectional doors, insulated flush steel design.

2. Operating hardware and supports.

1.2 RELATED WORK

A. Division 26 – Electrical: Power connections to operators.

1.3 SUBMITTALS:

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: For special components and installations not dimensioned or detailed in manufacturer's data sheets.

a. Wiring Diagrams: Detail wiring for power, signal, and control systems. Differentiate between manufacturer-installed and field-installed wiring and between components provided by door manufacturer and those provided by others.

2. Product Data: For each type and size of sectional overhead door and accessory. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes. Provide roughing-in diagrams, operating instructions, and maintenance information. Include the following:

a. Setting drawings, templates, and installation instructions for built-in or embedded anchor devices.

b. Summary of forces and loads on walls and jambs.

c. Motors: Show nameplate data and ratings; characteristics; mounting arrangements; size and location of winding termination lugs, conduit entry, and grounding lug; and coatings.

d. Programming features for keypad devices.

1.4 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide sectional overhead doors capable of withstanding the effects of gravity loads and the following loads and stresses without evidencing permanent deformation of door components:

1. Wind Load: Uniform pressure (velocity pressure) of 20 PSF, acting inward and outward.

B. Operation-Cycle Requirements: Design sectional overhead door components and operator to operate for not less than 50,000 cycles.

1.5 WARRANTY

A. Provide manufacturer’s standard one (1) year warranty on defects in materials and workmanship, and five (5) years from the date of installation on delamination of insulation from its interior and exterior skins.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

A. Design Product: The design for the insulated steel sectional door system is based on Overhead Door Corp. Model AP 850R-26 (27 ga.). Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Clopay Building Products Co. Model 3730R-23
2. Haas Door Model 816R-26

2.2 MATERIALS

A. Construct door sections from galvanized, structural-quality carbon-steel sheets complying with ASTM A 653 (ASTM A 653M), commercial quality, with a minimum yield strength of 33,000 psi and a minimum G60 (Z180) zinc coating.

1. Steel Sheet Thickness: 27 gauge.
2. Exterior and Interior Section Face: Flat.

B. Fabricate door panels from a single sheet to provide sections not more than 24 inches high and nominally 3 inches deep. Roll horizontal meeting edges to a continuous, interlocking, keyed, rabbeted, shiplap, or tongue-in-groove weathertight seal, with a reinforcing flange return.

1. R-Value: R-26
2. For insulated doors, provide door sections with continuous thermal-break construction, separating faces of door.

C. Enclose open section with not less than 27 gauge galvanized steel channel end stiles welded in place. Provide not less than 0.064-inch galvanized intermediate stiles, cut to door section profile, spaced at not more than 48 inches o.c., and welded in place.

D. Reinforce bottom section with a continuous channel or angle complying with bottom section profile.

E. Reinforce sections with continuous horizontal and diagonal reinforcement, as required to stiffen door and for wind loading. Provide galvanized steel bars, struts, trusses or strip steel, formed to depth and bolted or welded in place.

F. Provide reinforcement for hardware attachment.

G. Insulation: Insulate inner core of steel sections with manufacturer's standard polyurethane thermal insulation, with maximum flame-spread and smoke-developed indices of 75 and 450, respectively, according to ASTM E 84; or with fiberglass thermal insulation. Secure insulation to door section. Enclose insulation completely, with no exposed insulation material evident.

H. Fabricate sections so finished door assembly is rigid and aligned, with tight hairline joints, and free of warp, twist, and deformation.

I. Finish galvanized steel door sections as follows:

1. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
2. Surface Preparation: Clean galvanized surfaces with nonpetroleum solvent so surfaces are free of oil and surface contaminants.
3. Pretreat zinc-coated steel, after cleaning, with a conversion coating of type suited to organic coating applied over it.
4. Apply manufacturer's standard primer to both door faces after forming, according to coating manufacturer's written instructions for application and minimum dry film thickness. Doors will be finished in field.

J. Glazing: Provide 1/2" insulated double strength glass lites as illustrated on the overhead door elevations in the drawings.

2.3 TRACKS, SUPPORTS, AND ACCESSORIES

A. Track Reinforcement and Supports: Provide galvanized steel track reinforcement and support members, complying with ASTM A 36 (ASTM A 36M) and ASTM A 123. Secure, reinforce, and support tracks as required for door size and weight to provide strength and rigidity without sag, sway, and vibration during opening and closing of doors.

B. Support and attach tracks to opening jambs with continuous angle welded to tracks and attached to wall. Support horizontal (ceiling) tracks with continuous angle welded to track and supported by laterally braced attachments to overhead structural members at curve and end of tracks.

C. Weatherseals: Provide replaceable, adjustable, continuous, compressible weather-stripping gaskets of flexible vinyl, rubber, or neoprene fitted to bottom and at top of overhead door.

1. Provide motor-operated doors with combination bottom weatherseal and photo eyes.

2. In addition, provide continuous flexible seals at door jambs for a weather tight installation.

2.4 HARDWARE

A. General: Provide heavy-duty, corrosion-resistant hardware, with hot-dip galvanized, stainless-steel, or other corrosion-resistant fasteners, to suit door type.

B. Hinges: Provide heavy-duty galvanized steel hinges, of not less than 0.0747-inch-(1.9-mm-) thick uncoated steel, at each end stile and at each intermediate stile, per manufacturer's written recommendations for door size. Attach hinges to door sections through stiles and rails with bolts and lock nuts or lock washers and nuts. Use rivets or self-tapping fasteners where access to nuts is not possible. Provide double-end hinges, where required, for doors exceeding 16 feet (4.87 m) in width, unless otherwise recommended by door manufacturer.

C. Rollers: Provide heavy-duty rollers, with steel ball bearings in case-hardened steel races, mounted with varying projections to suit slope of track. Extend roller shaft through both hinges where double hinges are required. Provide 3-inch diameter roller tires for 3-inch track, and as follows:

1. Case-hardened steel tires.

D. Push/Pull Handles: For push-up-operated or emergency-operated doors, provide galvanized steel lifting handles on each side of door.

E. Chain Lock Keeper: Suitable for padlock.

F. Where door unit is power operated, provide safety interlock switch to disengage power supply when door is locked.

2.5 COUNTERBALANCING MECHANISM

A. Torsion Spring: Operation by torsion-spring counterbalance mechanism consisting of adjustable-tension torsion springs, fabricated from oil-tempered-steel wire complying with ASTM A 229 (ASTM A 229M), Class II, mounted on a cross-header steel shaft. Connect to door with galvanized aircraft-type lift cables with cable safety factor of at least 5 to 1. Provide springs calibrated for 50,000 cycles minimum.

B. Cable Drums: Provide cast-aluminum or gray-iron casting cable drums grooved to receive cable. Mount counterbalance mechanism with manufacturer's standard ball-bearing brackets at each end of shaft. Provide 1 additional midpoint bracket for shafts up to 16 feet (4.87 m) long and two additional brackets at one-third points to support shafts more than 16 feet (4.87 m) long, unless closer spacing is recommended by door manufacturer.

C. Bracket: Provide anchor support bracket, as required to connect stationary end of spring to the wall, to level shaft and prevent sag.

D. Provide a spring bumper at each horizontal track to cushion door at end of opening operation.

2.6 ELECTRIC DOOR OPERATORS

A. General: Provide Standard Duty operator equal to Overhead Door RSX® Commercial Operator, 3/4 hp continuous duty motor, complete with electric motor and factory-prewired motor controls, starter, gear-reduction unit, solenoid-operated brake, clutch, remote-control stations, control devices, integral gearing for locking door, and accessories required for proper operation.

B. Comply with NFPA 70.

C. Disconnect Device: Provide hand-operated disconnect or mechanism for automatically engaging sprocket-chain operator and releasing brake for emergency manual operation while disconnecting motor, without affecting timing of limit switch. Mount disconnect and operator so they are accessible from floor level. Include interlock device to automatically prevent motor from operating when emergency operator is engaged.

D. Design operator so motor may be removed without disturbing limit-switch adjustment and without affecting emergency auxiliary operator.

E. Provide control equipment complying with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70 Class 2 control circuit, maximum 24-V, ac or dc.

F. Door-Operator Type: Provide unit consisting of electric motor and the following:

1. Trolley or drawbar type, with V-belt primary drive, chain and sprocket secondary drive, and quick disconnect-release for manual operation.

G. Electric Motors: Provide high-starting torque, 208 volt, reversible, continuous-duty, Class A insulated, electric motors, complying with NEMA MG 1, with overload protection, sized to start, accelerate, and operate door in either direction, from any position, at not less than 2/3 fps (0.2 m/s) and not more than 1 fps (0.3 m/s), without exceeding nameplate ratings or considering service factor.

1. Provide interior units, full-guarded, surface-mounted, heavy-duty type, with general-purpose NEMA ICS 6, Type 1 enclosure.

H. Overhead Door Control Console: Provide a master control console with 4 control stations as indicated on the drawings. Provide momentary-contact, 3-button control station with push-button controls labeled "Open," "Close," and "Stop." To operate each door.

I. Obstruction Detection Device: Provide each motorized door with two (2) sets of manufacturer’s standard photoelectric sensor to protect full width of door opening, mount one high and low, coordinate with owner. Activation of sensor immediately stops and reverses downward door travel.

J. Limit Switches: Provide adjustable switches, interlocked with motor controls and set to automatically stop door at fully opened and fully closed positions.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine wall and overhead areas, including opening framing and blocking, with Installer present, for compliance with requirements for installation tolerances, clearances, and other conditions affecting performance of Work of this Section.

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

3.2 INSTALLATION

A. General: Install door, track, and operating equipment complete with necessary hardware, jamb and head mold strips, anchors, inserts, hangers, and equipment supports according to Shop Drawings, manufacturer's written instructions, and as specified.

B. Fasten vertical track assembly to framing at not less than 24 inches (600 mm) o.c. Hang horizontal track from structural overhead framing with angle or channel hangers welded and bolt fastened in place. Provide sway bracing, diagonal bracing, and reinforcement as required for rigid installation of track and door-operating equipment.

3.3 ADJUSTING

A. Lubricate bearings and sliding parts; adjust doors to operate easily, free from warp, twist, or distortion and fitting weathertight for entire perimeter.

B. Adjust belt-driven motors as follows:

1. Use adjustable motor-mounting bases for belt-driven motors.

2. Align pulleys and install belts.

3. Tension belt according to manufacturer's written instructions.

3.4 DEMONSTRATION

A. Startup Services: Engage a factory-authorized service representative to perform startup services and to train owner's maintenance personnel as specified below:

1. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

2. Train owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.

3. Review data in the maintenance manuals. Refer to Division 1 Section "Contract Closeout."

4. Review data in the maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."

5. Schedule training with owner with at least 7 days' advance notice.

END OF SECTION 08 36 13

Section 08 41 00 – Aluminum Entrances & Storefronts

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Provide all materials, labor and equipment necessary for the complete installation of aluminum entrances and storefront framing as indicated on the drawings. The work under this section shall include:

1. Exterior entrance doors and frames.
2. Storefront framing with operable project out vents.
3. Aluminum break metal components
4. Weatherstripping, hinges, push/pulls, thresholds, sweeps, deadbolts
5. Perimeter caulking

1.2 RELATED SECTIONS

A. Section 08 71 00 – Door Hardware

B. Section 08 71 13 – Door Operators

C. Section 08 80 00 – Glass and Glazing

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: Include elevations, details, hardware mounting heights, anchorages, expansion provisions and glazing details.
2. Product Data: Include fabrication methods, finishing, hardware, accessories and installation recommendations.
3. Samples: Pairs of each finish, on 12" long section soft extrusions and on 6" square sheets.
4. Test Reports: Submit test reports showing compliance with par. 1.04 – Performance Requirements.

1.4 PERFORMANCE REQUIREMENTS

A. Provide certified test results showing systems have been tested by a recognized testing laboratory and comply with characteristics specified.

1. Thermal Movement: Provide for expansion and contraction resulting from an ambient temperature range of 120 deg.F (67 deg.C).
2. Wind Loading: Withstand uniform test pressure of 20 psf inward and outward when tested according to ASTM E 330.
3. Structural (Doors): Resistance to corner racking shall be tested by the dual moment load test as follows:

a. Test section shall consist of a standard top door assembly. Side section shall be 24” long and top rail section shall be 12” long.

b. Anchor “top rail” positively to test bench so that the end of the top rail protrudes 3” beyond the bench edge.

c. Anchor a lever arm positively to “side rail” at a point 19” from inside edge of “top rail”. Attach weight support pad at a point 19” from inner edge of “side rail”.

d. Test section shall withstand a load of 245 pounds on the lever arm before reaching the point of failure, which shall be considered a rotation of the lever arm in excess of 45 degrees.

B. Fixed Framing Transmission Characteristics:

1. Air Infiltration: Not more than 0.06 CFM per sq. ft. when tested according to ASTM E 283 at an inward test pressure differential of 6.24 psf.

2. Water Penetration: No penetration when tested according to ASTM E 331 at an inward test pressure differential of 6.24 lbf. per sq. ft.

3. Condensation Resistance (451-T): Not less than 54 CRF when tested according to AAMA 1502.

4. Thermal Transmittance: Not more than 0.65 BTU/(hr. x sq. ft. x deg. F) at 15 mph wind velocity when tested according to AAMA 1503.

C. Aluminum Entrance Transmission Characteristics:

1. Air Infiltration: Not more than 0.50 CFM for single doors and 1.0 for pairs of doors when tested according to ASTM E 283 at an inward test pressure differential of 1.567 psf.

2. Condensation Resistance (thermally broken door 106): Not less than 48 CRF when tested according to AAMA 1502.

3. Thermal Transmittance: Overall U-value of not more than 0.93 BTU/(hr. x sq. ft. x deg.F) at 15 mph wind velocity when tested according to AAMA 1503.

1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: 5 years' experience in fabrication.

B. Installer's Qualifications: 5-years' experience in installation.

1.6 WARRANTY

A. Manufacturer's Product Warranty: Submit as part of project close-out requirements, two copies of the manufacturer's warranty for entrance system as follows:

1. Warranty Period: Two (2) years from Date of Substantial Completion of the project provided however that the Limited Warranty shall begin in no event later than six months from date of shipment by manufacturer. **In addition, welded door corner construction shall be supported with a limited lifetime warranty for the life of the door under normal use.**

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Entrance Basis of Design: Except as noted below, product specified is "Standard Wide Stile Entrances" nonthermally broken as manufactured by Tubelite, Inc. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by listed manufacturers are acceptable.

1. Door 106: Thermally broken equal to Tubelite 'Therml=Block Wide Style'

B. Storefront Basis of Design: Product specified is "T14650 Series", 2 inches by 6-1/2 inches, as manufactured by Tubelite, Inc. Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by listed manufacturers are acceptable. The architect will be the sole judge of the basis of what is equivalent.

C. Acceptable Alternate Manufacturers

1. Kawneer Co.

2. US Aluminum

3. EFCO

2.2 MATERIALS

A. Aluminum Members

1. Alloy and temper recommended for strength, corrosion resistance, and application of finish; comply with ASTM B 221 for extrusions and ASTM B 209 for sheet or plate.

2. Main framing sections and pressure plates to be of .090 inch minimum wall thickness and snap covers to be of .050 inch minimum thickness.

B. Fasteners: Aluminum, nonmagnetic stainless steel, or other noncorrosive material.

1. Except for application of hardware, do not use exposed fasteners. For hardware, use Phillips flat-head machine screws; match finish of member or hardware being fastened.

C. Weatherstripping: Replaceable compressible neoprene or molded PVC type gaskets or replaceable wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing as suitable for type of door operation.

1. Provide EPDM or vinyl-blade gasket weatherstripping in bottom door rail, adjustable for contact with threshold.

D. Thresholds: Extruded mill finished aluminum ADA compliant threshold of width required for frame depth.

E. Glass and Glazing Materials: Comply with requirements of Section 08 80 00 – Glass and Glazing.

F. Shims: Composite shims, tapered and non-tapered as required. Wood shims will not be accepted.

2.3 FABRICATED COMPONENTS

A. Storefront Framing: Thermally broken with interior portion of frame insulated from exterior portion, flush applied glazing stops. Frames for interior glazing need not be thermally broken.

1. Aluminum Storefront Entrance Framing

a. Frame face width: 1-3/4” to 2 inches

b. Frame Depth: 6-1/2 inches

2. Operable Vents: Provide project-out awning type operable vents consisting of 1” insulated glass silicone glazed to extruded thermally broken aluminum frame on the interior side of the windows. Furnish with screens and wickets, 4-bar hinges, and cam handles.

B. Stile-and-Rail Type Aluminum Doors: 1-3/4" thick; tubular frame members, with mechanical joints using heavy reinforcing plates and concealed tie-rods or j-bolts.

C. Prefabrication: Before shipment, complete fabrication, assembly, finishing, hardware application, and other work to the greatest extent possible. Disassemble only for shipment and installation.

1. Entrance Doors: All entrance doors shall be fabricated by the manufacturer.

2. Pre-glaze to greatest extent possible.

3. Do not drill and tap for surface-mounted hardware until installation.

4. Perform fabrication, including cutting, fitting, forming, drilling and grinding to prevent damage to exposed finish surfaces. For hardware, perform prior to application of finishes.

D. Welding: Comply with AWS recommendations; grind exposed welds smooth and restore mechanical finish.

E. Dissimilar Metals: Separate dissimilar metals with zinc chromate primer, bituminous paint, or other separator.

F. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

2.4 ALUMINUM FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

1. Finish: AAMA 2605, 70% Fluoropolymer Coating

a. Color: Custom color red to match standing seam metal roofing per Section 07 41 00.

2.5 HARDWARE

A. Hinges: Provide pin & barrel type continuous 14-gauge 304 stainless steel hinges with .25 dia. 304 stainless steel pin.

1. Manufacturer: Markar Architectural Products FM-300 Series

2. ANSI/BHMA Standard A 156.26 Grade 1

3. Finish: US 32D

B. Pulls: Provide entrance door manufacturer's standard 1" dia. x 10" (center to center) wire pull handle.

C. Push: 1" dia. bent bar with 90 deg. x 2-1/4 projection at both ends.

D. Threshold: Manufacturer's standard extruded aluminum threshold machined to fit door type, size and type of hinge. Thresholds shall be ADA compliant, ½" in height and beveled to the floor on both sides to provide easy access for wheelchairs and strollers.

E. Weatherstripping: Aluminum extrusion with replaceable compressible bulb style insert.

F. Sweep: Aluminum extrusion with replaceable polyurethane smooth insert for mounting to bottom edge of door with concealed fasteners on a mounting strip.

G. Deadbolt: Adams Rite Maximum Security Deadlock MS 1850A, standard long throw bolt of 5-ply laminated steel.

H. Hardware furnished under Section 08 71 00 – Door Hardware but installed under this Section shall include:

1. Door Closers

2. Lock cylinders

3. Exit devices

4. Overhead stops

5. Wall and floor stops.

6. Electric Lockset

2.6 GLASS AND GLAZING MATERIALS

A. Glass and Glazing Materials: As specified in Section 08 80 00.

2.7 PERIMETER CAULKING

A. One-part, low modulus, high performance, neutral curing, nonstaining, construction grade silicone sealant conforming to ASTM C920 Type S, Grade NS, Class 25

1. Uses: NT, G, M, A and O.

2. U.S. Federal spec TT-S-00001543A, Class A.

3. Tremco "Spectrem 1"

4. Color: Provide colored sealant to match aluminum door frame color.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's instructions. Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Provide proper support and anchor securely in place.

1. Separate aluminum and other corrodible metal surfaces from sources of corrosion at points of contact with other materials.

B. Adjust operating hardware to function properly.

C. Clean system promptly after installation.

3.2 HARDWARE SCHEDULE

HARDWARE GROUP AL-1

EACH SINGLE ALUMINUM DOOR TO HAVE:

DR. 101A, 121A, 106A, 106B

1 EA	CONTINUOUS HINGE	MARKAR FM300 32D
1 EA.	THRESHOLD	MANUF. STD. (SEE PAR. 2.5 ABOVE)
1 EA	WEATHERSTRIP	REESE 769 SERIES
1 EA.	SWEEP	REESE DB591DU

HARDWARE GROUP AL-2

EACH SINGLE ALUMINUM DOOR TO HAVE:

DR. 101B, 121B

1 EA	CONTINUOUS HINGE	MARKAR FM300 32D
1 EA.	THRESHOLD	MANUF. STD. (SEE PAR. 2.5 ABOVE)
1 EA	WEATHERSTRIP	REESE 769 SERIES
1 EA.	SWEEP	REESE DB591DU

END OF SECTION 08 41 00

Section 08 71 00 – Door Hardware

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applicable provisions of Division 1 shall govern all work under this section.

B. Section includes:

1. Furnish all finish door hardware listed in the hardware schedule specified herein, or required by the drawings.

2. Low energy automatic operators.

1.2 RELATED WORK

A. Section 06 20 00 - Finish Carpentry

B. Section 08 11 13 - Steel Doors and Frames

C. Section 08 14 16 - Wood Doors: Any intumescent material that may be required to comply with positive pressure fire door testing to be supplied by the wood door supplier.

D. Section 08 41 00 - Aluminum Entrances: Continuous hinges, weatherstrip, thresholds, and sweeps to be supplied by aluminum door supplier, unless otherwise stated.

1.3 REFERENCES

A. A.D.A.-Americans with Disabilities Act.

B. ANSI A117.1 Specification for making facilities accessible to physically handicapped people.

C. NFPA 80 Standards for Fire Doors and Windows

D. NFPA 101 Life Safety Code

E. U.L. Building Material Directory

F. D.H.I. Recommended Locations for Architectural Hardware

G. Applicable State and Building Codes, including IBC 2000

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures:

B. Schedules: Submit detailed hardware schedule, vertical format. Prepare under the supervision of an AHC, registered Architectural Hardware Consultant, and under provisions of Division 1.

1. Itemize hardware in the sequence and format established by this specification.

2. List and describe each opening separately. Include all doors with identical hardware, except hand, in a single heading. Include door number, room designations, degree of swing except hand, in a single heading.

3. List related details. Include dimensions, door and frame material and other considerations affecting hardware.

4. List all hardware items to be supplied. Include manufacturer's name, catalog number, size, finish, attachments and related details where applicable.

5. Keying Schedule: After receipt of approved hardware schedule, submit a copy of keying schedule as a result of an on-site keying meeting between the owner, architect and the hardware supplier.

C. Samples: Submit samples of finish hardware items for approval. Properly identify each sample as to make and number and finish.

D. Manufacturer's Instructions:

1. Field Templates: Furnish a copy of approved hardware schedule, along with applicable templates for factory-prepared hardware to each door and frame fabricator.

2. Electrical Hardware: Submit electrical specifications and applicable information to the electrical contractor after receipt of the approved hardware schedule.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Manufacturer: Except where specified in the hardware schedule, furnish products of only one manufacturer for each type of hardware.

2. Supplier: A company experienced in the builders hardware industry for a minimum of two (2) years, and can call upon an AHC for consultation during the full extent of project.

B. Regulatory Requirements

1. Furnish UL or Warnock Hersey listed hardware for all fire labeled and 20 minute openings in conformance with requirements for class of opening scheduled.

2. Furnish hardware that conforms to all applicable State and local building codes.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle according to Division 1. Mark each original container with a door number that corresponds to the approved hardware schedule for the installation location.

B. Receive, inventory and store hardware in a secure and dry environment. Protect against loss and damage.

C. Report any shortages to the hardware supplier no later than 48 hours after receipt of delivery to the job site.

D. Stockpile items sufficiently in advance to ensure their availability.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

Products	Specified	Acceptable
Hinges	McKinney	Stanley, Hagar, Ives
Closers	LCN	Sargent, Norton
Exit Devices	Von Duprin	Precision, Sargent
Flush Bolts	Rockwood	DCI, Trimco, Ives
Locks & Latches	Schlage	Sargent, Best
Electric Cylindrical Locksets	Schlage	Sargent, Best
Electric Locks w/ Keypad	Schlage AD-Series	No substitutions
Push/Pull	Rockwood	Trimco, Hager, Ives
Protective Plates	Rockwood	Burns, Hager, Ives
Overhead Stops, Holders	Glynn Johnson	ABH, Sargent
Wall & Floor Stops	Rockwood	Trimco, DCI, Ives
Threshold, Sweeps & Weatherstrip	Reese	Pemko, National Guard
Low Energy Automatic Operators	LCN	Norton

2.2 HINGES

A. Acceptable manufacturers and respective catalog numbers:

Description	Ives	Stanley	McKinney	Hager
Std. Wt. Plain Bearing Steel	5PB1	F179	T2714	1279
Std. Wt. Ball Bearing Steel	5BB1	FBB179	TA2714	BB1279
Std. Wt. Ball Bearing–nonferrous	5BB1	FBB191	T4B3786	BB1168
Hvy. Wt. Ball Bearing Steel	5BB1HW	FBB168	T4B3786	BB1168
Hvy. Wt. Ball Bearing-nonferrous	5BB1HW	FBB179	T4B3386	BB1199

B. Hinges supplied must be tested and comply with ANSI/BHMA standard for consistency, wear and corrosion resistance.

C. Quantity: Furnish hinges for each door leaf as follows, unless otherwise noted in groups.

1. Doors up to and including 90” high-3 Hinges
2. Doors over 90” high through 120” -4 hinges

D. Type: Furnish as indicated in hardware groups.

2.3 FLUSH BOLTS

A. Acceptable manufacturers and respective catalog numbers:

Description	Rockwood	Ives	Trimco	DCI
Manual-Metal door	555	FB458	3917	780F
Manual-Wood door	557	FB358	3913	790F
Automatic Metal door	1842	FB31P	3810	842
Automatic Wood door	1962			962
Self- latching metal door	1845	FB51P	3820	845
Self- latching wood door	1945	FB61P	3825	945
Dust proof strike	570	DP2	3911	82

B. Furnish a dustproof strike for all bottom bolts

2.4 LOCKS AND LATCHES

A. Acceptable manufacturers and respective catalog numbers:

Description	Best	Schlage	Sargent
Heavy-Duty Mortise	45H	L9000	8200
Heavy-Duty Grade 1 Cyl.	93K	ND Series	10 Line

B. Furnish lever designs as indicated in groups.

C. Furnish lock types and functions as specified in the hardware schedule and as follows:

1. Provide 2-3/4” backset
2. Provide 2-3/4” x 1-1/8” T strike with a dust box for use in wood doors or frame
3. Provide 4-7/8” x 1-1/4” ANSI strike for installation in a hollow metal door or Frame.
4. Locksets to conform to ANSI A156.2, Series 4000, Grade 1 and be UL listed
5. Lockets and cores to be of same manufacturer to maintain complete lockset warranty

2.5 EXIT DEVICES

A. Acceptable manufacturers and respective catalog numbers:

Description	Von Duprin	Precision	Sargent
Wide Stile Rim	98	2100	8800
Wide Stile Vert. Rod	9827	2200	8700
Wide Stile Conc Vertical Rod	9875	2800	8600
Wide Stile Mortise	9875	2300	8900
Narrow Stile Rim	35	2400	8500
Narrow Stile Conc Vert. Rod	3547	2600	8400

B. Furnish exit device types and functions as specified in the Hardware Schedule.

C. Lever handles supplied with exit devices shall match the design specified for locks/latches.

2.6 PULLS, PUSH BARS, PUSH/PULL PLATES

A. Acceptable manufacturers and respective catalog numbers:

Description	Rockwood	Trimco	Burns	Ives

B. Supply product as listed in groups and equal to acceptable manufacturers

2.7 DOOR CLOSERS

A. Acceptable manufacturers and respective catalog numbers:

Description	Norton	LCN	Sargent
Heavy Duty Reg. Arm	7500	4041	350
Heavy Duty Parallel Arm	PR7500	4041 EDA	350 PED
Heavy Duty Stop Arm	CLP7500	4041 Cush	350 PS

2.8 LOW ENERGY AUTOMATIC OPERATORS

A. Acceptable manufacturers and respective catalog numbers (shall be included in the hardware package).

Description	LCN	Norton
Operator – Push Side	4640	6960
Operator – Pull Side	4630	6910
Hardwired Wall Switch	956	685
Wireless Wall Switch	957	574
Wireless Receiver	931	RFI

B. Provide arms, mounting plates, sizes, stops, and any components that may be necessary to interface with electrified hardware that are required to complete and proper operation of the openings affected. Complete installation must meet or exceed requirements of ANSI A159.19.

C. Provide actuators as detailed in hardware groups.

D. Conduit, electrical back boxes, wiring, and 120 VAC input power by Division 26 – Electrical.

2.9 PROTECTIVE PLATES

A. Acceptable manufacturers: Rockwood, Trimco, Burns, Hager

B. All kickplate heights shall be as listed in groups and 2” less door width single doors and 1” less for pairs.

C. Thickness shall be .050” (16 gauge).

2.10 OVERHEAD STOP/HOLDERS

A. Acceptable manufacturers and respective catalog numbers:

Description	ABH	Sarget	Glynn Johnson
Heavy Duty Surface	9000	500	90
Heavy Duty Concealed	1000	600	100
Standard Duty Surface	4400	1540	450
Standard Duty Concealed	4000	1530	410

B. Furnish an overhead stop if a door opens against equipment, casework, sidelights, or other objects that would make wall bumpers inappropriate, and as specified in the hardware groups.

2.11 WALL STOPS

A. Acceptable manufacturers and respective catalog numbers:

Description	Rockwood	Hager	Ives
Wrought Convex Wall	407	232W	WS406
Wrought Concave w/Toggle	409	237W	WS407

B. When “wall stop” is called for in hardware group, provide 407 or 409. When overhead stops are required, they will be specified by product number in group.

C. Wall stops shall not be mounted to casework, cabinet work, sidelights or equipment.

D. Where wall stops are specified, but not applicable, supply an overhead stop as specified in Paragraph 2.10

2.12 THRESHOLDS, SWEEPS, WEATHERSTRIP, DRIP CAPS, GASKETS

A. Acceptable manufacturers and respective catalog numbers:

Description	Reese	Pemko	Nat’l Guard
Threshold	S205	171A	425A
Sweep	323	315N	200N
Sweep	967	18133CP	OV633
Weatherstrip	970	45100CP	603
Weatherstrip	DS78	315CR	130N
Gasket	797B	588	1010

B. Where specified in groups, furnish the above products unless otherwise detailed.

2.13 DOOR HARDWARE FINISHES

A. Unless indicated otherwise in the groups, provide finishes as follows:

1. Hinges exterior US32D
2. Hinges interior US26D
3. Flush Bolts US26D
4. Exit Devices US32D
5. Locks and Latches US26D
6. Pulls, Pushbars, Push/Pull US32D
7. Door Closers Painted Aluminum
8. Protective Plates US32D
9. Overhead stops Painted Aluminum

10.	Wall Stops	US32D
11.	Gasket	Black
12.	Threshold	Mill Aluminum
13.	Weatherstrip/Sweeps	Clear Anodized Aluminum
14.	Automatic Door Operators	Painted Aluminum

2.14 KEYING

A. Cylinders shall be of one manufacturer as listed for continuity of design and consideration of warranty.

B. Standards:

1. DHI Handbook "Keying systems and nomenclature" (1989)

C. Cylinders: Shall be interchangeable cores.

D. Keying:

1. Contact owner to establish a keying conference. Verify keyway, visual key identification, number of master keys and keys per lock.

E. Key into owner's existing keying system if applicable.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine doors, frames and related items for conditions that would prevent the proper application of finish hardware. Do not proceed until defects are corrected.

3.2 INSTALLATION

A. Install each hardware item in strict compliance with the manufacturers printed instructions and recommendations, using only fasteners as supplied by, or called for by the manufacturer.

B. Set units level, plumb and true to the line and location. Prepare and reinforce the attachment substrate as necessary for proper installation and operation.

C. Mortise and cut to close tolerance and conceal evidence of cutting in the finished work. Drill on countersink units which are not factory prepared for anchorage fasteners.

D. If manufacturers’ instructions do not call out a mounting location, refer to the Door and Hardware Institute’s publication Recommended Locations for Architectural Hardware.

E. Delivery to the owner, one complete set of installation and adjustment instructions, as well as all tools that were furnished with the hardware.

3.3 ADJUSTMENT AND CLEANING

A. At final completion, adjust and check each operating item of hardware at each door to ensure proper operation and function of every unit. Lubricate any moving parts that do not operate freely, smoothly, and quietly using only lubricant as recommended by the manufacturer of the hardware item. Replace units that cannot be adjusted or lubricated to operate properly.

B. Instruct the owner’s personnel in the proper adjustments of the hardware as needed.

C. Clean and restore hardware to the original finish.

3.4 HARDWARE SCHEDULE

HARDWARE GROUP 1

EACH SINGLE ALUMINUM DOOR TO HAVE:

DR. 101A

1 EA	EXIT DEVICE	98NLx990NL-R	VON DUPRIN
1 EA	RIM CYLINDER	20-057	SCHLAGE
1 EA	CLOSER	4040 CUSH	LCN

CONTINUOUS HINGE, WEATHERSTRIP, SWEEP, AND THRESHOLD BY ALUMINUM ENTRANCE SUPPLIER.

HARDWARE GROUP 2

EACH SINGLE ALUMINUM DOOR TO HAVE:

DR. 121A

1 EA	EXIT DEVICE	98NLx990NL-R	VON DUPRIN
1 EA	RIM CYLINDER	20-057	SCHLAGE
1 EA	ELECTRIC STRIKE	9600	HES
1 EA	CLOSER ~~(122A)~~	4040 CUSH	LCN

CONTINUOUS HINGE, WEATHERSTRIP, SWEEP, AND THRESHOLD BY ALUMINUM ENTRANCE SUPPLIER.

HARDWARE GROUP 3

EACH SINGLE ALUMINUM DOOR TO HAVE:

DR. 101B, 121B

1 EA	EXIT DEVICE	98DT x 990DT	VON DUPRIN
1 EA	DOOR CLOSER	4040 RW/PA	LCN
1 EA	WALL STOP	409	ROCKWOOD

CONTINUOUS HINGE, WEATHERSTRIP, SWEEP, AND THRESHOLD BY ALUMINUM ENTRANCE SUPPLIER.

HARDWARE GROUP 4

EACH SINGLE DOOR TO HAVE:

DR. 101C

3 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND70 x SPA	SCHLAGE
1 EA	DOOR CLOSER	4040 RW/PA	LCN
1 EA	WALL STOP	409	ROCKWOOD
1 EA	KICK PLATE	16”x 2” LDW 320	ROCKWOOD
1 EA	SMOKE SEAL	797B	REESE

HARDWARE GROUP 5

EACH SINGLE DOOR TO HAVE:

DR. 103, 104,109,128

3 EA	BUTTS	TA2714- 4.5 X 4.5	MCKINNEY
1 EA	PRIVACY SET	ND40S x SPA	SCHLAGE
1 EA	CLOSER	4040 REG x HO	LCN
1 EA	WALL STOP	409	ROCKWOOD
1 EA	FLOOR STOP@104	442	ROCKWOOD

HARDWARE GROUP 6

EACH SINGLE DOOR TO HAVE:

DR. 110, 115

3 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND 80 x SPA	SCHLAGE
1 EA	O.H. STOP	450S	GLYNN JOHNSON

HARDWARE GROUP 7

EACH SINGLE DOOR TO HAVE:

DR.113, 114, 116A,116B

3 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND70 x SPA	SCHLAGE
1 EA	WALL STOP	409	ROCKWOOD

HARDWARE GROUP 8

EACH SINGLE DOOR TO HAVE:

DR. 107

3 EA	BUTTS	TA2714NPD 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND50 x SPA	SCHLAGE
1 EA	ELECTRIC STRIKE	9600	HES
1 EA	WALL STOP	409	ROCKWOOD

HARDWARE GROUP 9

EACH SINGLE DOOR TO HAVE:

DR. 122A, 122D

3 EA	BUTTS	TA2314NPD 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND80 x SPA	SCHLAGE
1 EA	ELECTRIC STRIKE	9600	HES
1 EA	CLOSER	4040 CUSH	LCN
1 EA	KICKPLATE	16”x 2” LDW	ROCKWOOD

1 EA	WEATHERSTRIP	815A	REESE
1 EA	SWEEP	323A	REESE
1 EA	THRESHOLD	S40SA	REESE
1 EA	LATCH PROTECTOR	320CL	ROCKWOOD

HARDWARE GROUP 10

EACH SINGLE DOOR TO HAVE:

DR. 122B, 122C

3 EA	BUTTS	TA2714NRP- 4.5”x4.5”	MCKINNEY
1 EA	LOCKSET	ND80 x SPA	SCHLAGE
1 EA	CLOSER	4040 CUSH	LCN
1 EA	KICKPLATE	16” X 2” LDW	ROCKWOOD
1 EA	WEATHERSTRIP	815A	REESE
1 EA	SWEEP	323A	REESE
1 EA	THRESHOLD	S40SA	REESE
1 EA	LATCH PROTECTOR	320CL	ROCKWOOD

HARDWARE GROUP 11

EACH SINGLE DOOR TO HAVE;

DR. 105A

3 EA	BUTTS	TA2714NRP- 4.5 x 4.5	MCKINNEY
1 EA	ELECTRIC LOCKSET	ND96EL	SCHLAGE
1 EA	POWER TRANSFER	EPT2	VON DUPRIN
1 EA.	POWER SUPPLY	505-ULAC-KLC	SCHLAGE
3 EA	PUSH BUTTON SWITCH	621AL	SCHLAGE
1 EA	DOOR CLOSER	4040 HEDA	LCN
1 EA	KICK PLATE	16”x 2” LDW 320	ROCKWOOD
1 EA.	FLOOR STOP	442	ROCKWOOD

HARDWARE GROUP 12

EACH SINGLE DOOR TO HAVE:

DR. 105B

2 EA	SPRING HINGES	1552- 4.5”x 4.5”	MCKINNEY
3 EA	EDGE GUARD	EG341 (EDGE THREE SIDES)	MCKINNEY
1 EA	FLOOR STOP	442	ROCKWOOD

HARDWARE GROUP 13

EACH SINGLE ALUMINUM DOOR TO HAVE:

DR. 106A, 106B

1 EA	RIM CYLINDER	20-057	SCHLAGE
1 EA	ELECTRIC STRIKE	9600	HES

1 EA	EXIT DEVICE	98EO	VON DUPRIN
1 EA	DOOR CLOSER	4040 EDA	LCN

1 EA CONTINUOUS HINGE, WEATHERSTRIP, SWEEP, AND THRESHOLD BY ALUMINUM SUPPLIER

HARDWARE GROUP 14

EACH SINGLE DOOR TO HAVE:

DR. 119

3 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND50 x SPA	SCHLAGE
1 EA	ELECTRIC STRIKE	9600	HES
1 EA	DOOR CLOSER	4040 CUSH	LCN
1 EA	KICK PLATE	16” x 2” LDW 320	ROCKWOOD
1 EA	SMOKE SEAL	797B	REESE

HARDWARE GROUP 15

EACH SINGLE DOOR TO HAVE:

DR. 112

3 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND 80 x SPA	SCHLAGE
1 EA	DOOR CLOSER	4040 CUSH	LCN
1 EA	KICK PLATE	16” x 2” LDW 320	ROCKWOOD
1 EA	SMOKE SEAL	797B	REESE

HARDWARE GROUP 16

EACH SINGLE DOOR TO HAVE:

DR. 111A

3 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND 80 x SPA	SCHLAGE
1 EA	DOOR CLOSER	4040 RW/PA	LCN
1 EA	O.H. STOP	450S	GLYNN JOHNSON
1 EA	KICK PLATE	16” x 2” LDW 320	ROCKWOOD
1 EA	SMOKE SEAL	797B	REESE

HARDWARE GROUP 17

EACH SINGLE DOOR TO HAVE:

DR. 108

3 EA	BUTTS	TA2714NRP- 4.5 x 4.5	MCKINNEY
1 EA	LOCKSET	ND 70 X SPA	SCHLAGE
1 EA	DOOR CLOSER	4040 CUSH	LCN

HARDWARE GROUP 18

EACH SINGLE DOOR TO HAVE:

DR. 001

3 EA	BUTTS	TA2314NRP- 4.5 x 4.5	MCKINNEY
1 EA	LOCKSET	ND 80 x SPA	SCHLAGE
1 EA	WALL STOP	409	ROCKWOOD
1 EA	WEATHERSTRIP	815A	REESE
1 EA	SWEEP	323A	REESE
1 EA	THRESHOLD	S40SA	REESE
1 EA	LATCH PROTECTOR	320CL	ROCKWOOD

HARDWARE GROUP 19

EACH SINGLE DOOR TO HAVE:

DR. 111B

3 EA	BUTTS	TA2714NRP-4.5 x 4.5	MCKINNEY
1 EA	PASSAGE LATCHSET	ND 80 x SPA	SCHLAGE
1 EA	WALL STOP	409	ROCKWOOD

HARDWARE GROUP 20

EACH SINGLE DOOR TO HAVE:

DR. 118, 117C

3 EA	BUTTS	TA2714NRP-4.5 x 4.5	MCKINNEY
1 EA	LOCKSET	ND 80 x SPA	SCHLAGE
1 EA	WALL STOP	409	ROCKWOOD

HARDWARE GROUP 21

EACH SINGLE DOOR TO HAVE:

DR. 117A/B

8 EA	BUTTS	TA2714NRP- 4.5 X 4.5	MCKINNEY
1 EA	LOCKSET	ND 80 x SPA	SCHLAGE
2 EA	FLUSH BOLTS	FB358	IVES
2 EA	DOOR CLOSER	4040 CUSH	LCN
2 EA	KICK PLATE	16” x 2” LDW 320	ROCKWOOD
2 EA	SMOKE SEAL	797B	REESE

END OF SECTION 08 71 00

Section 08 80 00 – Glass and Glazing

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Glass and glazing for Sections referencing this Section for products and installation.

1.2 RELATED SECTIONS

A. Section 08 11 13 - Standard Steel Doors And Frames

B. Section 08 14 16 – Flush Wood Doors

C. Section 08 41 00 – Aluminum Entrances

1.3 REFERENCES

A. Glazing Standard: Comply with GANA "Glazing Manual" and FGMA "Sealant Manual".

B. Safety Glazing Standard: Comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

1.4 SUBMITTALS

A. Samples of each glass indicated, except for clear single pane units; and of each type of sealant or gasket exposed to view.

B. Certificates of compliance from glass and glazing materials manufacturers.

PART 2 – PRODUCTS

2.1 GLASS

A. Viracon.

B. Pilkington Libbey-Owens-Ford.

C. PPG Industries Inc.

D. Oldcastle Glass

2.2 FLAT GLASS MATERIALS

A. Primary Glass Products: Comply with ASTM C 1036 for the following:

1. Clear Float Glass: Type I, Class 1, Quality q3.

B. Uncoated Heat-Treated Glass Products: Comply with ASTM C 1048 and with manufacturing process indicated for the following:

1. Clear Tempered Float Glass: Kind FT, Condition A, Type I, Class 1, Quality q3.

2.3 SEALED INSULATING GLASS UNITS:

A. General: Comply with requirements of ASTM E 774 for Class A units and the following:

1. Performance characteristics indicated are those of units and are based on manufacturer's published test data for units with 1/4" thick panes and 1/2" thick air space. U-values are indicated in Btu per hr. per sq. ft. per deg. F difference.

2. For properties of individual glass panes making up units, refer to product requirements specified elsewhere in this section applicable to types, classes, kinds and conditions of glass products indicated.

3. Provide heat-treated, coated float glass of kind indicated or, if not otherwise indicated, Kind HS (heat strengthened) where recommended by manufacturer to comply with system performance requirements specified and Kind FT (fully tempered) where safety glass is designated or required.

4. Outboard Lite: 1/4” clear tempered float glass

5. Inboard Lite: 1/4” clear tempered float glass with Low ‘E’ coating on #2 surface.

6. Sealing System: Manufacturer’s standard.

7. Spacer Material: Manufacturer’s standard metal.

2.4 FIRE RATED GLAZING MATERIALS (IMPACT SAFETY RATED)-NOT USED

A. Manufacturer: SGG Swissflam N2 / SGG Contraflam N2 as manufactured by Vetrotech Saint-Gobain NA, Auburn, WA Telephone 888-803-9533

B. Properties:

1. Thickness: Varies with rating and application (range from 5/8” to 2 1/8”)

2. Weight: Varies with thickness (approx. range 8 to 25 lbs. / sq. ft.)

3. Approx. visible light transmission: Varies with thickness. (approx. range 85 to 70 percent)

4. Fire Rating: 45 minutes – 2 hours

5. Impact Safety Rating: ANSI Z97.1 and CPSC 16CFR1202 (Cat I & II)

6. STC Rating: Up to 44Db

C. Labeling: Permanently label each lite of SGG Swissflam N2 / SGG Contraflam N2 with laboratory logo (WHI and/or UL), product and manufacturer’s name, rating, and safety specifications.

D. Fire Rating: Fire-rating listed and tested by Intertek Testing (WHI) for fire rating scheduled at opening locations in drawings, when tested according to (ASTM E-119)(ASTM E-152) (ASTM E-163) (UBC Standards 7-1-97, 7-2 and 7-4) (NFPA 251) (NFPA 252) (NFPA 257) (UL 9) (UL10B & 10C) (UL 263)

2.5 GLAZING ACCESSORIES

A. Comply with sealant and glass manufacturers for selection of glass sealants which suit project application and installation conditions, and which are compatible with surfaces contacted. Provide color of exposed sealants indicated or as selected by architect.

1. 1-Part Non-Acid-Curing Silicone Glazing Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to uses indicated, O; and as follows:

a. Medium-Modulus: With additional capability to withstand an increase or decrease in joint width of 50 percent of joint width and a tensile strength of 75 psi or less per ASTM D 412 at 100 percent elongation after 14 days at 77 deg. F (25 deg. C).

B. Glazing Sealant for Fire-Resistant Glazing Products: Identical to product used in test assembly to obtain fire-resistive rating.

C. Blocks and Spacers: Neoprene, EPDM or silicone as required for compatibility with glazing sealants; of 80 to 90 Shore A hardness for setting blocks and, for spacers and edge blocks, of hardness recommended by glass and sealant manufacturer for application indicated.

2.6 GLAZING SCHEDULE

Glass Type **GL-1** – Heat Treated Float Glass (Tempered)

A. Interior glazing at non-rated doors and sidelites.

1. ASTM C1048, Condition A (uncoated surfaces).

2. Type 1 (transparent glass, flat).

3. Class I (clear)

4. Quality q3 (glazing select)

5. Fully tempered

6. 1/4”-thick, unless otherwise indicated.

Glass Type **GL-2** – Fire-Rated Glass -NOT USED

A. Glazing located in rated partitions, doors and sidelites.

1. Provide “Firelite Plus” as manufactured by Nippon Electric Glass Co. The rating of the material shall match the rating of the door.

Glass Type **GL-3** – Heat Treated Sealed Insulating Glass Units (Tempered)

A. Glazing located in exterior doors and sidelites.

B. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air space complying with ASTM E 774 and with other requirements as indicated on the drawings.

1. Glass Type GL-3 – Low E: Provide 1 inch insulating glass units (1/4” INE – 169 Neutral Low-Emissivity (2) on clear on outboard glass, ½” airspace, ¼” clear on inboard glass) fully-tempered, as produced by Guardian, Cardinal, PPG or approved equal.

Glass Type **GL-4** – Sealed Insulating Glass Units (Non-tempered)

A. Glazing located in exterior manufactured windows.

B. Sealed Insulating Glass Units: Preassembled units consisting of organically sealed lites of glass separated by dehydrated air spaces complying with ASTM E 774 and with other requirements as indicated on the drawings.

1. Glass Type GL-4 – Low E: Provide 1 inch insulating glass units (1/4-inch INE-169 Neutral Low-Emissivity (2) on clear on outboard glass, 1/2” airspace, 1/4” clear on inboard glass), as produced by Guardian, Cardinal, PPG, or approved equal.

Glass Type **GL-5** – Laminated One-way Glass

A. Laminated Glass: ASTM C 1172, as indicated at interior non-rated doors and sidelights.

B. Interlayers: Type as indicated below and of thickness indicated or required to comply with performance requirements and with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating to glass and installation:

1. One-way mirrored sheet

C. Fabrication: Laminate glass with interlayers to produce laminated lites free of foreign substances, air, and glass pockets.

D. Laminated-Glass Units ~~LG-1: LHS~~ (two 1/8” lites of heat-strengthened float glass) consisting of two lites.

PART 3 – GLASS INSTALLATION (GLAZING)

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Glazing Contractor shall confirm all field measurements of openings scheduled to receive glass prior to fabrication.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer and sealer.

3.3 GLAZING

A. General: Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and gaskets, to achieve airtight and watertight performance, and to minimize breakage.

B. Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

C. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

D. Protect glass from contact with contaminating substances resulting from construction operations; remove any such substances by method approved by glass manufacturer.

3.4 CLEANING

A. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08 80 00

Section 08 84 00 – Insulated Translucent Panels

PART 1 – GENERAL

1.1 SUMMARY

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

B. This section includes labor, materials, and equipment for the installation of factory glazed, translucent panel, including accessories, weep system and trim according to these specifications and the drawings. Design, furnishing and installation of all attachments of panels to structure shall be the responsibility of the panel supplier.

1.2 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry: Treated wood blocking

B. Section 07 60 00 – Flashing & Sheet Metal: Sill flashing

C. Section 07 92 00 – Joint Sealants

1.3 SUBMITTALS

A. Submit shop drawings and color samples according to Section 01 33 00 – Submittal Procedures.

B. Test reports to be furnished by sandwich panel system manufacturer according to Section 01 33 00 – Submittal Procedures. The manufacturer shall submit certified test reports made by an independent testing organization for each type and class of panel system. Reports shall verify that the material will meet all performance requirements of this specification. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project. Test reports required are:

1. Flame Spread and Smoke Developed (ASTM E-84 by UL 723)
2. Burn Extent (ASTM D-635)
3. Color Difference (ASTM D-2244)
4. Impact Strength (Free Falling Ball Method)
5. Tensile Bond Strength (ASTM C-297) after aging by ASTM D-1037
6. Shear Bond Strength (ASTM D-1002) after five (5) separate conditions
7. Beam Bending Strength (ASTM E-72)
8. Insulation “U” Factor (by NFRC-100: ASTM C-236, E-1423 and C-1199)
9. NFRC Certification
10. Condensation Resistance Factor (AAMA 1503.1)

1.4 QUALITY ASSURANCE

A. Manufacturer's and Erector's Qualifications

1. Sandwich panel system must be listed by a recognized building code authority including the International Code Council, which requires quality control inspections and fire, structural and water infiltration testing by an approved agency for sandwich panel systems.
2. Quality control inspections and required testing conducted at least once each year shall include manufacturing facilities, sandwich panel components and production sandwich panels for conformance with “Acceptance Criteria for Sandwich Panels” as regulated by the ICC-ES or equivalent.
3. Materials and products shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least 10 consecutive years and which can show evidence of these materials being satisfactorily used on at least 6 projects of similar size, scope and location within such a period. At least 3 of the projects shall have been in successful use for 10 years or longer.

4. Erection shall be by installer, which has been in the business of erecting specified materials for at least 5 consecutive years and can show evidence of satisfactory completion of projects of similar size, scope and type.

B. Performance Requirements: The manufacturer shall be responsible for the configuration and fabrication of the complete panel system.

1.5 PRODUCT HANDLING

A. Store translucent panels on the long edge, several inches above the ground, blocked and under cover to prevent warping according to manufacturer's storage and handling instructions.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the plans are based on Kalwall Corporation.

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications.

1. Major Industries

2.2 MATERIALS – TRANSLUCENT PANELS

A. Translucent panels shall consist of 2-3/4" thick flat factory prefabricated sandwich panels with translucent faces manufactured from glass fiber reinforced thermoset resins especially for architectural use. Thermoplastic (e.g., polycarbonate, acrylic) faces are not acceptable.

1. Exterior Face Sheet: ‘Crystal’ with manufacturer’s standard glass erosion barrier.

2. Interior Face Sheet: ‘Crystal’, interior sheet per ASTM E84 by UL 723.

B. Flammability – The interior face sheet shall be U.L. listed and have a flamespread rating no greater than 50 and smoke developed no greater than 250 when tested according to UL 723. Burn extent by ASTM D-635 shall be no greater than 1”. Faces shall not deform, deflect or drip when subjected to fire or flame or delaminate when exposed to 300°F for 25 minutes.

C. Weatherability –

1. The full thickness of the exterior face shall not change color more than 3.0 Hunter or CIE Units DELTA E by ASTM D-2244 after five years outdoor South Florida weathering at 5 degrees facing south, determined by the average of at least three white samples with and without a protective film or coating to ensure maximum, long term color stability. Color stability shall be unaffected by abrasion or scratching.

2. The exterior face shall have a permanent glass veil erosion barrier embedded integrally to provide maximum long-term resistance to reinforcing fiber exposure. Sacrificial plastic surface films or coatings such as Tedlar are not acceptable.

D. Appearance - Exterior face sheets shall be smooth, .070” thick and crystal in color. Interior face sheets shall be .045” thick and white in color. Faces shall not vary more than ± 10% in thickness and be uniform in color.

E. Strength - The exterior face sheet shall be uniform in strength and repel an impact equal to 60 ft. lbs. without fracture or tear when impacted by a 3-1/2” diameter, 6.37 lb. free falling ball, and be resistant to penetration by pencil point.

2.3 GRID CORE

A. Panels shall incorporate a thermally broken I-beam grid core with provisions for mechanical interlocking of muntin-mullion and perimeter. Width of I-beam shall be no less than 7/16”. The I-beam grid shall be machined to tolerances of not greater than ± .002”. Thermal break shall be minimum 1". The entire grid core, not just the perimeter grid, shall be thermally broken with a CRF of 80 measured on the grid itself, not the center of grid. No exceptions.

B. Thermally Broken panels shall withstand 1200°F fire for minimum one hour without collapse or exterior flaming.

2.4 ADHESIVE

A. The laminate adhesive shall be heat and pressure resin type engineered for structural sandwich panel use, with minimum 25 years field use. Adhesive shall pass testing requirements specified by the International Code Council “Acceptance Criteria for Sandwich Panel Adhesives”.

B. Minimum tensile strength shall be 750 PSI by ASTM C-297 after two (2) exposures to six (6) cycles each of the aging conditions prescribed by ASTM D-1037.

C. Minimum shear strength by ASTM D-1002 after exposure to five (5) separate conditions:

1. 50% Relative Humidity at 73° F: 540 PSI
2. 182° F: 100 PSI
3. Accelerated Aging by ASTM D-1037 at room temperature: 800 PSI
4. Accelerated Aging by ASTM D-1037 at 182° F: 250 PSI
5. 500 Hour Oxygen Bomb by ASTM D-572: 1400 PSI

2.5 PANEL CONSTRUCTION

A. Panels shall have a thickness of 2-3/4” with a “U” factor by NFRC certified laboratory of .10, light transmission of 8% and shading coefficient of .07. Complete system shall be NFRC certified.

B. Translucent panels shall be a true sandwich panel of flat fiberglass sheets bonded to a grid core of mechanically interlocking thermally broken I-beams. Panels shall be laminated under a controlled process of heat and pressure and deflect no more than 1.9” at 30 psf in 10’ by ASTM E-72.

C. Grid pattern shall be nominal 12” x 24” shoji.

D. The adhesive bonding line shall be straight, cover the entire width of the I-beam and have a neat, sharp edge.

E. Panel Weeps: Weep holes on down slope side of installed panels to permit condensation to leave panel interior.

2.6 BATTENS AND PERIMETER CLOSURE SYSTEM

A. Closure system shall be extruded 6063-T6 and 6063-T5 thermally broken aluminum screw clamp-tite.

B. All battens and perimeter closures to be supplied with 300 series stainless steel screws (excluding final fasteners to the building).

C. All exposed aluminum to be architectural corrosion resistant finish which meets the performance requirements of AAMA 2604, color to be selected from manufactures standards.

D. Maintain continuous air barrier and vapor retarder throughout assembly in line with inside face of sandwich panel.

E. Provide flashing tabs at every batten and perimeter joint to prevent air infiltration.

2.7 FLEXIBLE SEALING TAPE

A. Vapor retarding sealing tape shall be manufacturer's standard to prevent air infiltration into panel cells.

PART 3 – EXECUTION

3.1 PREPARATION

A. The general contractor shall prepare openings including isolating dissimilar materials from aluminum system, which may cause damage by electrolysis and shall provide temporary enclosures if required.

3.2 ERECTION

A. The erector shall erect translucent panel system in strict accordance with approved shop drawings as supplied by manufacturer. Fastening and sealing shall be in strict accordance with manufacturer's shop drawings and installation instructions. All surfaces shall be cleaned before sealants are applied.

B. After other trades have completed work on adjacent material, carefully inspect translucent panel installation and make adjustments necessary to ensure proper installation and weather-tight conditions.

C. All staging, lifts and hoists required for the complete insulated panel installation, including staging, etc., necessary for field measuring, shall be provided by, set up and maintained by the general contractor.

END OF SECTION 08 84 00

END OF DIVISION 08 – OPENINGS

DIVISION 09 – FINISHES

Section 09 22 16 – Non-Load Bearing Metal Wall Framing

PART 1 – GENERAL

1.1 SCOPE OF WORK

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

B Work Included: Provide metal studs, furring channels, and accessories as indicated on the drawings, as specified herein.

1.2 RELATED SECTIONS

A. Section 07 46 00 – Metal Soffit Panels

B. Section 09 29 00 – Gypsum Board

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Product Data: Manufacturer's product information

1.4 REFERENCES

A ASTM C 645 – Standard Specification for Nonstructural Steel Framing Members, 2000.

B. ASTM C 754 – Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

C. ASTM C 1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

D. AISI Specification for the Design of Cold-Formed Structural Members.

E. AISI – Standard for Cold-Formed Steel Framing General Provisions

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Dietrich Metal Framing, Miami, FL

B. Clark Steel Framing Systems, Middletown, Ohio

C. Nuconsteel (A Nucor Company), Denton, TX

2.2 COMPONENTS

A. Studs: Cold-formed galvanized steel C – studs, in conformance with AISI Specifications for Design of Cold-formed Steel Structural Members.

1. Minimum stud thickness: 22–gauge (use 20-ga. studs @ door and borrowed lite jambs)

2. Web Size: As indicated on the drawings.

3. Flanges: Equal lengths 1-1/4 inches.

B. Runner Track: Cold-formed galvanized steel in conformation with AISI Specifications for Design of cold-formed steel structural Members.

1. Thickness equal to stud thickness minimum or heavier per design required.

C. Furring Channels: Cold formed galvanized steel in conformance with AISI Specifications for Design of cold-formed steel structural members.

1. 'Z'-Furring: 25 gauge x 1 1/2 deep "z" profile with 3/4" wide flange for placement against the substrate and 1-1/4 inch wide flange for attachment of gypsum wallboard.

2. Hat-Channels: 25 gauge x 7/8" deep hat shaped corrosion-resistant framing component used to furr out masonry wall and ceiling assemblies.

2.3 ACCESSORIES

A. Bridging: 16 ga. corrosion-resistant galvanized steel U-shaped, ¾" wide channels with clip angles for attachment to studs.

B. Fasteners: Self-drilling, self-tapping screws; steel, complying with ASTM C 1513; galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.

C. Touch-Up Paint: Provide stud manufacturer's standard zinc rich, containing 95-percent metallic zinc.

2.4 MATERIALS

A. Cold-Formed Steel: Complying with ASTM A 1003/A 1003M; unless indicated otherwise.

B. Galvanized Coating: G40 coating weight minimum, complying with ASTM C 645.

2.5 FABRICATION

A. General: Framing components may be preassembled into panels prior to erecting.

B. Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.

C. Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.

D. Fasteners: Fasten components using self-tapping screws or welding.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Prior to installation, inspect previous work of all other trades. Verify that all work is complete and accurate to the point where this installation may properly proceed in strict accordance with framing shop drawings.

B. If substrate preparation is the responsibility of another installer, notify architect of unsatisfactory preparation before proceeding.

3.2 ERECTION

A. Install cold-formed framing according to requirements of ASTM C 745.

B. Framing Installation:

1. Erect framing and panels plumb, level and square in strict accordance with approved drawings.

2. Handle and left prefabricated panels in a manner to not cause distortion in any member.

3. Anchor runner track securely to the supporting structure. Install concrete anchors only after full compressive strength has been achieved.

4. Butt all track joints. Securely anchor abutting pieces of track to a common structural element or splice them together.

5. Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks.

6. Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.

7. Provide temporary bracing until erection is completed.

8. Where indicated in the drawings, provide for structural vertical movement using means according to manufacturer's recommendations.

9. Studs that directly about exterior walls shall be separated by placing a #15 asphalt felt strip between the stud wall and the exterior wall surface.

C. Framed Openings

1. Reference: The Gypsum Construction Handbook, Centennial Edition published by USG Corporation.

2. Door and borrowed lite jamb openings should be framed with double 20-ga. steel studs run continuous from floor to runner at top of partition. Provide cripple studs above header maintaining ½" clearance from double studs running continuous from floor track to top runner.

3. Double studs at jambs shall attached to floor anchors secured with no less than two suitable fasteners.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Replace damaged metal stud framing members prior to hanging gypsum board.

END OF SECTION 09 22 16

Section 09 24 00 – Plastering

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Provide all labor, material and equipment necessary for a complete installation of plastered interior surfaces as indicated on the drawings. Work shall include:

1. Portland cement 3-coat plastering over metal lath and metal ceiling suspension components.

2. Accessories in connection with plastering

3. Acrylic finish

1.2 RELATED SECTIONS

A. Section 07 92 00 – Sealants

1.3 SUBMITTALS

A. Samples : Submit (2) 12 inch square samples of plaster with acrylic finish in color(s) and texture(s) specified for preliminary approval.

1.4 REFERENCES

A. ASTM C926 – Application of Portland Cement - Based Plaster

B. ASTM C847 – Metal Lath

C. ASTM C897 – Aggregate for Job-Mixed Portland Cement Based Plasters

D. ASTM C932 – Surface-applied Bonding Agents for Exterior Plastering

E. ASTM C1063 – Lathing and Furring for Portland Cement Plastering

1.5 SYSTEM DESCRIPTION

A. Three-Coat System is an exterior finishing system and is comprised of: lath, scratch coat, brown coat, and a finish coat.

1.6 ENVIRONMENTAL CONDITIONS

A. Cement Plaster

1. Cold Weather

a. Do not use frozen materials

b. Do not apply cement plaster to frozen surfaces or surfaces containing frost.

c. Do not mix materials or apply cement plaster when ambient temperature is less than 40 degrees F.

2. Hot Weather

a. Protect cement plaster from uneven and excessive evaporation during hot, windy or dry weather.

b. In hot, windy or dry weather the cement plaster should be moistened down and then covered with a single sheet of clear polyethylene plastic.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Portland Cement Plaster

1. Gold Bond Building Products Div.

2. National Gypsum Co.

3. USG

B. Acrylic Finish

1. Sto
2. Dryvit
3. Synergy

2.2 PLASTER MATERIALS

A. Portland Cement Plaster Materials: As follows:

1. Cement, ASTM C 150, Type 1.
2. Masonry Cement ASTM C91.
3. Sand Aggregate: ASTM C 144 type used for cement plaster
4. Fiber for Base Coat: Alkaline resistant (AR) glass or polypropylene fibers, ½ inch long, free of contaminates, manufactured for use in Portland cement plaster.

B. Portland Cement Plaster Base Coat Proportions and Mixing: Comply with ASTM C926. Proportion materials by volume. Adjust mix proportions within limits specified to attain workability.

1. Base Coats: Ad follows:
   a. Scratch Coat: 1 part Portland cement, one part Masonry cement, 2-1/2 to 4 parts sand.
   b. Brown Coat: 1 part Portland cement, one part Masonry cement, 5 to 6 parts sand
   c. Metal Lath: ASTM C847, galvanized Diamond mesh, 3.4 lbs/SY.
2. Fiber Content: Add fiber to base coat mixes after ingredients have mixed at least 2 minutes. Comply with fiber manufacturer's directions but do not exceed 2 lbs. per cu. ft. of cementitious materials. Reduce aggregate quantities accordingly to maintain workability.
3. Mixing Liquid: 3 parts water to one part acrylic admix.

C. Acrylic Finish: Factory mixed 100 percent pure acrylic finish with aggregate and integral color.

1. Color(s): As selected by the architect from manufacturer's standard colors.

2.3 SUSPENSION SYSTEM

A. Suspension Channels: Cold-rolled steel, 0.05980 inch minimum thickness of base metal (uncoated) protected with rust inhibitive paint or galvanizing complying with ASTM A525 for G60 coating designation, and as follows:

1. Carrying Channels: 1 1/2 inches deep x 7/16 inch wide flanges, 475 lbs. per 1000 feet painted, 508 lbs per 100 feet galvanized.
2. Furring Channels: 3/4 inch deep x 7/16 inch wide flanges, 300 lbs per 1000 feet painted, 316 lbs per 1000 feet galvanized.
3. Hat Channels: 7/8 inch deep, zinc coated (galvanized) steel, minmum 0.0179 inch thick complying with ASTM A446, Coating Designation G60, grade A.
4. Provide galvanized channels for exterior installation and high moisture interior areas (shower rooms).

2.4 PLASTERING ACCESSORIES

A. Corner Mesh: Formed steel, minimum 26 gauge thick, expanded flanges shaped to permit complete embedding in plaster, minimum 2 in. wide, galvanized finish.

B. Metal Lath: 3.4 lb/yd² expanded metal, galvanized.

C. Square Edge Casing Bead: Formed steel, minimum 24 gauge thick thickness governed by plaster thickness, maximum possible lengths, expanded metal flanges with square edges, galvanized finish.

D. Flexible Corner Bead

E. Drip Screed: Double-V expansion joint, zinc, with corrosion-resistant expanded flanges.

F. Anchorages: Nails, staples, or other approved metal supports of type and size to suit application, galvanized to rigidly secure lath and associated metal accessories in place.

G. Moisture Resistant Barrier Underlayment: 30-lb building paper.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine surfaces which are to receive plaster and accessories, and conditions under which plastering work is to be performed. Do not proceed with plastering work until unsatisfactory conditions have been corrected.

B. Preparation

1. Clean plaster bases and substrates to be plastered. Remove loose material, coating and other substances which might impair work.

3.3 INSTALLATION

A. Plaster Suspension Grillage

1. Install main carrying channels at 48” o.c. (or as required for fire-resistive assemblies), and within 6” of walls. Provide 1” clearance between runners and abutting walls and partitions. At channel splices, interlock flanges, overlap ends 12”, secure each end with double-strand 18-ga. tie wire.

2. Attach furring or hat channels at right angles to 1-1/2” carrying channels at 16” o.c., spacing furring within 6” of walls. Provide furring within 6” of walls and partitions. Attach furring channels with wire ties or furring channel clips installed on alternate sides of carrying channels. Saddle tie furring to channels with double-strand 18-ga. tie wire when clips cannot be alternated. At splices, nest furring channels with at least an 8” overlap and securely wire tie each end with double-strand 18-ga. tie wire.

3. A light troffers or any openings that interrupt the carrying or furring channels, install additional cross-reinforcing to restore the lateral stability of grillage.

4. Hanger wires are required within 12” on both sides of a pivoted splice clip. At least one hanger wire is required within 12” of the transition clip. Do not support wires from mechanical and/or electrical equipment.

B. Lathing

1. Apply lath with long dimension across supports and with end joints staggered between courses. Lap ends of metal lath 1” and sides at least 1/2”. If end laps occur between supports, they should be laced or tied with 18-ga. tie wire.

2. Secure lath to all supports at intervals not exceeding 6 inches. At all interior angles, metal lath should be formed into corners and carried out onto abutting surface.

C. Portland Cement Plaster

1. Nominal plaster base coat thickness:

a. First coat ‘scratch’: 3/8 inch – 1/2 inch

b. Second coat ‘brown’: 3/8 inch – 1/2 inch

2. Apply cement plaster with sufficient force (by hand or machine) to develop full adhesion between plaster and the substrate.

3. Apply first coat to completely embed lath. Cross rake slightly to provide key for second base coat. Coat must be uniform in thickness.

4. Apply second coat to provide the required total thickness. Coat must be uniform in thickness. Rod off to desired thickness, leveled to screeds, to provide a true flat plane. Follow this by wood floating or darbying the surface. Fill all voids and dress surface for acrylic finish.

5. Completed second coat of cement plaster shall cure completely, prior to application of acrylic finish. Follow manufacturer's recommendations. Generally, the minimum curing time is 7 days.

D. Control Joints

1. Perimeter isolation of suspended plaster shall be formed of Sheetrock Brand No. 66 zinc casing bead to maintain 1/4" wide continuous perimeter joint.

2. Interior ceiling areas should have control joints installed at a maximum of 30 feet 0.c. in either direction. Control joints shall be formed using Sheetrock Brand zinc control joints No. 50, 1/4" wide.

E. Acrylic Finish

1. Comply with manufacturer's instructions for mixing and application of acrylic finish.

2. Apply finish continuously and in one operation to the entire wall/soffit area maintaining a 'wet' edge so that completed finish is free of scaffold lines and other imperfections due to application methods.

3. Finish Coat: Using a stainless steel trowel, apply and level a coat of integral colored 100 % acrylic-based, aggregate textured finish to a uniform thickness.

a. Finish texture: Equal to Dryvit 'Lymestone'

F. Cleaning: Remove spattering of plaster and acrylic finish from other finished surfaces.

END OF SECTION 09 24 00

Section 09 29 00 – Gypsum Board

PART 1 – GENERAL

1.1 WORK INCLUDED

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

B. Work Includes

1. Gypsum Board & Joint Treatment
2. Gypsum Board Ceiling Suspension System
3. Acoustical Sound Attenuation Blanket Insulation
4. Drywall Moldings, Furring & Accessories

1.2 WORK INCLUDED UNDER THIS SECTION BUT SPECIFIED ELSEWHERE

A. Section 06 10 00 – Rough Carpentry: Wood blocking

B. Section 07 21 16 – Blanket Insulation

C. Section 09 22 16 – Non-Bearing Metal Wall Framing

D. Section 09 90 00 – Painting

1.3 REFERENCES

A. ASTM C36 – Gypsum Wall Board

B. ASTM C475 – Joint Treatment Materials for Gypsum Wallboard

C. ASTM C 1002 – Gypsum Board Screws

D. ASTM C514 – Nails for the Application of Gypsum Wallboard

E. ASTM C 840 – The Standard Specification for Application and Finishing of Gypsum Board

F. Gypsum Association publication GA 214-90: Recommended Specifications: Levels of Gypsum Board Finish.

G. Fire-Resistance Ratings: Provide gypsum drywall construction fire-resistance ratings indicated, conforming to assemblies tested per ASTM E 119 by inspecting and testing organization acceptable to authorities having jurisdiction.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide gypsum board and related products by one of the following:

1. Georgia-Pacific Crop.
2. National
3. United States Gypsum Co.

2.2 MATERIALS

A. Standard Gypsum Board

1. Provide gypsum panels of types indicated in maximum lengths available to minimize end joints:

a. Standard Gypsum Board: ASTM C 36, ASTM C 1278 (Indicated on drawings as Gypsum Board).

I. Type: Regular, unless otherwise indicated

II. Type: Type X for fire-resistance-rated assemblies

III. Thickness: 5/8 inch (unless noted otherwise)

IV. Edges: Tapered

B. Moisture Resistant Gypsum Board: ASTM C1396 and C630

1. Gypsum panels encased in moisture and mold resistant, 100% recycled green face and brown back papers.

    a. ASTM C743 water absorption compliant.

    b. Thickness: 5/8 inch (unless noted otherwise)

    c. Edges: Tapered

C. Furring Channels: ASTM C 645; Cold formed galvanized steel in conformance with AISI Specifications for Design of Cold-formed steel structural members.

1. 'Z'-Furring: 25 gauge x 1 1/2 deep 'z' profile with 3/4" wide flange for placement against the substrate and 1-1/4 inch wide flange for attachment of gypsum wallboard.

2. Hat-Channels: 25 gauge x 7/8" deep hat shaped corrosion-resistant flaming component used to furr out masonry wall and ceiling assemblies.

3. Resilient Channels: single leg, 25 gauge x 1/2" deep resilient channels.

D. Steel Framing Components For Suspended Flat Ceilings

1. General: Provide components complying with ASTM C 754 for conditions indicated.

2. Wire Hangers: Galvanized carbon steel, soft temper, prestretched, 12-gauge wire.

3. Ceiling Suspension System

    a. Main Carrying Channels: 1-1/2" high x 17/32" wide flange x 16-ga. cold-rolled channels.

    b. Furring Channels: 20-ga. corrosion resistant roll-formed steel, hat-shaped sections, 7/8" high x 2-9/16" wide x 12' lengths.

    c. Tie Wire: 8-ga. galvanized soft annealed wire.

E. Steel Framing Components for Suspended Gypsum Board Ceilings

1. General: Provide ASTM Class Heavy Duty components complying with ASTM C635.

2. Wire Hangers: Galvanized carbon steel, soft temper, pre-stretched, 12-guage wire.

3. Suspension System

    a. Main Tees: Fire-Rated Heavy Duty Classification, 144" long, with integral reversible splice with knurled face. 1-1/2 " face, 1.617" high.

    b. Cross Tees: 1-1/2" high x 48" long with 1-1/2" wide face.

    c. Wall Moldings: Single web with knurled face, 1" x 1-1/2"

F. Trim Accessories: ASTM C 840: manufacture's standard trim accessories, including corner bead and edge trim of beaded type with face flanges for concealment in joint compound except where semi-finishing or exposed type is indicated.

1. Provide corner bead formed from zinc alloy.

2. Provide zinc-alloy corner bead and edge trim for exterior gypsum board.

3. Provide one-piece control joints with 1/4 inch wide by 7/16 inch deep vee-shaped slot, covered with removable tape, of roll-formed zinc or extruded vinyl as recommended by gypsum board mfr.

G. Gypsum Board Joint Treatment Materials: ASTM C475 and ASTM C 840, and as follows:

1. Joint Tape: Paper reinforcing tape, unless otherwise indicated.

2. Drying-Type Joint Compounds: Factory pre-packaged vinyl-based product complying with the following requirements:

a. Taping compound formulated for embedding tape and first coat over fasteners and flanges of corner beads and edge trim.

b. Topping compound formulated for fill (2nd) and finish (3rd) coats.

H. Miscellaneous Materials: As follows, recommended by gypsum board mfr.

1. Laminating Adhesives: Product recommended by gypsum board mfr.

2. Fastening Adhesive for Wood: ASTM C557

3. Gypsum Board Screws: ASTM C 1002

4. Gypsum Board Nails: ASTM C 514

5. Concealed Acoustical Sealant: Nondrying, non-hardening, non-skinning, non-staining, gunnable, synthetic-rubber sealant recommended for sealing interior concealed joints to reduce airborne sound transmission.

I. Sound Attenuation Fire Blankets (SAFB);

1. Type: Un-faced mineral fiber blanket insulation.

2. SAFB Thickness: 3 inches

3. Density: 2.5 pcf nominal density

4. Acceptable Manufacturers

a. Owens/corning Noise Barrier.

b. Manville Sound Control Batts.

c. Certainteed “Certasound”.

d. Knauf Acoustical Blanket Insulation.

PART 3 – EXECUTION

3.1 INSPECTION

A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on the shop drawings.

B. Beginning of installation means acceptance of existing surfaces.

3.2 METAL FURRING INSTALLATION

A. Erect ‘Z’-furring channels vertically against masonry walls as indicated on the drawings. Secure ‘Z’-furring at maximum 24 inches on center with appropriate anchoring method. Provide shims behind furring channels as necessary to ensure a flush wall surface.

B. Space furring channels maximum 16 inches on center, not more than 2 inches from abutting walls. Continue furring channels from floor to 12” above finished ceiling at suspended ceiling locations.

3.3 CEILING SUSPENSION SYSTEM – FLAT CEILINGS

A. Install main carrying channels at 48” o.c. (or as required for fire-resistive assemblies), and within 6” of walls. Provide 1” clearance between runners and abutting walls and partitions. At channel splices, interlock flanges, overlap ends 12”, secure each end with double-strand 18-ga. tie wire.

B. Attach furring channels at right angles to 1-1/2” carrying channels at 16” o.c., spacing furring within 6” of walls. Provide furring within 6” of walls and partitions. Attach furring channels with wire ties or furring channel clips installed on alternate sides of carrying channels. Saddle tie furring to channels with double-strand 18-ga. tie wire when clips cannot be alternated. At splices, nest furring channels with at least an 8” overlap and securely wire tie each end with double-strand 18-ga. tie wire.

C. A light troffers or any openings that interrupt the carrying or furring channels, install additional cross-reinforcing to restore the lateral stability of grillage.

D. Hanger wires are required within 12” on both sides of a pivoted splice clip. At least one hanger wire is required within 12” of the transition clip. Do not support wires from mechanical and/or electrical equipment.

3.4 ACOUSTICAL SEALANT

A. Prior to hanging gypsum board, apply continuous bead of acoustical sealant between floor track runner and concrete slab (both sides), and between wall studs and abutting walls.

3.5 INSTALLATION (GYPSUM BOARD)

A. Install and finish gypsum board to comply with ASTM C 840 and as follows:

B. Isolate drywall construction from abutting structural and masonry work; provide edge trim and acoustical sealant as recommended by mfr. NO RAW EDGES OF DRYWALL ACCEPTABLE.

C. Screw gypsum board to metal framing and ‘Z’ –furring channels.

D. Screw both layers to supports where double-layer work is indicated or otherwise required.

E. Direct bonding: Comply with manufacturer’s recommendations where gypsum board is indicated to be directly bonded to substrate.

F. Do not bridge building expansion joints. Leave space of the width indicated between boards and trim both edges for installation of sealant or gasket.

G. Place control joints consistent with lines of buildings or as indicated on the drawings.

1. Maximum spacing of control joints shall comply with the following:

a. Interior Partitions: 30 feet

b. Interior ceilings with perimeter relief: 50 feet Max single area: 2,500 S.F.

c. Interior ceilings without perimeter relief: 30 feet Max. single area: 900 S.F.

d. Exterior Ceiling/Soffit: 30 feet Max. single area: 900 S.F.

H. Suspended Drywall Ceilings:

1. Apply gypsum panels first to ceiling and then to walls.

2. Attach gypsum panels to the suspension system main runners, cross tees and cross channels with conventional Mo.6 Type S Hi Lo bugle head, self-drilling, self-tapping steel screws spaced 8” o.c. at periphery of gypsum panels.

3. Lighting fixtures or troffers, air vents and other equipment shall be separately supported from the structure.

4. Control Joints: Provide USG control joint No. 093 where shown. Ceiling areas should not exceed 2,500 SF without perimeter relief.

3.6 DRYWALL FINISHING

A Apply joint tape and joint compound at joints between gypsum boards. Apply compounds, indicated below at accessory flanges, penetrations, fastener heads and surface defects.

B. Install compound in 3 coats (plus pre-fill of cracks where recommended by mfr); sand between coats and after last coat.

C. Joint Treatment:

1. Embedding and First Coat: Ready-mix drying type all-purpose taping compound.

2. Fill (Second) Coat: Ready-mix drying type all-purpose compound.

3. Finish (Third) Coat: Ready-mix drying type all-purpose compound.

4. Treat water-resistant gypsum, board joints, fastener heads, cut edges and penetrations in water-resistant backing board to comply with gypsum board manufacturer’s directions.

D. Finish: Level 4 smooth finish (GA 214-96)

END OF SECTION 09 29 00

Section 09 31 00 – Tiling

PART 1 – GENERAL

1.1 WORK INCLUDED:

A. Applicable provisions of Division 1 shall govern all work under this section.

B. Section Includes

1. Porcelain ceramic wall and floor tile.
2. Setting materials and grout.
3. Waterproof membrane liner.
4. Transition strip accessories.
5. Substrate preparation.
6. Thick-set mortar bed.
7. Sealants and backer materials for joints in tile work.
8. Final cleaning of tile surfaces.

1.2 RELATED WORK

A. Section 07 92 00 – Joint Sealants

1.3 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.

1. ASTM INTERNATIONAL (ASTM)
   a. ASTM C 1027(2009) Standard Test Method for Determining Visible Abrasion Resistance of Glazed Ceramic Tile
   b. ASTM C 1028(2007e1) Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull-Meter Method
   c. ASTM C 648(2004; R 2009) Breaking Strength of Ceramic Tile
   d. ASTM D 4068(2009) Chlorinated Polyethylene Sheeting for Concealed Water-Containment Membrane
   d. ASTM E 2129(2005) Standard Practice for Data Collection for Sustainability Assessment of Building Products
2. GREEN SEAL (GS)
   a. GS-36(2000) Commercial Adhesives
3. GREENGUARD ENVIRONMENTAL INSTITUTE (GEI)
   a. GEIGreenguard Standards for Low Emitting Products
4. TILE COUNCIL OF NORTH AMERICA (TCNA)
   a. TCA Hdbk (2008) Handbook for Ceramic Tile Installation

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittals Procedure:

1. Product Data
   a. Tile
   b. Setting Adhesives
   c. Sheet membrane waterproofing and crack isolation underlayment
   d. Grout, and Adhesive

2. Samples

a. Tile

b. Sheet membrane waterproofing membrane

c. Trim accessories

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install adhesives in a closed, unventilated environment.

B. Maintain 50 deg. F during installation of mortar materials.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. For basis of design, the plans are based on tile products from Dal-Tile. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate metal roofing products shall submit product data sheets and/or specifications.

1. Interceramic

2. Crossville Tile

B. Tile Setting Materials

1. Bostik

2. Custom Building Products

3. Laticrete International, Inc.

4. Hydroment

5. Mapei Corporation

C. Tile Grout

1. Polyblend

2. Mapei

3. Hydroment

4. TEC

2.2 SETTING MATERIALS

A. Latex-Portland Cement Mortar: ANSI A118.4, composed as follows:

1. Mixture of Dry-Mortar Mix and Latex Additive: Mixture of prepackaged dry-mortar mix and liquid-latex additive complying with the following requirements:

a. Latex Additive: Manufacturer's standard.

b. For wall applications, provide non-sagging, latex-portland cement mortar complying with ANSI A118.4 for mortar of this type defined in Section F-2.1.2.

2.3 GROUTING MATERIALS

A. Latex-Portland Cement Grout: ANSI A118.6 for materials described in Section H-2.4, composed as follows:

B. Mixture of Dry-Grout Mix and Latex Additive: Mixture of factory-prepared, dry-grout mix and latex additive complying with the following requirements:

1. Unsanded Dry-Grout Mix: Dry-set grout complying with ANSI A118.6 for materials described in Section H-2.3, for joints 1/8 inch and narrower.

2. Latex Additive: Manufacturer's standard.

3. Color(s): As selected from manufacturer's full range of color choices.

2.4 ANTIFRACTURE/WATERPROOF MEMBRANE

A. Liquid latex waterproofing and crack prevention membrane complying with ASTM A118.10 and A118.12.

1. Manufacturers:

a. Greenseel Products

b. Custom Building Products ‘RedGard’

2.5 ELASTOMERIC SEALANTS

A. Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Section 07 92 00 - Joint Sealants.

1. Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

2.6 METAL TRANSITION STRIPS

A. Manufacturer: For basis of design, the plans are based on metal transition products from Schluter® Systems. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications.

B. Flooring Applications

1.	Floor Tile to Resilient Flooring	Schluter® RENO-U
2.	Floor Tile Movement Joint	Schluter® DECO
3.	Floor Tile to Carpet	Schluter® SCHIENE
4.	Floor Tile to Exposed Slab	Schluter® RENO-RAMP

C. Wall Tile Vertical Outside Edge Protection Trim

1. Schluter Systems ‘JOLLY’’, aluminum with trapezoid-perforated anchoring leg that is secured in the mortar bond coat beneath the tile.

D. Wall Tile Inside Wall Corners and Floor/Wall Protection Trim

1. Schluter Systems ‘DILEX-AHK’’, aluminum with trapezoid-perforated anchoring leg that is secured in the mortar bond coat beneath the tile and a cove section that forms the visible surface.

2.7 PORCELAIN TILE SCHEDULE

A. Floor Porcelain Tile (PCT-1)

1. Daltile ‘Unity’

2. Size: 12” x 12”

3. Color: ‘Grigio’ P402 Matte

B. Wall Porcelain Tile (PCT-2)

1. Daltile ‘Affinity’

2. Size: 12” x 12”

3. Color: ‘Gray’ AF03 Matte

C. Floor Porcelain Tile Cove Base (PCT-3)

1. Daltile ‘Unity’

2. Size: 6” x 12” S36C9

3. Color: ‘Grigio’ P402 Matte

PART 3 – EXECUTION

3.1 WALL SUBSTRATE PREPARATION

A. Examine concrete masonry surfaces which are to receive ceramic tile to assure that surfaces are stable, flat, firm, dry, clean. Remove protrusions, bumps, and ridges by sanding.

3.2 INSTALLATION - GENERAL

A. Blending: For tile exhibiting color variations within the ranges selected during sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved samples.

B. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated.

C. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated.

D. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Adjust layout to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.

E. Grout tile to comply with the requirements of the following tile installation standards:

1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

F. Wall Tile Installation: Install tile to comply with requirements indicated, including those referencing TCA installation methods and ANSI A108 series of tile installation standards.

1. Joint Widths: 1/8 inch

3.2 INSTALLATION – THIN SET METHOD

A. Install in compliance with TCA Installation Method F113-09.

3.3 INSTALLATION – FULL MORTAR BED METHOD

A. In areas where waterproofing is required, pour reinforced cement mortar bed and install waterproof membrane, tile, and grout according to TCA Installation Method F121-09.

1. Applicable Locations: Toilet and shower rooms

B. Slope mortar bed to floor drains as indicated on the drawings.

C. Lay tile to pattern indicated on the drawings.

D. Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor and base joints.

E. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight without voids, cracks, excess mortar, or excess grout.

F. Sound tile after setting. Replace hollow sounding units.

G. Keep expansion and control joints free of mortar or grout. Apply sealant to joints.

H. Grout tile joints.

I. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

3.4 CLEANING AND PROTECTION

A. If one has been used, remove grout release and clean tile surfaces so they are free of grout residue and foreign matter, according to manufacturer's instructions. If a grout haze or residue remains, use a suitable grout haze remover or cleaner and contact grout manufacturer for recommendations. Flush surface with clean water before and after cleaning. Do not use harsh hydrochloric, muriatic or sulfuric acid or acid-based cleaners to clean glazed tiles or tiles grouted with latex modified grout.

B. When a heavy residue of Portland cement grout is present, acceptable tile cleaning acids may be used. However, the grout should be allowed to cure a minimum of 10 days before this aggressive cleaning method is employed. Tile and grout shall be soaked with water before cleaning. In the absence of a recommendation from the grout manufacturer, acid cleaning may be done with a saturated solution of phosphoric or sulfamic acid, mixed according to manufacturer's recommendations.

C. Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

END OF SECTION 09 31 00

Section 09 51 00 – Acoustical Tile Ceilings

PART 1 – GENERAL

1.1 WORK INCLUDED

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

B. Work Includes

1. Suspended metal grid ceiling system.
2. Acoustical tile
3. Accessories

1.2 RELATED WORK

A. Section 12 20 00 – Window Treatment: Recessed Solar Shade Ceiling Pocket

B. Division 23 – Mechanical: Air diffusion grilles in ceiling system

C. Division 26 – Electrical: Light fixtures in ceiling system

1.3 REFERENCES

A. ASTM C635 – Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings

B. ASTM C636 – Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels

C. FS HH-I-521 – Insulation Blankets, Thermal Mineral Fiber, for Ambient Temperatures

1.4 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Product Data
2. Samples: 6-inch square samples of each acoustical panel type, pattern, and color. Set of 12-inch long samples of exposed suspension system members, including moldings, for each color and system type required.

1.5 FIRE-TEST-RESPONSE CHARACTERISTICS

A. Provide acoustical panel ceilings that comply with the following requirements:

1. Surface-burning characteristics of acoustical panels comply with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84.
   a. Flame spread: 25 or less.
   b. Smoke developed: 50 or less.

1.6 GUARANTEE

A. Manufacturer's 30-year limited warranty against sagging or warping due to humidity conditions, mold/mildew, and bacterial growth.

B. Suspension Grid: Provide written guarantee of no visible red rust on exposed to view surfaces for 10 years from date of substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS- ACOUSTICAL TILE

A. Acoustical Panel Products:

1. Armstrong World Industries, Inc.
2. CertainTeed
3. USG Interiors Inc.

2.2 MANUFACTURERS – SUSPENSION GRID

A. Subject to compliance with requirements, provide products from one of the following:

1. Armstrong World Industries, Inc.

2. Chicago Metallic Corporation.

3. USG Interiors, Inc.

4. CBI USA.

2.3 MATERIALS

A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, acoustical ratings, and light reflectances, unless otherwise indicated.

1. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified to have a CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.

B. Nodular, Cast, or Molded, (Type III, Form 1) or Water-Felted, (Type III, Form 2) Mineral-Base Acoustical Panels, per ASTM E 1264, with painted finish, complying with pattern and other requirements indicated below:

C. Ceiling panels shall be humidity resistant and treated with special biocide that inhibits the growth of mold or mildew associated with prolonged high humidity conditions.

D. Ceiling Tile Schedule (Mineral Base Acoustical Panels)

ACT-1 24" x 24" x 5/8” Angled tegular edge

NRC .55

CAC 35

Light Reflectance 0.84 min.

Fire Resistance: Class ‘A’

1. Manufacturers: Armstrong #1732 Fine Fissured w/ Humiguard Plus or approved equivalent products from Celotex and USG subject to approval by architect.

E. Suspension System Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

1. Cast-In-Place and Post-installed Anchors in Concrete: Cast-in-place or expansion anchors, with holes or loops for attachment of hangers of type indicated and with capability to sustain, without failure, a load equal to 5 times that imposed by ceiling construction, as determined by testing per ASTM E 488, conducted by a qualified testing agency.

2. Powder-Actuated Fasteners in Concrete: Fastener system fabricated from corrosion-resistant materials, with clips or other accessory devices for attachment of hangers, and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing per ASTM E 1190, conducted by a qualified testing agency.

F. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper.

2. Nickel-Copper Alloy Wire/Fasteners: Provide Monel (L.D. Peters (800) 221-9933) nickel- copper alloy suspension wire, or equal, and nickel-copper alloy fasteners/anchors where low PH and/or high chlorine conditions exist (example: pool). Comply with ASTM B 164 fur UNS N04400 alloy.

3. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire but provide not less than 0.106-inch- (2.69-mm-) diameter wire.

G. Sheet-Metal Edge Moldings and Trim: Type and profile indicated, or if not indicated, manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners. Provide manufactured shapes of proper size(s) where ceiling mouldings abut radiused materials (radiused block, round columns, etc.).

1. Wall Edge Molding: Provide manufacturer’s standard angle type wall channel.

2. Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635 requirements:

3. 15/16”Grid Face, Capped, Steel Suspension System: Main and cross runners roll formed from minimum G-30 hot-dipped galvanized/electro-galvanized/prime painted (guaranteed 15 years against any visible red rust on exposed to view surfaces), cold-rolled steel sheet, with prefinished metal caps on flanges; other characteristics as follows:

   a. Structural Classification: Intermediate-duty system.

   b. End Condition of Cross Runners: Override (stepped) or butt-edge type, as standard with manufacturer.

   c. Cap Material and Finish: Steel sheet painted to match color indicated by manufacturer's standard color designations – Color: White.

2.4 ATTIC STOCK:

A. Prior to project close-out, deliver replacement material to owner in the amount of 1 box for every 50 installed, or fraction thereof (2 boxes minimum), of each type, pattern, color or size.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install acoustical panel ceilings to comply with publications referenced below per manufacturer's instructions and CISCA "Ceiling Systems Handbook."

1. Standard for Ceiling Suspension System Installations: Comply with ASTM C 636.

2. Balance ceiling borders on opposite sides, using more-than-half-width acoustical units.

B. Suspend ceiling hangers as follows:

1. Secure wire hangers to ceiling suspension members and to supports above. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.

2. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches (200 mm) from ends of each member.

C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels. Secure to building structure with screw anchors spaced 16" o. c. Mitre corner joints.

D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members. Cope exposed edges of intersecting exposed suspension members to produce flush intersections.

E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.

END OF SECTION 09 51 00

Section 09 65 00 – Resilient Flooring

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work Includes:

1. Heterogeneous sheet vinyl flooring.
2. Vinyl wall base.

1.2 RELATED SECTIONS

A. Section 09 31 00 – Tiling: Flooring Transition Strip

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – SUBMITTAL PROCEDURES:

1. Product Data
    a. Manufacturer's product data and installation instructions for each type of resilient flooring.
2. Samples
    a. Samples of each type, color and pattern of resilient flooring and accessories; full size for tile.
3. Maintenance instructions for each type of flooring.

1.4 WARRANTY

A. Submit copies of manufacturer’s standard warranty against material and/or manufacturing defects.

PART 2 – PRODUCTS

2.1 SHEET VINYL FLOORING

A. Manufacturers:

1. For basis of design, the plans are based on the sheet vinyl as manufactured by Polyflor 2000 PUR.
2. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer’s wishing to submit alternate sheet vinyl products shall submit product data sheets and/or specifications.
    a. Armstrong Commercial Flooring
    b. Mannington

B. Materials

1. Composition: Homogenius polyurethane reinforced cross linked and UV cured sheet flooring.
2. Gauge: 2 mm
3. Sheet Size: 6’ – 6”
4. Fire Test Data: ASTM E648 Class 1
5. Abrasion Resistance: Group M
6. Smoke Developed: 450 or less
7. Static Load Limit: ASTM F 970 Modified 750 psi

C. Colors

1. ‘Stonewall’ 8230

2.2 VINYL WALL BASE

A. Manufacturers

1. For basis of design, the plans are based on the resilient wall base as manufactured by Armstrong.

2. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications.

a. Johnsonite, Chagrin Falls, OH: ‘Traditional’ collection

b. Roppe

c. VPI

B. Material: ASTM F 1861-98; 4" high; 0.125" gage; with matching stops; standard top-set cove unless otherwise indicated. Provide base in 96’-0” rolls (4’-0” lengths not acceptable).

C. Colors

1. Armstrong ‘Flagstone’ R48FS

PART 3 – EXECUTION

3.1 EXAMINATION

A. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Apply primer to concrete substrates as recommended by flooring manufacturer.

3.3 INSTALLATION

A. Comply with flooring manufacturer's recommendations for type(s) of materials, adhesives, project conditions, and intended use.

3.4 CLEANING

A. Clean floors and accessories after installation according to flooring manufacturer's instructions.

END OF SECTION 09 65 00

Section 09 68 00 – Carpeting

PART 1 – GENERAL

1.1 SECTION INCLUDES

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

B. Section includes:

1. Modular carpet tile.

2. Stitched carpet wall base with same pattern as modular carpet tile.

1.2 REFERENCES

A. ASTM E84 – Surface Burning Characteristics of Building Materials

1.3 SUBMITTALS

A. Submit Product Data for each type of carpet, and the following:

B. Samples two full tile samples illustrating color and pattern for each carpet material specified.

C. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

1. Maintenance Data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

1.4 QUALITY ASSURANCE

A. Contractors Certification: Provide certification testifying installation contractor is certified by the Floor Covering Installation Board (FCIB).

1.5 WARRANTY

A. Warranty to be sole source responsibility of the Manufacturer. Second source warranties and warranties that involve parties other than the carpet manufacturer are unacceptable.

B. If the product fails to perform as warranted when properly installed and maintained, the affected area will be repaired or replaced at the discretion of the Manufacturer.

C. Chair pads must not be required for carpet warranty coverage.

D. Warranty shall be for a specifically defined non-prorated period of 15 years. "Lifetime" warranties are not acceptable.

E. Warranty shall not exclude carpet product installed on stairs provided it is properly installed and maintained.

F. The non-prorated twenty-year warranty shall specifically warrant against:

1. Excessive Surface Wear: More than 15% loss of pile fiber weight.

2. Excessive Static Electricity: More than 3.0 kV per AATCC 134.

3. Resiliency Loss of the Backing: More than 10% loss of backing resiliency.

4. Delamination

5. Edge Ravel (Tuft Bind warranty in lieu of edge ravel and zippering is not acceptable.)

6. Zippering

1.6 PROJECT CONDITIONS

A. Sub-floor preparation is to include all required work to prepare the existing floor for installation of the product as specified in this document and Manufacturer's installation instructions.

B. The maximum amount of moisture evacuation from the floor is 3.0 pounds per 1,000 square feet in 24 hours. The acceptable pH level of the substrate is between 7.0 and 9.0. Flooring contractor is responsible for floor testing.

C. All material used in the sub-floor preparation and repair shall be recommended by the carpet manufacturer and shall be chemically and physically compatible with the carpet system being bid.

D. Maintain minimum 65 degrees F ambient temperature and 65% Relative Humidity for 72 hours prior to, during, and 48 hours after installation.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. For basis of design, the plans are based on Interface 'Kamala II'

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate carpet products shall submit product data sheets and/or specifications.

1. C & A Floor coverings
2. Mannington
3. Patcraft
4. J&J Commercial

2.2 MATERIALS

A. Modular Carpet Tile

1. Tufted texture loop
2. Antimicrobial Treatment: (AATCC 138 Washed) (AATCC 174 Parts 2 & 3)
3. Soil/Stain Protection: Protekt® with Duratech®
4. Size: 50 cm x 50 cm.
5. Dye Method: 100% Solution Dyed
6. Pile Density: 5,667 oz/SY
7. Backing: GlasBac® Tile

B. Performance Specifications

1. Indoor Air Quality: Green Label Plus Certified #GLP0820
2. Radiant Panel: (ASTM E-648) Class 1
3. Smoke Density: ASTM E – 662

C. Trowelable Underlayments and Patching Compounds: As recommended by the carpet manufacturer.

1. 3000 psi minimum Portland cement based leveling compound and substrate primer according to carpet manufacturer's recommendations.

2.3 CARPET COLOR: 'Sake' 101587

2.4 STITCHED CARPET BASE

A. Provide matching 4 inch high stitched edge carpet base where indicated on the plans and Room Finish Schedule.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are smooth and flat with maximum variation of 1/8 inch in 10 feet and are ready to receive work.

B. Beginning of installation means acceptance of existing substrate and site conditions.

3.2 PREPARATION

A. Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes, and other defects with subfloor filler. Use leveling and patching compounds to fill cracks, holes, and depressions in subfloor as recommended by the Carpet manufacturer.

B. Clean floors and apply min. 3000 psi. Portland cement based leveling compound and substrate primer if required, according to flooring manufacturer's instructions. Start of laying flooring product will indicate acceptance of floor slab conditions.

C. Prohibit traffic from area until filler is cured.

D. Vacuum clean substrate.

E. Project Conditions: Comply with CRI 104, Section 6: "Site Conditions."

F. Subfloor Moisture Conditions: Provide moisture content, vapor emission, and alkalinity testing of the concrete slab, as well as all other tests recommended by the carpet manufacturer and adhesives. Tests shall indicate (in addition to other information) if slabs pass the following:

1. Verify that concrete floors are dry to a maximum moisture content of 7 percent and exhibit Negative alkalinity, carbonization, or dusting. Submit testing results to owner’s supervising professional.

G. Remove subfloor coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone.

H. Apply manufacturer’s recommended Primer Barrier Coating over entire surface.

3.3 INSTALLATION

A. Apply TacTiles at each corner along anchor rows and perimeter walls according to manufacturer’s guidelines.

B. TacTiles must be applied under every cut tile and any adjoining tile to the cut tile. Install TacTile an any area that will be exposed to high foot traffic and/or heavy rolling traffic.

C. Vacuum carpet using commercial machine with face-beater element.

D. Clean carpet to remove spots and soiling. Replace carpet tile where spots cannot be removed. Remove adhesive from carpet surface with manufacturers recommended cleaning agents. Remove protruding face yarns according to manufacturer’s recommendations.

E. Remove and dispose of debris and unusable scraps.

F. Protection: Comply with CRI 104, Section 15: "Protection of Indoor Installation."

G. Apply stitched carpet base to all wall surfaces or recessed toe-kick spaces at built-in base cabinets.

END OF SECTION 09 68 00

Section 09 77 00 – Fiberglass Reinforced Panels (FRP)

PART 1 – GENERAL

1.1 SUMMARY

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

B. Section includes:

1. Fiberglass reinforced plastic panels
2. Substrate preparation

1.2 REFERENCES

A. ASTM D2583 Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.

B. ASTM D5420 Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).

C. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SYSTEM DESCRIPTION

A. Performance Requirements: Provide fiberglass reinforced plastic (FRP) panels which have been manufactured and installed to maintain performance criteria stated by manufacturer without defects, damage or failure.

1.4 SUBMITTALS

A. General: Submit listed submittals.

B. Product Data: Submit product data.

C. Shop Drawings: Submit shop drawings showing layout, profiles and product components, including anchorage, accessories, finish colors, patterns and textures. Indicate location and dimension of joints and fastener attachment.

D. Samples: Submit selection and verification samples for finishes, colors and textures. Submit 2 samples of each type of panel, trim and fastener.

1. Manufacturer’s Instructions: Manufacturer’s installation instructions. Submit manufacturer’s Installation Guide #6211.

E. Closeout Submittals: Submit the following:

1. Operation and Maintenance Data: Operation and maintenance data for installed products according to Division 01 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products and precautions against cleaning materials and methods detrimental to finishes and performance.
2. Warranty: Warranty documents specified herein.

1.5 PROJECT CONDITIONS

A. Environmental Requirements

1. Installation shall not begin until building is enclosed, permanent heating and cooling equipment is in operation, and residual moisture from concrete work has dissipated.
2. During installation, and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
3. Provide ventilation to disperse fumes during application of adhesive as recommended by adhesive manufacturer.

B. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.6 WARRANTY

A. 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.

1.7 MAINTENANCE

A. Extra Materials: Deliver to owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 01 Closeout Submittals (Maintenance Materials) Section.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. For basis of design, the plans are based on Crane Composites, Inc.

B. Equivalent products from the following alternate manufacturers will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate FRP products shall submit product data sheets and/or specifications.

1. Marlite
2. Kal-Lite

2.2 MATERIALS

A. Wall Panels:

1. Thickness, finish: 0.09" (sandstone)
2. Color: Pepper Dust (8044)
3. Sheet Sizes: Provide panels of 4' wide x 10' high

B. Moldings: Provide harmonizing PVC (polyvinyl chloride) moldings matched to panels.

C. Division Bars, Corner Trim: Panel manufacturer's standard length extruded vinyl pieces; longest length possible to eliminate end joints.

D. Fasteners: Noncorrosive drive rivets.

2.3 PERFORMANCE PROPERTIES

A. Class C flamespread per ASTM E84 latest version.

B. Barcol Hardness (scratch resistance) of 55 as per ASTM D2583.

C. Gardner Impact Strength of 40 in-lb (4.5 J) showing no visible damage on front side per ASTM D5420.

D. Meets USDA/FSIS requirements.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Site Verification of Conditions: Verify that substrate conditions, which have been previously installed under other sections, are acceptable for product installation according to manufacturer's instructions.

3.2 INSTALLATION

A. Install panels with manufacturer’s recommended gap for panel field and corner joints.

B. Predrill fastener holes in panels with 1/8 inch (3.2 mm) oversize.

C. For trowel type and application of adhesive, follow adhesive manufacturer’s recommendations.

3.3 CLEANING

A. Cleaning: Remove temporary coverings and protection of adjacent work areas. Repair or replace products that have been installed and are damaged. Clean installed products according to manufacturer’s instructions prior to owner’s acceptance. Remove construction debris from project site and legally dispose of debris.

END OF SECTION 09 77 00

Section 09 90 00 – Painting

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 surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.

1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where the plans indicate that a surface or material is not to be field painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Supervising Professional will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, labels.

1. Prefinished items include but are not limited to the following factory-finished components:

a. Flush wood doors

b. Overhead sectional doors

c. Architectural casework.

d. Finished mechanical and electrical equipment.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

a. Ceiling plenums.

b. Pipe spaces.

c. Duct shafts.

3. Finished metal surfaces include the following:

a. Anodized aluminum.

b. Stainless steel.

c. Copper.

4. Operating parts include moving parts of operating equipment and the following:

a. Valve and damper operators.

b. Linkages.

c. Sensing devices.

d. Motor and fan shafts.

5. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

D. Related Sections include the following:

1. Division 3 Section "Cast in Place Concrete" for surface preparation of exposed interior concrete finishes.
2. Section 04 20 00 – Unit Masonry: Field applied sealer to ground faced CMU surfaces.
3. Section 05 50 00 – Metal Fabrications
4. Section 05 52 13 – Pipe & Tube Railings
5. Division 6 Section "Interior Architectural Woodwork" for shop priming interior architectural woodwork.
6. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
7. Division 9 Section "Gypsum Board Assemblies" for surface preparation for gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

1. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
2. Eggshell refers to low-sheen finish with a gloss range between 5 and 20 when measured at a 60-degree meter.
3. Satin refers to low-sheen finish with a gloss range between 15 and 35 when measured at a 60-degree meter.
4. Semigloss refers to medium-sheen finish with a gloss range between 30 and 65 when measured at a 60-degree meter.
5. Full gloss refers to high-sheen finish with a gloss range more than 65 when measured at a 60-degree meter.

1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 - Submittal Procedures.

B. Product Data: Submit manufacturer's technical information, label analysis, and application instructions for each paint material proposed for use.

1. List each material and cross-reference specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.
2. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOC’s).

C. Samples for verification purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions; define specific products to be used for each coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture is achieved.

1. Submit samples for the architect's review of color and texture only:
   a. Submit 3 drawdowns of each product and color combination. Drawdowns shall be applies using a 4 mil WFT drawdown bar on Leneta form WD plain white coated cards size 3 7/8” x 6”. Label each card with the job name, date, product name, product number and color number as stated in the Color Schedule.
2. Samples for initial color selection in the form of manufacturer's color charts shall be submitted to the Supervising Professional for color selection. Field samples on various surfaces to be finished may be requested by the Supervising Professional.

D. Maintenance data for each product specified, to include in Operating and Maintenance Manual specified in Division 1.

1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.

B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F (10 and 32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F (7.2 and 35 deg C).

C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied in the quantities described below. Package paint materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to the owner.

1. Quantity: Provide one gallon of each type of stain and paint to owner.
2. Provide formulation of each paint product and color used on project.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the plans are based on the following paints, coatings and stains from The Sherwin-Williams Company.

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate paint products shall submit paint product data sheets and/or specifications cross referenced from the Sherwin Williams paint numbers listed in this Section.

1. Pittsburgh (PPG).
2. Hallman/Lindsay (HL).
3. ICI Paints (ICI).
4. Mautz Paint (MP).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat 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.

B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types specified. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance for proposed substitutions.

C. Colors: For basis of design, the color selections listed in the Color Schedule are based on the paints, coatings and stains from The Sherwin-Williams Company.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Supervising Professional about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

    a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

    b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

3. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

    a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

    b. Prime, stain, or seal wood to be painted immediately on delivery. Prime edges, ends, faces, undersides, and backsides of wood, including chair rail, counter edge bands, and shelving.

    c. When transparent finish is required, backprime with spar varnish.

    d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.

    e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.

4. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

    a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

5. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.

3. Use only thinners approved by paint manufacturer and only within

    recommended limits.

E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment with prime coat only.
6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.
7. Finish exterior doors on tops, bottoms, and side edges the same as exterior faces.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush or roller according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to items exposed in equipment rooms and in occupied spaces.

1. Items to be painted include: Piping and accessory items.

F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

G. Prime Coats: Before applying finish coats, apply a prime coat of material, as

recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Supervising Professional.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

C. Paint plywood equipment boards in their entirety prior to the installation of equipment. Coordinate this Work with other trades.

3.6 EXTERIOR PAINT SCHEDULE

A. Ferrous Metal: Provide the following finish systems over exterior ferrous metal. Primer is not required on shop-primed items.

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a rust-inhibitive primer.

a. Primer: Rust-inhibitive metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.3 mils (0.033 mm).

I. Moore: IronClad Retardo Rust-Inhibitive Paint #163.

II. PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.

III. P & L: S 4551 Tech-Gard High Performance Rust-Inhibitor Primer.

IV. S-W: Kem Kromik Metal Primer B50N2/B50W1.

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 3.0 mils (0.076 mm).

I. Moore: Impervo Enamel #133.

II. PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.

III. P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.

IV. S-W: Industrial Enamel B-54 Series.

B. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated (galvanized) metal surfaces:

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a galvanized metal primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

I. Moore: IronClad Galvanized Metal Latex Primer #155.

II. PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.

III. P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

IV. S-W: Galvite Paint B50W3.

b. First and Second Coats: Full-gloss, exterior, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

I. Moore: Impervo Enamel #133.

II. PPG: 6-282 Speedhide Interior/Exterior Gloss-Oil Enamel.

III. P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.

IV. S-W: Industrial Enamel B-54 Series.

C. Aluminum: Provide the following finish systems over exterior aluminum surfaces that are not factory finished.

1. Full-Gloss, Alkyd-Enamel Finish: 2 finish coats over a primer.

a. Primer: Rust-inhibitive, acrylic- or alkyd-based, metal primer, as recommended by the manufacturer for use over aluminum, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.4 mils (0.036 mm).

II. Moore: IronClad Retardo Rust-Inhibitive Paint #163.

II. PPG: 90-709 Pitt-Tech Primer.

III. P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

IV. S-W: Pro-Cryl Universal Water Based Primer B66-310.

b. First and Second Coats: Full-gloss, alkyd enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.6 mils (0.066 mm).

I. Moore: Impervo Enamel #133.

II. PPG: 6-282 Speedhide Interior/Exterior Gloss Oil Enamel.

III. P & L: S 4500 Series Tech-Gard Maintenance Gloss Enamel.

IV. S-W: Industrial Enamel B-54 Series.

3.7 INTERIOR PAINT SCHEDULE

A. Concrete Masonry Units: Where scheduled, provide the following finish systems over interior concrete masonry block units:

1. Semigloss, Alkyd-Enamel Finish: 2 finish coats over an undercoat and a filled surface.

a. Block Filler: High-performance, latex-based, block filler applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 5.0 mils (0.13 mm).

I. Moore: Moorcraft Interior & Exterior Block Filler #173.

II. PPG: 6-7 Speedhide Interior/Exterior Masonry Latex Block Filler.

II. P & L: Z 98 Pro-Hide Plus Latex Block Filler.

IV. S-W: Prep-Rite Blockfiller B25W25.

b. Undercoat: Interior, alkyd- or latex-based, enamel undercoater, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

II. Moore: Moore's Alkyd Enamel Underbody #217.

II. PPG: 6-855 Speedhide Interior Latex Enamel Undercoater.

III. P & L: S/D 1012 Suprime "12" Interior Alkyd Wall Primer.

IV. S-W: Promar 200 Alkyd Semi-Gloss

c. Finish Coat: Odorless, semigloss, alkyd, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

II. Moore: Satin Impervo #235.

II. PPG: 27 Line Wallhide Low Odor Interior Enamel Wall and Trim Semi-Gloss Oil.

III. P & L: S/D 5700 Series Cellu-Tone Alkyd Satin Enamel.

IV. S-W: Promar 200 Alkyd Semi-Gloss

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Low-Luster, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Latex-based, interior primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

I. Moore: Regal First Coat Interior Latex Primer & Underbody #216.

II. PPG: 17-10 Quick-Drying Interior Latex Primer-Sealer.

III. P & L: Z/F 1004 Suprime "4" Interior Latex Wall Primer.

IV. S-W: PrepRite 200 Interior Latex Primer

b. First and Second Coats: Low-luster (eggshell or satin), acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.8 mils (0.071 mm).

I. Moore: Moore's Regal AquaVelvet #319.

II. PPG: 89 Line Manor Hall Eggshell Latex Wall and Trim Enamel.

III. P & L: Z/F 4000 Series Accolade Interior Velvet.

IV. S-W: ProMar 200 Interior Latex Eg-Shel B20 Series

C. Stained Woodwork: Provide the following stained finishes over, interior woodwork:

1. Alkyd-Based, Satin-Varnish Finish: 2 finish coats of an alkyd-based, clear-satin varnish over a sealer coat and an alkyd-based, interior wood stain. Wipe wood filler on open grain woods before applying stain.

a. Filler Coat: Paste-wood filler applied at spreading rate recommended by the manufacturer.

I. Moore: Benwood Paste Wood Filler #238.

II. PPG: None required.

III. P & L: None required.

IV. S-W: Sher-Wood Natural Filler.

b. Stain Coat: Alkyd-based, interior wood stain applied at spreading rate recommended by the manufacturer.

I. Moore: Benwood Penetrating Stain #234.

II. PPG: 77-302 Rez Interior Semi-Transparent Stain.

III. P & L: S-Series Tonetic Wood Stain.

IV. S-W: Oil Stain A-49 Series.

c. Sealer Coat: Clear sanding sealer applied at spreading rate recommended by the manufacturer.

I. Moore: Moore's Interior Wood Finishes Quick-Dry Sanding Sealer #413.

II. PPG: 77-30 Rez Interior Quick-Drying Sealer and Finish.

III. P & L: H-40 Sanding Sealer.

IV. S-W: Wood Classics FastDry Sanding Sealer B26V43.

d. First and Second Finish Coats: Alkyd-based or polyurethane varnish, as recommended by the manufacturer, applied at spreading rate recommended by the manufacturer.

I. Moore: Benwood Satin Finish Varnish #404.

II. PPG: 77-7 Rez Varnish, Interior Satin Oil Clear.

III. P & L: H24 38 Clear Finish Gloss.

IV. S-W: FastDry Oil Base Varnish, Gloss A66-300.

D. Ferrous Metal and Plywood Equipment Boards: Provide the following finish systems over ferrous metal:

1. Full-Gloss, Acrylic-Enamel Finish: 2 finish coats over a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.5 mils (0.038 mm).

I. Moore: IronClad Retardo Rust-Inhibitive Paint #163.

II. PPG: 6-208 Speedhide Interior/Exterior Rust Inhibitive Steel Primer.

III. P & L: S 4551 Tech-Gard High Performance Rust Inhibitor Primer.

IV. S-W: Kem Kromik Metal Primer B50N2/B50W1.

b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

I. Glidden:6900 Series Lifemaster Pro Hi-Performance Acrylic Coating.

II. Moore: Impervex Enamel #309.

III. PPG: 51 Line Brilliant Reflections Interior/Exterior Latex Gloss Enamel.

IV. P & L: Z/F 4400 Series Accolade Interior High Gloss.

V. S-W: ProMar 200 Interior Latex Gloss Enamel B21W201.

E. Zinc-Coated Metal: Provide the following finish systems over zinc-coated metal:

1. Full-Gloss, Acrylic-Enamel Finish: 2 coats over a primer.

a. Primer: Galvanized metal primer applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 1.2 mils (0.031 mm).

I. Moore: IronClad Galvanized Metal Latex Primer #155.

II. PPG: 90-709 Pitt-Tech One Pack Interior/Exterior Primer/Finish DTM Industrial Enamel.

III. P & L: Z/F 1003 Suprime "3" Interior/Exterior Latex Metal Primer.

IV. S-W: Galvite Paint B50W3.

b. First and Second Coats: Full-gloss, acrylic-latex, interior enamel applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.5 mils (0.064 mm).

I. Moore: Impervex Enamel #309.

II. PPG: 51 Line Brilliant Reflections Interior/Exterior Latex Gloss Enamel.

III. P & L: Z/F 4400 Series Accolade Interior High Gloss.

IV. S-W: Industrial Enamel B54YZ37.

2. Color: For interior pipe rails, handrails, guardrails, and steel tube curbs at inspection pits, paint safety yellow.

F. Interior Metal Decks Exposed To View:

1. Dry Fall Flat Finish: 2 finish coats over a primer.

a. Primer: Quick-drying, rust-inhibitive, alkyd-based or epoxy-metal primer, as recommended by the manufacturer for this substrate, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 2.0 mils.

I. S-W: Kem Bond HS.

b. First and Second Coats: Dry fall flat white modified alkyd paint for interior use, applied at spreading rate recommended by the manufacturer to achieve a total dry film thickness of not less than 4.0 mils.

I. S-W: Dry Fall Flat White B48W60.

G. Traffic Striping on Interior Concrete Floors: Provide the following finish systems as indicated on the drawings:

1. Two-component, 100% Solids Epoxy, Rust-Oleum 6500 System, Mautz Paint Co.

   a. Preparation: Per manufacturer's instructions.

   b. Application: Per manufacturer's instructions.

2. Color: For interior traffic striping, paint safety yellow.

END OF SECTION 09 90 00

Section 09 96 00 – High Performance Coatings

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes:

1. Fluid applied seamless flooring with integral cove base.

2. Joint, edge, and termination strips.

3. Prior to installation of structural floor slab, advise [General Contractor] of all requirements of concrete substrate regarding finish, level tolerance, and curing; see INSPECTION in Part 3.

4. Locate all flexible joints required. See submittals below.

5. Accessories necessary for complete installation.

B. Related Sections:

1. Cast-in-Place Concrete: Section 03300.
   a. Concrete sub-floor to be level (maximum variation not to exceed ¼ inch in 10 feet) and to have a steel troweled finish. No curing agents or other additives which could prevent bonding should be used unless the mechanical surface preparation method completely removes the curing agent residue or sealer.
   b. Slabs on grade must have an efficient puncture resistant vapor barrier placed directly under the slab.

2. Sealants: Section 07920

1.02 REFERENCE STANDARDS

The publications listed below from a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

A. American Society for Testing and Materials (ASTM) Publications:

C-307 Test Method for Tensile Strength of Chemical-Resistant Mortars.

C-531 Test Method for Linear Shrinkage and Coefficient of Thermal Expansion of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.

C-579 Test Methods for Compressive Strength of Chemical-Resistant Mortars and Monolithic Surfaces.

C-580 Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, and Monolithic Surfacing.

C-884 Test Method for Thermal Compatibility Between Concrete and an Epoxy Resin Overlay.

B. ACI 301 Specifications for Structural Concrete for Buildings (most recent edition). Committee in Concrete 403 bulletin 59-43, Bond Strength to Concrete.

1.03 DEFINITIONS

A. Epoxy Resin Flooring specified under this section is referenced on the drawings as [HPC] High Performance Coatings.

1.04 SYSTEM DESCRIPTION

A. System shall be 1/8 inch textured epoxy surfacing with broadcast aggregate to form a skid resistant surface. Surface finish shall be a two component, chemical resistant epoxy, Key #625.

1.05 SUBMITTALS

A. Samples: Submit 6 by 6 inch cured samples of flooring system indicating color combination and non-skid properties. Approved samples will be used during installation for product match.

B. Certified Test: Submit two copies of suppliers/ manufacturers written certification that flooring system meets or exceeds required properties.

C. Manufacturers Application Instructions: Submit descriptive data and specific recommendations for mixing, application, curing including any precautions of special handling instructions required to comply with the Occupational Safety and Health Act.

D. Maintenance Instructions: Submit current copies of the flooring manufacturer's printed recommendations on maintenance methods and products. Submit according to Section 01730 - Operation and Maintenance Manuals.

1.06 QUALITY ASSURANCE

A. Materials used in the floor surfacing shall be the products of a single manufacturer.

B. Installation shall be performed by an applicator with minimum 3 years' experience in work of similar nature and scope. Installer must be approved by the manufacturer of the floor surfacing materials. The contractor shall furnish a written statement from the manufacturer that the installer is acceptable.

C. Installer to verify locations of all flexible joints required by the provisions of this Section and by the recommendations of the related material manufacturers.

1. Joint locations may or may not be shown in drawings.
2. Refer to drawings required under SUBMITTALS above.

D. Contractor to have proven experience with specified system.

E. Portable mock-up: Prior to starting application of flooring, provide full scale portable mock-up to establish acceptable quality, durability, and appearance. Mock-up size must not be less than 4 square feet.

1. Acceptable mock-up to be standard of quality for installed work.
2. Unacceptable installed work to be removed and replaced until acceptable. Aesthetically unacceptable but well bonded work may be overlaid or recoated per Manufacturer's instructions if thickness clearances permit.

F. Qualifications:
1. Installer: Must be acceptable to architect and manufacturer.

1.07 PROJECT CONDITIONS

A. Maintain the ambient room and the floor temperatures at 60 degrees Fahrenheit, or above, for a period extending from 72 hours before, during and after floor installation. Concrete to receive surfacing shall have cured for at least 28 days and shall have been free of water for at least 7 days.

B. Dew Point: Substrate temperature must be minimum of 5 degrees above dew point prior to, during or up to 24 hours after application of flooring system.

C. Illumination: Apply flooring system only where a minimum of 30 footcandles exist when measured 3 feet from surface.

D. Advise other trades of fixtures and fittings not to be installed until flooring is cured and protected.

1.08 PROTECTION

A. Protect adjacent surfaces not scheduled to receive the flooring by masking, or by other means, to maintain these surfaces free of the flooring material.

B. Provide adequate ventilation and fire protection at all mixing and placing operations. Prohibit smoking or use of spark or flame producing devices within 50 feet of any mixing or placing operation.

C. Provide polyethylene or rubber gloves or protective creams for all workmen engaged in applying products containing epoxy.

1.09 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered to project site in original manufacturer's sealed containers including type of material, batch numbers, date of manufacture, and pertinent labels intact and legible.

B. Store materials in dry protected area at a temperature between 60° F to 80° F.

C. Follow all manufacturer's specific instructions and prudent safety practices for storage and handling.

1.10 WARRANTY

A. Contractor to guarantee work under this Section to be free from defects of material and installation for the duration of the warranty period. Defects occurring during warranty period shall be repaired, in a manner satisfactory to the owner and the architect, at no additional cost to the owner.

1. Warranty Period: One year.

PART 2 – PRODUCTS

2.01 MANUFACTURERS

A. Specifications and quality of design standard (basis of design) based on Key Resin Company: Key Mortar SLT

Key Resin Company: (888) 943-4532, www.keyresin.com

B. System description: Heavy duty, three-component epoxy resin surfacing broadcast with silica aggregate for non-skid texture.

C. Alternative manufacturers must have as a minimum the standards set forth in this specification and must be preapproved according to project requirements.

2.02 MATERIALS

A. Prime Coat: Two component penetrating damp-proof epoxy.

B. Aggregates:

1. Blended aggregate for base.

2. Broadcast silica with a minimum Mohs. hardness of 6.

C. Matrix: Matrix-epoxy/aggregate composition.

D. Grout and Topcoats:

1. Two component epoxy grout, Key #510 pigmented.

2. Two component epoxy sealer, Key #450 Urethane pigmented.

2.04 MIXING

A. Apply flooring to specified physical properties.

B. Provide slip-resistant, cleanable textured finish. Samples to be approved by owner and architect.

2.05 FINISHES

A. Color: Medium Grey

PART 3 – EXECUTION

3.01 PREPARATION

A. Obtain architect's approval of mock-up before installing flooring; see QUALITY ASSURANCE in PART 1.

B. Preparation of Surface:

1. Inspect surfaces to receive flooring and verify that condition is smooth and free from conditions that will adversely affect execution, permanence, or quality of work.

a. Remove all projections, all debris detrimental to flooring system, and dirt, oil contaminates, grease, and surface coatings affecting bond.

2. Notify architect or owner in writing prior to commencing work of any conditions deemed unsatisfactory for the installation; installation of flooring materials is understood as acceptance of the substrate as satisfactory.

3. Concrete: The General Contractor shall be responsible for hiring an independent testing service to test for moisture content and moisture vapor emission rate; install no flooring over concrete until the concrete has been cured and is sufficiently dry to achieve acceptable bond with flooring as determined by material manufacturer's recommended bond and moisture tests.

a. Effectively remove concrete laitance by steel shot blasting or other method approved by flooring manufacturer.

b. Concrete slab shall have an efficient puncture-resistant moisture vapor barrier 10 mils thick minimum placed directly under the concrete slab (for slab on grade). Testing must be done to verify that the moisture vapor emission rate of the slab does not exceed that as recommended by the manufacturer at time of installation of the flooring or at any future date. Moisture vapor emission and moisture content testing must conform with the requirements of ASTM F-1869-98 (Calcium Chloride Test) and ASTM F-2170-02 (Relative Humidity Probe Test). If test results show excessive levels of moisture content or vapor emission rate, installation shall not proceed until source of excessive moisture is identified and removed or corrected. If excessive moisture cannot be removed or prevented, apply manufacturer’s recommended moisture vapor emission control material.

c. Treat cracks in concrete using manufacturer's recommended practices. Rout out crack and fill with rigid epoxy; Reinforce crack with fiberglass cloth. Refer to section 3.02.B.

3.02 INSTALLATION

A. Install all floor materials in strict conformance with manufacturer's instructions.

B. Route out all cracks (larger than hairline width) and fill with Key Crack Filler or other material approved by Manufacturer of floor materials. Reinforce crack with fiberglass cloth using Key #502 Primer or the epoxy used to fill the crack.

C. Prime entire surface with recommended primer.

D. Apply epoxy and broadcast aggregate to achieve a minimum thickness of 1/8 inch.

E. Apply epoxy grout and Urethane seal coats to provide a uniform, dense surface.

F. Match finished work to approved samples, uniform in thickness, sheen, color, pattern and texture, and free from defects detrimental to appearance.

G. Integral Cove Base: Where scheduled, provide integral cove base formed from flooring over tile backerboard as specified under 09250 - Gypsum Drywall. Provide cove cap strip at top of base as recommended by flooring manufacturer and trowel material up wall to form smooth, integral transition and base 4-6 inches high unless otherwise indicated or scheduled.

H. Apply temporary protection until floor is fully cured. The General Contractor shall protect the finished floor from the time that the sub-contractor completes the work.

END OF SECTION 09 96 00

END OF DIVISION 09 – FINISHES

DIVISION 10 – SPECIALITIES

Section 10 11 00 – Visual Display Surfaces

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Applicable provisions of Division 1 shall govern the work under this Section.

B. Section includes:

1. Porcelain Enamel Markerboards
2. Vinyl-Fabric-Faced Tackboards

1.2 RELATED WORK

A. Section 06 10 00 – Rough Carpentry: Wall backing

1.3 SUBMITTALS

A. Shop Drawings: Include sections of trim members and dimensioned elevations. Show anchors, grounds, reinforcement, accessories, layout, and installation details.

B. Samples: For selection of colors, patterns, and textures and verification of compliance with requirements.

1. Porcelain Enamel Markerboard: Sample panels showing full range of colors available.
2. Vinyl-fabric-faced Tackboards: Color charts showing full range of colors, textures, and patterns available.
3. Aluminum Trim and Accessories: Samples of each finish and color showing full range of colors.

1.4 WARRANTY

A. Porcelain Enamel Markerboard Warranty: Furnish written warranty, agreeing to replace markerboards that do not retain their original writing and erasing qualities, become slick and shiny, or exhibit crazing, cracking, or flaking, provided manufacturer's instructions with regard to handling, installation protection, and maintenance have been followed.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

A. PolyVision Corp.

B. Platinum Visual Systems

C. Claridge Products and Equipment, Inc.

D. Neal Slate Co.

2.2 MATERIAL

A. Porcelain Enamel Markerboards: Balanced, high-pressure laminated porcelain enamel markerboards of 3-ply construction consisting of face sheet, core material, and backing.

1. Face Sheet: 24-gage enameling-grade steel. Coat exposed face and edges with 3-coat process consisting of primer, ground coat, and color cover coat, and concealed face with 2-coat process consisting of primer and ground coat. Fuse coats to steel at not less than 1200 deg F (649 deg C). Color as selected by architect from manufacturer’s standard colors.
   a. Cover Coat: Matte finish cover coat.
   b. All boards up to 16'-0" to be seamless.
2. Core: 3/8-inch-thick particleboard, ANSI A208.1, Grade 1-M-1.
3. Backing Sheet: 0.015-inch-thick aluminum sheet.

4. Laminating Adhesive: Moisture-resistant thermoplastic adhesive.

5. Mounting Method: Continuous top hanger strips with clips at bottom edge.

B. Vinyl-Fabric-Faced Tackboards: Mildew-resistant, washable, vinyl fabric complying with FS CCC-W-408, Type II, laminated to 1/2-inch fiberboard backing. Provide flame spread rating of 25 or less when tested according to ASTM E 84. Color as selected by architect from manufacturer's standard colors.

C. Metal Trim and Accessories: Fabricate frames and trim of not less than 0.062-inch-thick aluminum alloy, size and shape as indicated, to suit type of installation. Provide straight, single-length units wherever possible; keep joints to a minimum. Miter corners to a neat, hairline closure.

1. Where size of boards or other conditions exist that require support in addition to the normal trim, provide structural supports or modify trim as indicated.

1. Factory-Applied Trim: Slip-on, with no visible screws.

2. Chalktray: Continuous box-type aluminum chalktray with slanted front and cast aluminum end closures.

3. Integral Map Rail: Furnish map rail at the top of each marker board unit, complete with the following accessories:

a. Display Rail: Continuous cork display rail approximately 2 inches wide, as indicated, integral with the map rail.

b. End Stops: One end stop at each end of the map rail.

c. Map Hooks: 2 map hooks for each 4 feet of map rail or fraction thereof.

D. Fabrication: Laminate porcelain enamel facing sheet and backing sheet to core material with flexible, waterproof adhesive.

E. Assembly: Provide factory-assembled units except where field-assembled units are required. Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, balanced around center of the board. Provide vertical joint system between abutting sections of boards. Provide mullion trim at joints between markerboard and tackboard.

F. Finishes: Comply with NAAMM "Metal Finishes Manual."

1. Class II Clear Anodized Finish: AA-M12C22A31.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation: Deliver factory-built units completely assembled in one piece (except for field applied trim). Where dimensions exceed panel size, provide two or more pieces of equal length. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site. Use splines at joints to maintain surface alignment.

B. Install units in locations and mounting heights indicated according to manufacturer's instructions. Keep perimeter lines straight, plumb, and level. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for a complete installation.

C. Coordinate job-site-assembled units with grounds, trim, and accessories. Join parts with a neat, precision fit.

3.2 MARKERBOARD BREAK-IN:

A. Clean according to manufacturer's instructions. Break-in markerboards only as recommended by the manufacturer.

END OF SECTION 10 11 00

Section 10 12 00 – Display Cases

PART 1 – GENERAL

1.1 SCOPE OF WORK

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

B. Work includes:

1. Prefabricated aluminum map display cases.

2. Brochure display rack

1.2 SUBMITTALS

A. Submit shop drawings, technical data sheets and schedules

1. Submit corner sample of display case in specified color finish for approval

B. Contract Closeout Submittals: Maintenance Data: manufacturer's cleaning and maintenance instructions covering both routine and long-term operations.

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. B 221, Specifications for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

2. C 1048, Specification for Heat-Treated Flat Glass-Kind HS, Kind FT Coated and Uncoated Glass.

3. D1752, Specification for cork sheet, bulletin board

1.4 DELIVERY & STORAGE

A. Ship materials including attachment devices carefully packaged to prevent surface damage. Include shop drawings to ensure correct installation and arrangement of all materials.

1.5 WARRANTY

A. Warrant the work specified herein for 'one year' against becoming unserviceable or causing an objectionable appearance resulting from either defective or non-conforming materials or workmanship. Warranty shall cover replacement of defective workmanship and product defects such as but not limited to deterioration of material or finish and difficult operation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Map Display Cases

1. For basis of design, the plans are based on aluminum framed display cases as supplied by Poblocki Signs Co., West Allis, WI.

2. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate products shall submit product data sheets and/or specifications.

a. Aarco Products Inc.

b. Nelson-Harkins Industries

c. Apco

B. Wall Mounted Brochure Display Holder

1. For basis of design, the plans are based on all acrylic wall brochure rack as manufactured by Brochure Holders Now Model CLRB8564.

2. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturer's wishing to submit alternate products shall submit product data sheets and/or specifications.

a. Magazineracks.com

b. Braeside Display

c. Siegel Display Products

2.2 MATERIALS

A. Map Display Case

1. Aluminum Extrusions: Meeting ASTM B221, alloy 6063-T5

2. Aluminum Panels: Meeting ASTM B209, minimum 0.090" (2.28 mm thick)

3. Glass: ASTM C 1048, fully-tempered, Type 1 clear with minimum 0.25" (6 mm) thickness

4. Tackable Surface: 1/4" thick linoleum grade cork with burlap backing.

B. Wall Mounted Brochure Holder

1. The rack shall include six acrylic pockets, 4-1/8" x 1-1/2" deep and one pocket for 8-1/2" x 11" prints mounted to a 22-3/4"w. x 20" h. acrylic backplate.

2.3 FABRICATION – MAP DISPLAY CASE

A. Map Display Case Cabinet:

1. Description: 6030-T5 extruded aluminum alloy according to ASTM B221; minimum 0.090" thick for window frame panels, and horizontal mullions. Aluminum extrusion mitered and assembled with concealed corner angles.

2. Cabinet Profile: 2" x 1/2" x 1/8" channel framed aluminum case. Cabinet depth to be 2".

3. Glazing: Minimum 1/4" inch clear tempered glass according to Section 08 80 00.

4. Door Profiles:

a. Vestibule 101: Top hinged aluminum frame with continuous anodize aluminum piano hinges and stainless steel pins, hold-open devices, continuous door stops and weather-tight glazing channel suitable for exterior use.

b. Public Lobby 102: Side hinged aluminum frame with continuous anodized aluminum piano hinges and stainless steel pins, continuous door stops, and weather-tight glazing channel suitable for exterior use.

5. Locks: All hinged doors shall be equipped with flush mounted cam locks keyed alike.

B. Mounting Method: Surface mounted to concrete masonry wall surfaces behind.

C. Cabinet Background Finish: 1/4" thick linoleum grade colored cork at background over 1/4" luan plywood. Finish and color to be selected by architect from manufacturer's standard option.

D. Frame Finish: Provide custom color acrylic polyurethane finish on all exposed framing in color to match storefront aluminum framing specified under Section 08 41 00.

2.3 DISPLAY CASE & BROCHURE DISPLAY RACK SCHEDULE (indicated on plans as 'DC')

Mark	Qty	Location	Width x Height	Access Panel
DC-1	1	Vestibule 101	72"w. x 48"h	Top hinged
DC-2	1	Public Lobby 102	36"w. x 44" h.	Side hinged
DC-3	2	Public Lobby 102	22-3/4" x 20" h.	

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install map cases according to shop drawings and manufacturer's recommendations.

3.2 CLEANING, PROTECTION AND REPAIR

A. Clean display units of dirt, dust, and grease after installation.

B. Protect finished installation from damage from work of other trades, such as plastering, gypsum wall board, painting, etc.

END OF SECTION 10 12 00

Section 10 14 16 – Interior Room Signage

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor and equipment necessary for the installation of interior specialty signs. Applicable provisions of the General Conditions, Supplemental Conditions and General Requirements shall govern the work under this Section.

B. Work includes:

1. Interior room sign plaques
2. Die-cut vinyl letters and graphic

1.2 REFERENCES

A. ADA 101-336, Sections 4.30 – 4.30-5.

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop Drawings: Submit drawings indicating dimensions and text layout. Also submit complete schedule of signs.
2. Sample:
   a. Submit full size sign sample in selected colors.
   b. Sign plaque sample.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

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

1. ABC Architectural Signing System
2. Allenite
3. Andco Industries Corp.
4. APCO Graphics, Inc.
5. ASI Sign Systems; Minneapolis, MN
6. Environmental Graphic Systems, Inc.
7. Modulex
8. Mohawk Sign Systems
9. Poblocki & Sons, Milwaukee, WI
10. Spanjer Brothers, Inc.

2.2 MATERIALS

A. Sign Frame: Square corner modular plastic molded frame, ½" deep, pre-punched for screw mounting to wall substrate.

B. Room Signs: Sign plaques shall be of solid color plastic equal to Rowmark "Ultramatte" and shall incorporate both raised graphics and Grade 2 Braille. Raised letters and numbers shall be a minimum 1/32" high. Sign panel and graphics shall be as selected from manufacturer's full range of colors and meet the 70% contrast requirement of ADA 101-336, Section 4.30-5

2.3 SIGN TYPES

A. Room Signs: Room name and number to be identified with 1-1/4" high 'Helvetica Medium' raised letters with corresponding Grade 2 Braille text.

1. Size: 8" x 8"

B. Die-Cut Vinyl Lettering And Graphics

1. Vinyl Film: Opaque, non-reflective vinyl film, 0.0035-inch min. thickness, with pressure sensitive adhesive backing, suitable for exterior applications. Colors shall be custom colors compatible with the State of Wisconsin State Patrol and DOT.

2. State Patrol and Department of Transportation Die-Cut Graphics will be provided by WisDOT. Contact Bob Spoerl at (608) 266-8665 for more information. Approximate size: 18 inches x 18 inches.

3. 'Confined Space' signage: At door 001A to Scale Tunnel 001, provide vinyl lettering in 2" high lettering indicating 'CONFINED SPACE'.

2.4 MOUNTING METHOD

A. Signs to be furnished to the jobsite with factory applied double-face tape and pre-punched for mechanical attachment (min. 2 screws).

PART 3 – EXECUTION

3.1 INSTALLATION

A. Unless indicated otherwise, room signs shall be installed on the wall adjacent to the latch side of the door or on the nearest adjacent wall where required.

B. All room signs shall be mounted at 60 inches above finished floor to centerline of the sign.

C. Apply die-cut vinyl lettering and graphics where directed by WisDOT personnel.

3.2 ROOM SIGN SCHEDULE

Mark	Room Location	Room No	Graphic/Text
1	Public Lobby	102	Room Name and Room Number
1	Women's Toilet	103	Female Pictogram w/ Universal Accessibility Symbol
1	Men's Toilet	104	Male Pictogram w/ Universal Accessibility Symbol
1	Operations	105	Room Name and Room Number
1	Office	107	Officer's Name / Room Number
1	Intox	108	Room Name and Room Number
1	Uni-Sex Toilet	109	Male/Female Pictogram w/ Universal Accessibility Symbol
1	Janitor	110	Room Name and Room Number
2	Mechanical Room	111	Room Name and Room Number
1	Maintenance Storage	112	Room Name and Room Number
1	Multi-purpose Room	113	Room Name and Room Number
1	Troopers	114	Room Name and Room Number

1	Elec/Telecom	115	Room Name and Room Number
2	Conference	116	Room Name and Room Number
2	Inspections Storage	117	Room Name and Room Number
1	Evidence	118	Room Name and Room Number
1	Uni-Sex Toilet	128	Male/Female Pictogram w/ Universal Accessibility Symbol
3	Employee Entrance	TBD	Text only
3	Public Entrance	TBD	Text only
3	Drivers Entrance	TBD	Text only
12	Generic Signage	TBD	Text & Pictogram

END OF SECTION 10 14 16

Section 10 14 19 – Exterior Building Signage

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work includes:

1. Individual cast aluminum lettered sign.

2. Cast aluminum numerals

1.2 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures:

1. Shop Drawings: Show plans and elevations, sections of typical members, anchors, reinforcement, layout and installation details. Include the following:

2. Product Data: Manufacturer's construction details

3. Samples for selection of color, pattern and surface texture. Show full range of colors available.

PART 2 – PRODUCTS

2.1 MANUFACTURERS:

A. Subject to compliance with requirements, provide products of one of the following:

1. Andco Industries Corp.

2. Matthews.

3. Spanjer Brothers, Inc.

4. The Supersine Company.

B. Aluminum Castings: Alloy and temper recommended for casting process used.

C. Fasteners: Concealed non-corrosive metal fasteners.

D. Anchors and Inserts: Non-ferrous metal or hot-dipped galvanized. Use toothed steel or lead expansion bolts for drilled-in-place anchors. Furnish inserts to be set into concrete or masonry work.

E. Unframed Panel Signs: Fabricate edges mechanically and smoothly finished as follows:

1. Corner Condition: Square.

F. Dimensional Letters and Numbers: Form characters by casting with smooth, flat faces, sharp corners, precisely-formed profiles and lines, free from pits, scale, sand holes or other defects. Cast lugs into the back and tap to receive threaded mounting studs.

1. Metal: Aluminum.

G. Finishes: Comply with NAAMM "Metal Finishes Manual" for finish designations and applications recommendations.

1. Aluminum Finish: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

a. Finish: AAMA 605.2, Fluoropolymer Coating

b. Color: Custom color red to match standing seam metal roofing per Section 07 41 00.

PART 3 – EXECUTION

A. Installation: Locate signs where indicated, using mounting methods described. Install level, plumb and at height indicated, with surfaces free from distortion or other defects in appearance.

B. Dimensional Letters and Numbers: Mount characters using fastening methods recommended for wall construction and exposure indicated. Provide template to establish spacing and locate holes for fasteners.

1. Projected Mounting: Mount at distance indicated from wall surface.

C. Cleaning and Protection: At completion of the installation, clean soiled sign surfaces. Protect from damage until owner's acceptance.

END OF SECTION 10 14 19

Section 10 28 00 – Toilet and Bath Accessories

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work Includes

1. Toilet and shower room accessories

2. Janitor's Closet Accessories

1.2 SUBMITTALS

A. Manufacturer's product data for each toilet accessory item specified, including details of construction relative to materials, dimensions, gages, profiles, method of mounting, specified options, and finishes.

B. Samples: Full-size samples of toilet accessory items when requested for verification of design, operation, and finish requirements, acceptable samples will be returned and may be used in the work.

1.3 REFERENCES

A. International Building Code

B. Americans with Disabilities Architectural Guidelines (ADA)

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable manufacturers include the following, subject to compliance with the specifications under this section.

1. American Specialties, Inc. (ASI)

2. Bobrick

3. Bradley Corporation.

4. McKinney/Parker.

2.2 MATERIALS

A. Materials - General: Fabricate toilet accessory items from the following materials and in accordance requirements specified for individual accessory items:

1. Stainless Steel: AISI Type 302/304, with polished No. 4 finish, 22-gage (.034-inch) minimum thickness, unless otherwise indicated.

3. Brass: Leaded and unleaded, flat products, ASTM B 19; rods, shapes, forgings, and flat products with finished edges, ASTM B 16, Castings, ASTM B-30.

3. Sheet Steel: Cold-rolled, commercial quality ASTM A 366, 20-gage (.040-inch) minimum, unless otherwise indicated. Surface preparation and metal pretreatment as required for applied finish.

4. Galvanized Steel Sheet: ASTM A 527, G60.

5. Chromium Plating: Nickel and chromium electro-deposited on base metal, ASTM B 456, Type SC 2.

6. Mirror Glass: Nominal 6.0 mm (0.23 inch) thick, conforming to ASTM C 1036, Type I, Class 1, Quality q2, and with silvering, electro-plated copper coating, and protective organic coating

7. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanize after fabrication.

8. Fasteners: Screws, bolts, and other devices of same material as accessory unit or of galvanized steel where concealed.

9. Keys: Provide universal keys for access to toilet accessory units requiring internal access for servicing, re-supply, etc. Provide minimum of six keys to owner's representative and obtain receipt.

B. Toilet Tissue Dispenser:

1. Description: Surface-mounted, twin jumbo-roll, toilet issue dispenser door, cabinet and mounting plate shall be constructed of type-304 stainless steel. Cabinet shall be 20-gauge and equipped with a tumbler lock. Door shall be 18-gauge with a wide viewing slot to reveal toilet tissue supply. Unit shall be fastened through 20-gauge stainless steel mounting plate. Dispensing mechanism shall be constructed of high impact, ABS and shall accommodate two 10” diameter toilet tissue rolls with 3” diameter core; and be equipped with a sliding access panel that exposes one roll at a time. Spindles shall be convertible in the field to dispense 2-1/4” diameter core rolls by removing outer spindles furnished in-place.

2. Qty: 4

C. Stainless Steel Grab Bars: Provide grab bars with wall thickness not less than 18 gage (.050 inch) and as follow:

1. Mounting: Concealed, manufacturer's standard flanges and anchorages.

2. Clearance: 1-1/2 inches clearance between wall and inside face of bar.

3. Gripping Surfaces: Manufacturer’s standard nonslip texture.

4. Heavy-Duty Size: Outside diameter of 1-1/2 inches.

D. Stainless Steel Channel-Framed Mirror Units

1. Flat Wall Mounted Channel-Framed Mirrors: Fabricate frame with channel shapes of not less than 20 gauge (.040 inch), with square corners carefully mitered to hairline joints and mechanically interlocked. Provide in Type 430 bright polished finish. Mirror to be tempered glass.

2. Qty: 4

E. Stainless Steel Shelves

1. Shelf shall be type-304, 18-gauge (1.2 mm) stainless steel with satin finish. Mounting brackets welled to shelf shall be 16-gauge (1.6 mm) stainless steel. Shelf shall be 5” wide with ¾” return edges. Front edge shall be hemmed for safe handling.

2. Lengths

a. Inspections 122: 36 inches wide x 6” deep

F. Lavatory-Mounted Soap Dispenser

1. Lavatory-mounted piston and spout assembly with type-304 stainless steel with bright polished finish. Escutcheon shall lock to body with concealed locking mechanism that is opened only with a special key (provided with the dispenser). Spout shall rotate 360 deg. without damage to valve mechanism. Piston, spout, and supply-tube assembly shall be removable from top for filling and maintenance. Valve shall be equipped with plastic cylinder, stainless steel spring, U-packing seal, and duckbills. Translucent, shatter-resistant polyethylene container shall have a capacity of 20-fl oz.

2. Qty: 4

G. Recessed Sanitary Napkin Disposal

1. Recessed sanitary napkin disposal shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Front of sanitary napkin disposal door shall have curved profile with radiused corners and edges. Door shall be self-closing, one-piece, seamless construction; secured to cabinet with a spring-loaded, full length stainless steel piano-hinge and equipped with two stainless steel cable door swing limiters, two hooks for retaining receptacle, a finger-pull recess at top for easy opening, and an international graphic symbol identifying sanitary napkin disposal.

2. Qty: 1

H. Recessed Combination Towel Dispenser and Waste Receptacle

1. Recessed ADA compliant combination towel dispenser and waste receptacle with removable 10.5 gal. stainless steel waste receptacle. Unit shall be fabricated of 22-gauge type-304 stainless steel with exposed surfaces in satin finish. Warp-free towel cabinet door equipped with piano hinge and secured by tumbler lock. Heavy gauge steel roll towel dispenser for most non-perforated roll towels up to 8” in diameter and 8” wide core sizes from 1-1/2” to 2”.

2. Overall Dimensions: 17-1/8”W x 56”H x 8”D

3. Qty: 4

I. Surface-Mounted Soap Dispenser (Inspections 122)

1. Surface mounted soap dispenser shall be type-304 stainless steel with satin finish. Corrosion resistant valve shall dispense commercially marketed all-purpose hand soaps. Valve shall be operable with one hand and with less than 5 pounds of force to comply with barrier-free accessibility guidelines. Door front shall have curved profile with radiused corners and edges of soap dispenser. Container body and back plate shall be epoxy sealed to prevent warping and leakage. Soap dispenser shall have concealed, vandal-resistant mounting. Locked hinged stainless steel lid for top filling shall require special key to open.

J. Surface Mounted Paper Towel Dispenser (Multi-Purpose Rm 113 & Inspections 122)

1. Manufaturers

a. Bobrick Model B-72860

b. Bradley Model 2495

c. Tork Hand Towel Roll Dispenser, Lever Auto Transfer, Model 84TR

2. Description: Surface-mounted towel dispenser with lever-operated dispensing mechanism will provide an adjustable means to dispense a nominal 2-1/2”, 4” or 5” of toweling per stroke. Toweling will only be dispensed with the downward stroke of the lever. Unit shall accommodate one 8” wide paper towel roll and one 4” partial (stub) roll. 1-1/2” core diameter.

K. Mop / Broom Holder (Janitor’s Room 110)

1. Mop and broom holder shall be type-304 stainless steel with satin finish. Unit shall be 24” long with three spring-loaded rubber cam holders.

L. Hand Dryers

1. Manufacturer: Excel Dryer Inc.’Xlerator® Model No. XL-SB’

2. Construction: One piece die-cast zinc alloy cover for surface mounting and automatic time cycle. Motor shall be thermally protected, series commutated, through-flow discharge vacuum motor/blower (5/8 hp / 20,000 rpm) providing air velocity of up to 19,000 lfm. Heating element to be Nichrome wire and mounted inside the blower housing producing an air temperature of up to 135 deg.

3. Control assembly is activated by an infrared optical sensor located next to the air outlet. The dryer shall operate as long as hands are under the air outlet.

4. Qty: 4

2.3 FABRICATION

A. Only a maximum 1-1/2-inch diameter, unobtrusive stamped logo of manufacturer, as approved by architect, is permitted on exposed face of toilet or bath accessory units. On either interior surface not exposed to view or back surface, provide additional identification by means of either a printed, waterproof label or a stamped nameplate, indicating manufacturer's name and product model number.

B. Surface-Mounted Toilet Accessories, General: Except where otherwise indicated, fabricate units with tight seams and joints, exposed edges rolled. Hang doors or access panels with continuous stainless steel piano hinge. Provide concealed anchorage wherever possible.

C. Recessed Toilet Accessories, General: Except where otherwise indicated, fabricate units of all welded construction, without mitered corners. Hang doors or access panels with full-length stainless steel piano hinge. Provide anchorage that is fully concealed when unit is closed.

D. Framed Mirror Units, General: Fabricate frames for glass mirror units to accommodate wood, felt, plastic, or other glass edge protection material. Provide mirror backing and support system that will permit rigid, tamperproof glass installation and prevent accumulation of moisture, as follows:

1. Provide galvanized steel backing sheet, not less than 22 gage (.034 inch) and full mirror size, with non-absorptive filler material. Corrugated cardboard is not an acceptable filler material.

E. Mirror Unit Hangers: Provide system of mounting mirror units that will permit rigid, tamperproof, and theft proof installation, as follows:

1. Heavy-duty wall brackets of galvanized steel, equipped with concealed locking devices requiring special tool to remove.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install toilet accessory units according to manufacturers' printed installations instructions, using fasteners appropriate to substrate as recommended by manufacturer of unit. Install units plumb and level, firmly anchored in locations and at heights indicated.

B. Secure mirrors to walls in concealed, tamperproof manner with special hangers, toggle bolts, or screws. Set units plumb, level, and square at locations indicated, according to manufacturer's instructions for type of substrate involved.

C. Adjust toilet accessories for proper operation and verify that mechanisms function smoothly.

D. Replace damaged or defective items.

E. Clean and polish all exposed surfaces in strict accordance with manufacturer's recommendations after removing temporary labels and protective coatings.

END OF SECTION 10 28 00

Section 10 44 13 – Fire Extinguishers, Cabinets, and Accessories

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Section Includes:

1. Recessed/Semi-recessed fire extinguisher cabinets.

2. UL-listed fire extinguishers bearing UL "Listing Mark" for type, rating, and classification of extinguishers indicated.

1.2 RELATED WORK

A. Section 04 20 00 – Concrete Unit Masonry : Preparation of openings

1.3 SUBMITTALS

A. Submit the following according to Section 01 33 00 – Submittal Procedures.

1. Shop drawings indicating wall mounting conditions, opening requirements and installation accessories.

2. Manufacturer’s product data

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, provide products by one of the following:

1. J.L. Industries.

2. Larsen's Manufacturing Co.

3. Modern Metal Products by Muckle.

4. Profile International Inc.

5. W. F. Lee Corp.

2.2 EQUIPMENT

A. Fire Extinguishers: Provide fire extinguishers for each extinguisher cabinet and surface wall mount locations indicated. EXTINGUISHERS TO BE FULLY CHARGED, TAGGED AND DATED.

B. Multipurpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10-lb. nominal capacity, in enameled steel container.

1. Where unit type specified conflicts with other systems or hazard (such as chemicals contained in range hood type systems) provide units as acceptable to regulatory authority.

C. Mounting Brackets: Provide brackets for extinguishers not located in cabinets.

D. Fire Extinguisher Cabinets: Provide fire extinguisher cabinets where indicated, of suitable size for housing fire extinguishers of types and capacities indicated. Provide fire rated cabinets in 1 hr. and 2 hr. wall construction to maintain fire rating of wall.

1. Recessed: Cabinet box (tub) fully recessed in walls of sufficient depth to suit style of trim indicated.

2. Semi-recessed: Cabinet box (tub) partially recessed in walls of shallow depth.

3. Trim Style: Fabricate trim in one piece with corners mitered, welded, and ground smooth.

4. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

    a. Provide 3" rounded edge trim at semi-recessed cabinets.

    b. Trim Metal: Enameled steel.

    c. Pull Handle: Manufacturers standard design, or provide flush cup design, to comply with ADA requirements where applicable.

E. Door Material and Construction: Manufacturer's standard door construction, of material indicated, coordinated with cabinet types and trim styles selected.

1. Enameled Steel: Manufacturers standard finish.

F. Identify fire extinguisher in cabinet with lettering spelling "FIRE EXTINGUISHER" applied to door. Provide lettering to comply with requirements indicated for letter style, color, size, spacing, and location or, if not otherwise indicated, as selected by architect from manufacturer's standard arrangements.

G. Identify bracket-mounted extinguishers with red letter decals spelling "FIRE EXTINGUISHER" applied to wall surface. Letter size, style, and location as selected by architect.

H. Door Style: Manufacturer's standard design.

1. Full-Glass Panel: 1/4-inch-thick clear acrylic.

    a. Silk screen lettering.

I. Door Hardware: Provide manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated. Provide flush cup design door pull with friction latch. Provide concealed or continuous-type hinge permitting door to open 180 deg.

J. Factory Finishing of Fire Extinguisher Cabinet: Comply with NAAMM "Metal Finishes Manual" to provide uniformly finished products. Provide color as indicated, or if not indicated, as selected from manufacturer's standard colors.

1. Baked Enamel Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish; chemical conversion coating, acid chromate-fluoride-phosphate pretreatment; Organic Coating: As specified below.

2. Organic Coating: Thermosetting modified acrylic enamel primer/topcoat system complying with AAMA 603.8 except with minimum dry film thickness 1.5 mils, medium gloss.

    a. Color: As selected by architect from manufacturer's standard colors.

K. Surface Preparation for Steel Fire Extinguisher Cabinets: Solvent clean surfaces in compliance with SSPS-SP 1 to remove dirt, oil, grease, and other contaminants which could impair paint bond. Remove mill scale and rust, if present, from un-coated steel in compliance with SSPC-SP 5 (white metal blast cleaning) or SSPC-SP 8 (pickling).

L. Baked Enamel Finish: Immediately after cleaning and pretreatment, apply manufacturers standard two-coat baked enamel finish, consisting of prime coat and thermosetting topcoat.

M. Comply with paint manufacturer’s instructions for application and baking to achieve a minimum dry film thickness of 2.0 mils.

1. Color and Gloss: As selected by architect from manufacturers standard choices for color and gloss.

PART 3 – EXECUTION

3.1 INSTALLATION

B. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.

END OF SECTION 10 44 13

Section 10 51 00 – Metal Lockers

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 1 Specifications, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Single-tier storage lockers
2. Provide fasteners and anchorage devices to install lockers provided under this section.
3. Provide metal filler panels to fill between banks of lockers and adjacent construction.

1.3 SUBMITTALS

A. The following shall be submitted according to Section 01 33 00 - Submittal Procedures:

1. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and furnishes for each type of locker and bench.
2. Shop Drawings: Show lockers in detail, method of installation, fillers, trim, base and accessories. Include locker numbering sequence information.
3. Samples for verification: Deliver to the jobsite, one full-size Type L-2 locker sample for evaluation. Adherence to the specification is required. Locker submitted must meet specification regardless of manufacturer's standard product. Submit manufacturer's technical data and installation instructions for metal locker units.
4. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals specified in Division 1.

1.4 QUALITY ASSURANCE

A. Uniformity and Single Manufacturer Requirements: Provide each type of metal locker as produced by a single manufacturer, including necessary mounting accessories, fittings, and fastenings.

B. Installers Qualifications: Lockers to be installed by an experienced agent of the manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: Do not deliver metal lockers until building is enclosed and ready for locker installation.

B. Storage and Protection: Protect materials from damage during delivery, handling, storage, and installation.

1.6 WARRANTY

A. Locker manufacturer shall warrant the locker for the lifetime use of the original purchaser from date of shipment. Warranty shall include all defects in material and workmanship, excluding finish, vandalism and improper installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the plans are based on the DeBourgh Manufacturing Co. 'Corregidoor Series'.

B. Subject to compliance with basis of design and requirements of the Contract Documents, other acceptable manufacturers are as follows:

1. Republic Storage Systems
2. List Industries, Inc.

2.2 FABRICATION

A. Locker Construction

1. Lockers to be welded at seams and joints with exposed welds sanded smooth.
2. No bolts, screws or rivets to be used in assembly of locker units.
3. Ship lockers set-up, ready to be anchored in place according to manufacturer's instructions.

B. Body of Lockers

1. Exterior sides, Tops, Bottoms, Tier Dividers and Fascia: Constructed of 16 gauge domestic cold rolled sheet steel for maximum durability.
2. Backs: Solid sheet of 18 gauge cold rolled sheet steel welded to frames of sides and intermediate partitions.
3. Shelves and Intermediate Partitions: Constructed of 18 gauge cold rolled sheet steel welded to sides and intermediate partition construction. Shelves provided in lockers 60 inches and taller, located to provide a minimum of 12 inches clearance.

C. Continuous Door Strike:

1. Tier dividers, tops and bottoms constructed of 18 ga. to provide four-sided, continuous door strike for a secure, sanitary and intrusion-free locker while door is in closed position.

D. Doors

1. Doors are 16 gauge steel, formed outer panel with double bends on both sides and a single bend on top and bottom with 18 gauge steel formed stiffener panel.
2. Door stiffener runs top to bottom on hinge side of door and is securely welded to outer door to form a reinforced channel for additional torque-free strength and sound reduction when closing door. (Inner panel not available on 9 inch wide or box lockers 12 inches high or less).

E. Door Ventilation

1. Louvered doors with six louvers at the top and bottom of the formed door providing 7% ventilation per square inch.

F. Latching

1. Sentry III Single Point Latch
    a. Eleven gauge unbreakable stationary latch welded to the locker frame extending through no more than 1-1/4 inches into locker opening.
    b. Latch protrudes through flush-mounted, recessed stainless steel cup.
    c. Capable of accepting padlock or built-in lock.

2. Sentry II Recessed Gravity Latch

a. Door containing stainless steel cup recessed into formed door.

b. 12 gauge steel finger lift mechanism

c. Spring activated nylon slide latching enclosed in steel latch channel allows closing of door while padlock or built-in lock is in position.

d. Rubber bumpers riveted to door stops for silent operation.

G. Hinges

1. 16 gauge continuous piano hinge on the right side of the opening.

2. Hinges welded to door and riveted to locker frame.

H. Slope Tops

1. Provide 18 gauge all welded steel top with 25 degree pitch, attached at factory with concealed fasteners. Slope top to be in addition to standard 16 gauge flat top.

I. Closed Base

1. Provide 4 inch high, 14 gauge welded steel base enclosed on all four sides, securely welded to locker bottom.

J. Reinforced Bottom

1. Provide 16 gauge spacer channel welded to locker bottom from front to back for a more secure installation (when closed bases are not used).

K. Filler Panels: Manufacturer's standard fabricated from 18 gauge solid steel finished to match lockers.

L. Finish

1. Complete locker unit to be thoroughly cleaned, phosphatized and sealed.

2. Finish to be baked pure TGIC polyester powder coat with a minimum 2-3 mil thickness.

3. Colors of lockers shall be chosen from manufacturer's 47 standard colors.

2.3 LOCKER ACCESSORIES

A. Hooks

1. Hooks to be heavy-duty forged steel with ball ends and zinc plated Hooks to be heavy-duty forged steel with ball ends and zinc plated.

2. Provide two single wall hooks and one double ceiling hook in each locker opening 20 inches or taller.

B. Numbering

1. Furnish each locker with polished aluminum number plate with etched black numbers.

2. Locate number plate near center of each door

3. Owner to furnish numbering sequence.

2.4 LOCKER SCHEDULE

Symbol*	**Location**	**Type**	**Size**
LO-1	Corridor 120	Single-Tier	18" W x 18" D x 36" H

PART 3 – EXECUTION

3.1 INSTALLATION

A. Wall Installation

1. Securely anchor every locker to wall before use. Installation hardware to be determined based upon wall construction.

2. Tie adjacent locker units by bolting at four points, two at top and two at bottom, using ¼ inch cadmium plated bolts.

3.2 ADJUSTING

A. General Requirements: Upon completion of installation, inspect lockers and adjust for proper door and locking mechanism operation.

3.3 CLEANING

A. General Requirements

1. Clean interior and exposed surfaces, removing debris, dust dirt and foreign substances on exposed surfaces.

2. Touch up scratches and abrasions to match original finish

3. Polish stainless steel and non-ferrous metal surfaces

4. Replace locker units that cannot be restored to factory-finished appearance

5. Use only materials and procedures recommended by locker manufacturer

END OF SECTION 10 51 00

Section 10 51 13 – Metal Evidence Lockers

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. Related Work, Not Furnished:

Finish floor covering materials and installation.

B. Related Sections:

Division 9 – Finishes, relating to finish floor and base materials.

1.3 REFERENCES

A. American National Standards Institute (ANSI) Standards:

Applicable standards for fasteners used for assembly.

B. American Society for Testing and Materials (ASTM) Standards:

Applicable standards for steel sheet materials used for fabrication.

Applicable standards for the testing of electrostatically applied Powder Coat Paint

C. American Institute Of Steel Construction (AISC) Standards:

Applicable standards for steel materials used for fabrication.

1.4 DESCRIPTION

A. General: Metal Evidence Lockers

B. Finishes:

Fabricated Metal Components and Assemblies: All components to be painted with an electrostatically applied Powder Coat paint that can meet or exceed test requirements set out by ASTM standard D3451-06 Standard Guide for Testing Coating Powders and Powder Coatings.

C. Sizes:

As noted on drawings.

Depth of 24 inches as noted on drawings.

1.5 PERFORMANCE REQUIREMENTS

A. Design Requirements:

Limit overall width to [0.032] inches [0.793MM] greater or less than the nominal specified width.

1.6 SUBMITTALS

A. Product Data: Submit manufacturer's product literature and installation instructions for each type of evidence lockers required. Include data substantiating that products to be furnished comply with requirements of the contract documents.

B. Shop Drawings: Show fabrication, assembly, and installation details including descriptions of procedures and diagrams. Show complete extent of evidence lockers installation layout including quantities, locations and types of accessory units required. Include notations and descriptions of all installation items and components.

Show installation details at non-standard conditions, if any.

Provide layout, dimensions, and identification of each unit corresponding to sequence of installation procedures.

Provide installation schedule and procedures to ensure proper installation.

C. Samples: Provide minimum 3 inch (76MM) square example of each color and texture on actual substrate for each component to remain exposed after installation.

D. Selection Samples: For initial selection of colors and textures, submit manufacturer's color charts consisting of actual product pieces, showing full range of colors and textures available.

E. Warranty: Submit draft copy of proposed warranty for review by the [architect] [architect/engineer] [engineer] [designer].

F. Maintenance Data: provide written documentation of the manufacturer’s statement claiming the maintenance free nature of the product.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: Engage an experienced manufacturer who is ISO 9001 certified for the design, production, installation and service of evidence lockers. Furnish certification attesting ISO 9001 quality system registration.

B. Installer Qualifications: Engage an experienced installer who is a manufacturer's authorized representative for the specified products for installing evidence lockers.

Minimum Qualifications: 1-year experience installing evidence lockers of comparable size and complexity to specified project requirements.

1.8 DELIVERY, STORAGE AND HANDLING

A. Follow manufacturer’s instructions and recommendations for delivery, storage and handling requirements.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify quantities of evidence lockers before fabrication. Indicate verified measurements on Shop Drawings. Coordinate fabrication and delivery to ensure no delay in progress of the Work.

B. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating evidence lockers units without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

1.10 SEQUENCING AND SCHEDULING

A. Sequence evidence lockers units with other work to minimize possibility of damage and soiling during remainder of construction period.

B. Schedule installation of specified evidence lockers after finishing operations; including painting have been completed.

C. Provide components which must be built in at a time which causes no delays general progress of the Work.

D. Pre-installation Conference: Schedule and conduct conference on project site to review methods and procedures for installing evidence lockers including, but not limited to the following:

Recommended attendees include:

1. Owner's Representative.
2. Prime Contractor or representative.
3. The architect/engineer
4. Manufacturer's representative.
5. Subcontractors or installers whose work may affect or be affected by the work of this section.

1.11 WARRANTY

A. Provide a written warranty executed by contractor, Installer and Manufacturer, agreeing to repair or replace units which fail in materials or workmanship within the established warranty period. This warranty shall be in addition to and not a limitation of other rights the owner may have under the General Conditions provisions of the Contract Documents.

B. Limited Lifetime Warranty: Subject to the terms in the written warranty, warrant the original purchaser exclusively that the locker frames manufactured by it will be free from defects in materials and workmanship for the lifetime of the locker. Warrant the original purchaser exclusively that all moving parts manufactured by it will be free from defects in materials and workmanship for five years.

C. Warrants that all refrigeration units shall be free from defects in materials and workmanship for one year from the date of the customer's written acceptance of installation. During the one-year warranty period, all parts are included at no cost for one year. Labor is included at no cost during the first year of the one-year warranty period. After the first year of the one-year warranty, all labor will be charged at the current rate.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. General: Products known as DSM Evidence Lockers are based upon evidence lockers manufactured by Spacesaver Corporation, 1450 Janesville Avenue, Fort Atkinson, Wisconsin 53538-2798. Telephone (866)-276-0445.

2.2 BASIC MATERIALS

A. General: Provide materials and quality of workmanship, which meets or exceeds established industry standards for products specified. Use furniture grade sheet metal and fasteners for component fabrication unless indicated otherwise. Material thicknesses/gauges are manufacturer’s option unless indicated otherwise.

2.3 LOCKER TYPES

A. Non pass-through evidence lockers

2.4 MANUFACTURED COMPONENTS, STANDARD EVIDENCE LOCKERS

A. Welded Frame:

1. The welded frame is structural and shall consist of top, bottom, back and sides constructed of a minimum of 18 gage (1.21MM) steel. All frame components shall be joined using resistance welding. Riveting or bolting of structural members will not be permitted.

2. Horizontal and vertical outer front flanges will be a minimum of 1.5 inches (38MM). Horizontal and vertical flanges will overlap with a minimum of two resistance welds per corner.

3. Center vertical lock housing is structural and will run the full height and depth of the locker. All locks will be completely enclosed by a full height removable panel. Pass-through rear release mechanisms will be completely enclosed by the lock housing and accessible only when the rear door is open. Provide engagement points for the anti-pry tabs that are on all front doors.

4. Exposed lock mechanisms that can snag evidence and be obstructed by stored articles will not be permitted.

B. Welded Bases:

1. Each welded base shall be permanently affixed to each locker using modern Inert Gas Metal Arc Welding techniques for lateral unit stability. The base shall be a minimum of 14 gage (1.98MM) steel 4 inches (101MM) high with a 1.5 inch (38MM) return on the bottom for support.

2. Provide four 0.375 inch (9.5MM) mounting holes and four 0.375 inch (9.5MM) nuts welded in place for the mounting of floor levelers. Provide four appliance levelers per locker.

3. Provide removable access panels for access to mounting holes and leveling points.

C. Shelves:

1. Shall be a single-piece formed from a minimum of 18-gage (1.21MM) cold rolled steel with a double 90-degree bend on the rear of the shelf and a double 90-degree bend on the front of the shelf. Shelf sides shall be turned up 90-degrees for ease of cleaning and to prevent debris from becoming caught between the shelf and the sidewall.

2. All shelves shall be welded into place. Rivets, screws, bolts or other loose fasteners will not be permitted for the fastening of shelves to the locker frame.

D. Locks:

1. Patent Pending. Lock shall be push button locking with a stainless steel push button and alignment bezel. Locks shall be a one-piece removable design. Locks will secure the door with the single push of a button with no other action required by the user.

2. Locks will be deadbolt type locks with multi-point engagement. Rotary latches or cam locks will not be tolerated.

3. Non Pass-through locks will be reset from the front of the locker using tube type locks keyed to differ.

4. Provide documentation for cycle testing where locks are tested successfully to a minimum 40,000 cycles without failure.

5. Locks shall be pre-lubricated with no maintenance required for the lifetime of the unit (estimated at 20 years).

E. One Piece Welded Doors:

1. Shall be formed from two pieces of minimum 18-gauge (1.2MM) cold rolled steel box formed and welded together using modern GMAW techniques. The one piece door with inner and outer door skins shall have a combined steel thickness of no less than 0.096 inches (2.4MM) thick.

2. Each door shall have a nickel plated, flush mounted door handle installed with fasteners visible only in the unlocked position.

3. Provide neoprene silencers on each door.

4. Provide anti-pry tabs that engage with the Center Vertical Lock Housing when the door is locked.

5. Doors shall have no moving parts except the door and the hinge.

6. Provide stainless steel spring loaded hinges that are welded to prevent pin removal. Spring loaded hinges shall be capable of holding the door closed and flush with the door frame. Doors that hang ajar are a safety concern and will not be tolerated.

2.5 FABRICATION

A. General: Coordinate fabrication and delivery to ensure no delay in progress of the Work.

2.6 FINISHES

A. Colors: Selected from manufacturer's standard available colors.

B. Paint Finish: Provide factory applied electrostatic powder coat paint. Meet or exceed specifications of the American Society for Testing and Materials (ASTM) standards.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine evidence lockers scheduled to receive accessories [with Installer present] for compliance with requirements for installation tolerances and other conditions affecting performance of specified accessory items.

B. Proceed with accessory installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Follow manufacturer's written instructions for installation of each type of accessory item specified.

3.3 FIELD QUALITY CONTROL

A. Verify accessory unit alignment and plumb after installation. Correct if required following manufacturer's instructions.

B. Remove components that are chipped, scratched, or otherwise damaged and which do not match adjoining work. Replace with new matching units, installed as specified and in manner to eliminate evidence of replacement.

3.4 ADJUSTING

A. Adjust all accessories to provide smoothly operating, visually acceptable installation.

3.5 CLEANING

A. Immediately upon completion of installation, clean components and surfaces. Remove surplus materials, rubbish and debris resulting from installation upon completion of work and leave areas of installation in neat, clean condition.

3.6 DEMONSTRATION/TRAINING

A. Schedule and conduct demonstration of installed accessory items and features with owner's personnel.

B. Schedule and conduct maintenance training with owner's maintenance personnel. Training session should include lecture and demonstration of all maintenance and repair procedures that end user personnel would normally perform.

3.7 PROTECTION

A. Protect system against damage during remainder of construction period. Advise owner of additional protection needed to ensure that system will be without damage or deterioration at time of substantial completion.

END OF SECTION 10 51 13

Section 10 60 00 – Safety Netting

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 specification sections, apply to this section.

B. Section includes

1. Safety net system for use in conjunction with the recessed floor inspection trenches in the Inspection Bays.

1.2 RELATED SECTIONS

A. Section 05 50 00 – Metal Fabrications: Steel tube trolley assembly for safety netting attachment.

1.3 SUBMITTALS

A. Product data

B. Samples: Submit 36” long sample of netting complete with hemmed edge and grommets.

C. Shop drawings showing fabrication and erection of safety net system. Include plans, elevations, and large scale sections of typical components. Show anchors, reinforcement, accessories, and installation details.

1.4 REFERENCES

A. Safety net system shall comply with the following regulations:

1. OSHA regulation 1910.22c and 1910.23(a) and General Duty Clause 5(a)(1).

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver netting protected in waterproof wrapping and identified as “Inspection Bay Trench Netting”. Store in dry area.

PART 2 – PRODUCTS

2.1 MANUFACTURER

A. BayNets Safety Systems, Colchester, CT 06415, Phone (800) 331-0731: BayNets™ ‘BNS38 System’

2.2 MATERIALS

A. Description: Provide two sets of bi-parting net systems.

B. Netting Specifications

1. Model # 218-060-06
2. Style: Raschel Knotless Netting
3. Fiber: High Tenacity, Polypropylene (HTPP)
4. Cord Diameter: 3/16 inch (5 mm)
5. Mesh Size: 2-1/2 inch square opening measured between mesh joints.
6. Mesh Break: 719 lbf
7. Dynamic Drop Test: 12,075-ft-lb (ANSI A10.11 test method)
8. Weight: 0.0528 PSF
9. Melting Point: 340 deg. F.
10. UV: Extra UV stabilizers added.
11. Color : Black

C. Netting Components:

1. Provide quick-link connectors for attachment to steel tube trolley rails.

PART 3 – EXECUTION

3.1 PREPARATION

A. Unpack all items and verify that all net, cable, clamps, turnbuckles, quick links, snap hooks, cable pad eyes and cable lug components have been included.

3.2 MOCK-UP SECTION

A. Prior to installation of trolley assembly (see Section 05 50 00), provide length of netting necessary testing of operability.

3.3 INSTALLATION

A. Install netting as indicated on the drawings for a complete and functioning system.

B. Following installation, the entire safety net system should be checked for smooth operation. Adjust as necessary.

3.3 DEMONSTRATION

A. Train owner’s designated personnel on procedures related to net operation, stowage, troubleshooting, servicing, and preventative maintenance.

B. Schedule training with owner with at least 7-day advance notice.

END OF SECTION 10 60 00

Section 10 75 00 – Flagpoles

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, accessories and labor necessary for the installation of aluminum flagpoles as shown on the drawings.

1.2 RELATED WORK (BY OTHERS)

A. Section 03 30 00 – Concrete Piers

B. Division 26 - Electrical Systems: Connection to pole mounted light fixtures.

1.3 SUBMITTALS

A. Shop Drawings

B. Manufacturer's product data and installation instructions.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Manufacturer: Provide flagpoles manufactured by one of the following:

1. American Flagpole, Division of Keamy-National.
2. Automatic Flagpole Co., 511 N. Lincoln Avenue, Skokie, Illinois 60153.
3. Concord Industries, Inc.
4. Eder Flag Manufacturing Corp.
5. EMC, Div. of Eder Manufacturing Corp.
6. John Ewing and Co., Inc.
7. Pole-Tech Co. Inc.

2.2 FABRICATION

A. Pole Construction: Fabricate pole in one piece wherever possible. For field joints, use internal splicing sleeve for weather-tight and invisible seams.

1. Flagpole, with or without flag flying, shall resist without permanent deformation a 90-mph wind, have a safety factor of 2.5, and be non-resonant.
2. Pole shall be capable of flying a flag 6'-0" x 10'-0" maximum size.

B. Aluminum Flagpole: Seamless extruded tubing complying with ASTM B 241, alloy 6063-T6, heat-treated and age-hardened, with natural clear 0.7-mil anodized finish, NAAMM-M31C21A41.

1. Pole Height: 30 feet
2. Quantity: 1

C. Cone Taper: Manufacturer's standard seamless, uniform, straight-line tapered section above a cylinder butt section.

D. Base: Provide manufacturer's standard base and anchorage system for ground mounted installation required, including necessary brackets and bracing.

2.3 ACCESSORIES: Manufacturer's standard to suit size and type of pole, and as follows:

A. Finial ball, 8" aluminum w/gold anodized finish.

B. Interior stainless steel halyard, with plastic coated counterweight and sling.

C. Truck assembly, stainless steel, revolving, stainless steel ball bearings, non-fouling, finished to match pole.

D. Hand crank, removable type.

E. Flash collar, spun aluminum to match flagpole finish.

F. Light Fixtures: Bracket mounted 18” long x 6” diameter aluminum cylinders (3 such) designed to accept 150 watt flood lamps for up lighting. Finish to match flagpole.

G. Flags: Provide manufacturer’s standard nylon outdoor flags with canvas header and brass grommets.

1. U.S. Flags:

a. Size: 5’ x 8’

b. Qty: 4

2. State of Wisconsin flags

a. Size: 4’ x 6’

b. Qty: 4

PART 3 – EXECUTION

3.1 INSTALLATION: As shown, complete and according to manufacturer’s instructions.

A. Coat metal sleeve surfaces below grade and surfaces in contact with dissimilar materials with asphaltic paint.

B. Maximum variation from plumb: 1 inch.

C. Adjust operating devices so halyard and flag operate smoothly.

END OF SECTION 10 75 00

END OF DIVISION 10 – SPECIALTIES

DIVISION 11 – Equipment

Section 11 24 00 – Maintenance Equipment

PART 1 – GENERAL

1.1 SCOPE OF WORK:

A. Work Includes

1. Two-stage Gas Snow Blower

1.2 SUBMITTALS:

A. Submit product literature and specifications.

PART 2 – PRODUCTS

2.1 SNOW BLOWER EQUIPMENT

A. Manufacturer: Toro 32” Power MAX HD 1432 OHXE Commercial 420 cc Two-Stage Electric Start Gas Snow Blower

2.2 DESCRIPTION

A. Features:

1. Commercial-Grade 32” clearing width.
2. Self-Propelled with 6 speeds forward and 2 speeds reverse.
3. Quick Stick Chute Control – Quickly change the chute and deflector direction with a single smooth motion.
4. Power Steering
5. Auger Gearbox – Commercial Grade No Shear Pins.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Store as recommended by manufacturer.

END OF SECTION 11 24 00

Section 11 31 13 – Kitchen Equipment

PART 1 – GENERAL

1.1 REFERENCES:

A. National Fire Protection Association (NFPA)

B. NSF International

C. U.S. Department of Energy (DOE)

1. Energy Star Energy Efficiency Labeling System

1.2 RELATED WORK BY OTHERS

A. Division 26 – Electrical: Electrical supply

1.3 SUBMITTALS:

A. Submit product literature and specifications.

PART 2 – PRODUCTS

2.1 KITCHEN EQUIPMENT

A. Refrigerator

1. UL 250, refrigerator with frost proof freezer, minimum 20 cubic feet, automatic defrosting, two vegetable bottom baskets, four adjustable shelves, two door shelves and minimum 12 egg container in the door, separate interior shelves, multiple door shelves, and two ice trays. Provide refrigerator that in Energy Star labeled. Provide data identifying Energy Star label for refrigerator. (For refrigerator with top freezer, provide reversible left swing and right swing interchangeable doors) Provide four fixed rollers or adjustable leg levelers.

B. Microwave Oven

1. UL 923, Countertop unit, with black glass window door, minimum one cubit foot capacity, automatic oven light, browning element, 10 power levels, automatic temperature controllers, minimum two automatic memory levels, digital time controllers, and electronic touch-control panel.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Do not install items that show visual evidence of biological growth.

3.2 FIELD INSPECTION

A. Before and after installation, inspect each piece of kitchen equipment for compliance with specified requirements.

3.3 MANUFACTURER'S WARRANTY

A. Submit all manufacturers signed warranties to contracting officer prior to final commissioning and acceptance.

END OF SECTION 11 31 13

Section 11 52 00 – Audio Visual Equipment

PART 1 – GENERAL

1.1 SCOPE OF WORK:

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work Includes

1. Flat screen monitor and tv mounting frames.
2. Flat screen TV's.
3. Flat screen monitors.

1.2 RELATED WORK BY OTHERS

A. Division 26 – Electrical: Electrical supply for electric screens

1.3 SUBMITTALS: In addition to product data, submit the following:

A. Shop drawings showing screen dimensions, fabrication, installation details, and electric wiring details.

PART 2 – PRODUCTS

2.1 FLAT SCREEN MONITOR MOUNTING FRAME

A. Basis of Design Product: The design is based on the Da-Lite product described below. Subject to compliance with the requirements, provide either the named product or a comparable product by one of the other manufacturers listed in this section:

B. Manufacturer: Ergotron Model LX Sit-Stand Wall Mount LCD Arm, Heavy Duty.

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

a. Bret Ford

b. Chief Kontour

c. Peerless

C. Equipment

1. Plasma screen mounting frame shall be fabricated mild steel design and consist of a pivot assembly, adjustable frame assembly, and adjustable support arms.

a. The monitor mount shall have a minimum weight capacity of 20 lbs or more.

b. Mount packages shall safely hold a 32" to 42" diagonal screen TV/monitor.

2.2 FLAT SCREEN TV MOUNTING FRAME

A. Basis of Design Product: The design is based on the Kanto product described below. Subject to compliance with the requirements, provide either the named product or a comparable product by one of the other manufacturers listed in this section:

B. Manufacturer: Kanto Model LDX690 Full Motion TV Mount.

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

a. Sanus

b. Insignia

c. Echogear

C. Equipment

1. Flat screen TV mounting frame shall be fabricated with solid steel construction and a durable powder coated finish.

a. The mount shall have adjustable horizontal leveling with cable management.

b. The mount shall have a range of motion to include swivel, tilt and extension.

c. Maximum weight allowance to be no less than 100 lbs.

2.3 ACCESSORIES

A. Installation hardware: Provide attachment hardware, fasteners, and other components of type, size, and spacing recommended by manufacturer for complete, functional, secure installation of suspended monitor mounting frame.

2.4 FLAT SCREEN TV

A. Basis of Design Product: The design is based on the Element product described below. Subject to compliance with the requirements, provide either the named product or a comparable product by one of the other manufacturers listed in this section:

B. Manufacturer: Element Model 450 Series 75” 4K UHD HDR10 Roku TV

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

a. Samsung

b. Sony

c. LG

C. Manufacturer: Element Model 400 Series 55” 4K UHD HDR10 Roku TV

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

a. Samsung

b. Sony

c. LG

D. Equipment

1. Flat screen TV shall be VESA mounting compatible and 4K UHD.

2.5 FLAT SCREEN MONITOR

A. Basis of Design Product: The design is based on the Dell product described below. Subject to compliance with the requirements, provide either the named product or a comparable product by one of the other manufacturers listed in this section:

B. Manufacturer: Dell Model S2421NX 24” IPS LED FHD – AMD FreeSync – VESA – Monitor (HDMI) - Black

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

a. Samsung

b. HP

c. LG

C. Manufacturer: HP Model 32s FHD IPS Monitor

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

a. Samsung

b. Dell

c. LG

D. Equipment

1. Flat screen TV shall be VESA mounting compatible and 4K UHD.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Flat Screen Monitor Mounting Bracket

1. Mount to blocking in soffit as required by manufacturer.

2. Secure monitor mount to wall as per manufacturers recommendations.

3. Attach monitor mount and pivot assembly per manufacturer's installation guidelines.

3.2 TESTING

A. Test electrically operated units to verify that screen, controls, limit switches, closure, and other operating components are in optimum functioning condition.

END OF SECTION 11 52 00

Section 11 72 53 – Medical Treatment Equipment

PART 1 – GENERAL

1.1 SCOPE OF WORK:

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Work Includes

1. Defibrillator equipment

1.2 RELATED WORK BY OTHERS

A. Division 26 – Electrical: Electrical supply

1.3 SUBMITTALS:

A. Submit product literature and specifications.

PART 2 – PRODUCTS

2.1 DEFIBRILLATOR EQUIPMENT

A. Manufacturer (No substitutions): Medtronic Physio Control LifePak 9P

2.2 DESCRIPTION

A. Defibrillator to have EASY 1-2-3 operation with built-in noninvasive pacing and user-friendly display.

B. Features:

1. High and low energy select displays.

2. Annotating recorder that prints out time. Date, leads, gain, and CODE SUMMARY critical event, which recaps critical events from the moment of “power on”.

3. Defibrillator adapter used with auxiliary paddles for “hands-free” defibrillation.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Mount defibrillator as recommended by manufacturer.

END OF SECTION 11 72 53

END OF DIVISION 11 – EQUIPMENT

DIVISION 12 – Furnishings

Section 12 20 00 – Window Treatment

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Furnish and install window treatment at all rooms identified on the drawings, including all track systems, recessed roller shade pocket headbox assembly and mounting hardware necessary for a complete installation.

B. Window treatment will include the following:

1. Horizontal louver window blinds.
2. Rolling fabric room darkening solar shades (manual).
3. Roller tinted film shades (manual).

1.2 REFERENCES

A STM E84 – Surface Burning Characteristics of Building Materials

1.3 SUBMITTALS

A. Samples two 12” long samples, illustrating color and pattern for each horizontal blind material specified.

B. Shop drawings showing details of components necessary for a complete installation.

C. Manufacturer’s Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

D. Maintenance Data: Include maintenance procedures. Recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

1.4 WARRANTY

A. Warranty to be sole source responsibility of the manufacturer. Second source warranties and warranties that involve parties other than the window blind manufacturer are unacceptable.

B. If the product fails to perform as warranted when properly installed and maintained, the affected area will be repaired or replaced at the discretion of the manufacturer.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Horizontal Louver Blinds (**WT-1**)

1. Graber
2. Hunter Douglas
3. Levolor Contract
4. Springs Window Fashions Division; Bali
5. Verosol USA, Inc.

B. Rolling Fabric Solar Shades (**WT-2**)

1. BTX Window Automation, Inc.
2. Draper Shade & Screen Co., Inc.
3. MechoShade Systems, Inc.

C. Rolling Tinted Film Solar Shades (**WT-3**)

1. Hunter Douglas Window Fashions
2. Nyson Shading Systems Ltd.
3. Sol-R-Veil

2.2 MATERIALS – HORIZONTAL LOUVER BLINDS: **WT-1** (See drawing A904)

A. Fabrication

1. Louver Slats: Aluminum, alloy and temper recommended by manufacturer for type of use and finish indicated with crowned profile and radiused corners.

   a. Slat Width: 1 inch (25 mm)

   b. Slat Spacing: Not less than every 20 mm for 15.2 slats or more per foot (20 mm).

   c. Nominal Slat Thickness: Not less than 0.008 inch (0.20 mm).

   d. Slat Finish: Equal to Hunter Douglas Woodland Dusk. Slats to have ionized coating with antistatic, dust-repellent, baked polyester finish.

2. Headrail/Valance: Decorative, integrated headrail, valance not requiring a separate valance or end brackets for finished appearance; formed steel or extruded aluminum; log edges returned or rolled; fully enclosing operating mechanism on three sides and ends; capacity for one blind per headrail, unless otherwise indicated.

   a. Finish Color Characteristics: Match color, texture, pattern, and gloss of louver slats.

3. Bottom Rail: Formed-steel or extruded-aluminum tube, sealed with plastic or metal capped ends top contoured to match crown shape or louver slat, bottom contoured for minimizing light gaps; with enclosed and protected ladders and tapes to prevent their contact with sill.

4. Tilt Control Method: Consisting of enclosed worm gear mechanism, slip clutch or detachable wand preventing over-rotation, and linkage rod, for the following operation:

   a. Tilt Operation: Manual with clear plastic wand.

   b. Tilt Two-direction, positive stop or lock-out limited at an angle of 60 degrees from zero-degree horizontal, both directions.

5. Lift Operation: Manual, top-locking cord lock; locks pull cord to stop blind in either fully opened or fully closed position only and is equipped with a ring pull not more than 4 inches long.

6. Ladders: Evenly spaced to prevent long-term louver sag.

7. Mounting: End mounting permitting easy removal and replacement without damaging blind or adjacent surfaces and finishes; with spacers and shims required for blind placement and alignment indicated. Provide intermediate support brackets if end support spacing exceeds spacing recommended by manufacturer for weight and size of blind.

2.3 MATERIALS – ROLLING SOLAR SHADES: **WT-2** (See drawing A904)

A. Fabrication

1. Fabric: Vinyl-coated polyester yarns consisting of 25% polyester, 75% PVC on polyester, Greenguard Certified based on Mecho/5 Manual Shade System *Thermoveil*® Open Basket Weave 2100 Series.

   a. Percent Opening: 10 %

   b. Solar Shade Color: Based on Mechoshade: Grey #2113

   c. Shades must be the sizes as shown on the drawings. Splitting of shades is not allowed.

B. Roller: Fabricated from extruded aluminum or steel. Diameter, wall thickness, and material selected by manufacturer to accommodate shade size. Provide with roller idler assembly of molded nylon and zinc-plated steel pin. Sliding pin to allow easy installation and removal of roller.

C. Hem Bar: Provide manufacturer's standard aluminum extrusion enclosed in a fabric hem pocket with heat-welded seams and ends.

D. Recessed Pocket Headbox: Fabrication from manufacturer's standard extruded aluminum sections with endcaps and integral ceiling angled leg for support of abutting acoustical ceiling tile.

1. Exposed Aluminum Finish: Baked enamel paint finish available in manufacturer's standard range of colors.

2. Attachment Hardware: Window Treatment Contractor shall provide wall brackets and mounting hardware as necessary to secure roller assembly.

E. Endcaps: Stamped steel with universal design suitable for mounting to ceiling, wall, and jamb.

F. Lift Operation: Manual, top-locking cord lock.

2.4 MATERIALS – ROLLER TINTED FILM SHADES; **WT-3** (See drawing A904)

A. Shade Material (Based on Mecho/5 Manual Shade System *MirroFilm*™ 0600 Series)

1. PVC-free, light filtering, and heat insulating of tinted polyester film with a deposit of pure aluminum in the core.

2. Color: Smoke/Silver-Smoke 0606

B. Hembars: Provide extruded aluminum oval or rectangular shaped hembar with matching end caps, pre-weighted, to maintain bottom of shade fabric straight and flat. Aluminum extrusions to be finished to match color of curtainwall framing.

C. Rollers: Electrogalvanized or epoxy primed steel or extruded-aluminum tube of diameter and wall thickness required to support and fit internal components of operating system and the weight and width of shade band material without sagging; designed to be easily removable from support brackets with manufacturer's standard method for attaching shade material.

D. Recessed Pocket Headbox: Fabrication from manufacturer's standard extruded aluminum sections with endcaps and integral ceiling angled leg for support of abutting acoustical ceiling tile.

1. Exposed Aluminum Finish: Baked enamel paint finish available in manufacturer's standard range of colors.

2. Attachment Hardware: Window Treatment Contractor shall provide wall brackets and mounting hardware as necessary to secure roller assembly.

E. Lift Operation: Manual, top-locking cord lock.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Complete field measurements prior to fabrication

3.2 INSTALLATION

A. Mount track assembly as recommended by manufacturer and install blinds

END OF SECTION 12 20 00

Section 12 41 13 – Office Shredder

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Work Includes

1. Commercial grade paper shredder

1.02 SUBMITTALS:

A. Submit product literature and specifications

PART 2 – PRODUCTS

2.1 COMMERCIAL PAPER SHREDDER

A. For basis of design, the plans are based on:

1. Fellowes Powershred 225Ci 100% Jam Proof Cross-cut Shredder

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturers wishing to submit alternate products shall submit product data sheets and/or specifications.

1. Dahle Shredders.

2. Formax.

2.2 DESCRIPTION

A. Features:

1. 100% Jam proof system.

2. SilentShred for ultra-quiet performance in shared workspaces.

3. Safesense technology stops shredding when hands touch the paper opening.

4. Energy savings system to reduce energy consumption.

5. Cross cutting for security level 3 with 30 gallon bin.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Store as recommended by manufacturer.

END OF SECTION 12 41 13

Section 12 46 33 – Waste & Recycle Containers

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Work Includes

1. Waste & recycling containers

1.02 SUBMITTALS:

A. Submit product literature and specifications.

PART 2 – PRODUCTS

2.1 WASTE CONTAINER

A. For basis of design, the plans are based on:

1. Rubbermaid Commercial Products – Vented Slim Jim 16 Gal black for trash, blue for recycling and yellow for paper only.
2. Rubbermaid Commercial Products – Wastebasket medium 28 QT black
3. Rubbermaid Commercial Products – Vented wheeled brute container 44 gal. gray

B. Equivalent products from the following alternate manufactures will be accepted contingent on compliance with the performance requirements as set forth by the base specifications. Manufacturers wishing to submit alternate products shall submit product data sheets and/or specifications.

a. Toter LLC.

2.2 DESCRIPTION

A. Features:

1. Venting channels for making removal of liners easier.
2. Four bag cinches to secure liners around the rim of the container.
3. Rim with rib-strengthened design to increase strength and resists crushing.
4. Injection molded with a high-quality resin blend.

2.3 LIDS

A. Rubbermaid Slim Jim Lids to match waste/recycling/paper container and function.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Store as recommended by manufacturer.

END OF SECTION 12 46 13

Section 12 48 16 – Floor Grids & Floor Mats

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Applicable provisions of Division 1 shall govern the work under this section.

B. Section Includes

1. Aluminum framed floor grid and mat.

2. Anti-fatigue mats.

1.2 RELATED SECTIONS

A Section 03 30 00 – Concrete: Recessed Floor Slab

1.3 REFERENCES

A. American Society for Testing and Materials (ASTM)

1. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes.

1.4 SUBMITTALS

A. Submit manufacturer's specifications and technical data, including Material Safety Data Sheets, installation instructions, as required, and catalog cuts and templates where required to explain construction and to provide for incorporation into the project.

B. Submit shop drawings showing layout and types of mats and floor grids and frames; full-scale sections of typical installations; anchors and accessories. Shop drawings submittal shall be coordinated with concrete workshop drawings showing oversized recess for deferred installation of frame.

C. Samples:

1. Floor grid

2. Anti-fatigue mat

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver floor grid system to jobsite in new, clean, unopened crates of sufficient size and strength to protect materials during transit.

B. Store components in original containers in a clean, dry location.

1.6 WARRANTY

A. Submit manufacturer's warranty that materials furnished will perform as specified for a period of not less than two years for floor grids and not less than three years for floor mats when installed according to manufacturer's recommendations.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Floor Grids (F. GRID)

1. Balco, Inc. 'FGLP Series'

2. Mats Inc. 'Grate Mat XT'

3. Pawling Corp.

B. Anti-Fatigue Mats (MAT)

1. Mats Inc. 'Cushion Eze'

2. R C Musson Rubber Company: 'Sof-spun Vinyl Sponge Mats'

3. 3M™ Anti-Fatigue Mats

2.2 MATERIALS – FLOOR GRIDS

A. Floor Grid Systems:

1. Tread rails: ASTM B221, alloy 6005-T6
2. Continuous vinyl hinges: Flexible PVC
3. Frames: Aluminium, ASTM B221, alloy 6063-T5
4. Angle Frames: Aluminium, ASTM B221, alloy 6063-T5
5. Locking Bars: Aluminum, ASTM B221, alloy 6063-T5

B. Inserts: Two (2) part epoxy combined with aluminum oxide grit.

1. Color: Balco 'Nickel Gray' or as selected from approved alternate manufacturers.

C. Fasteners, accessories and other materials indicated as provided by the manufacturer on the manufacturer's details and in the manufacturer's installation instructions and required for complete installation to manufacturer's instructions.

2.3 MATERIALS – ANTI-FATIGUE MATS

A. 3/8" thick closed cell sponge w/ vinyl edge perimeter.

B. Surface: Manufacturer's standard embossed pebble surface

C. Sizes (cut from roll goods)

Operations 106: 7'- 0" x 48" QTY (1)

Operations 106: 5'- 0" x 48" QTY 3)

D. Color: Black

2.4 FABRICATION – FLOOR GRIDS

A. Fabricate floor grid assemblies as detailed.

1. Fabricate grid custom cut sections as required.
2. Fabricate floor grids as a series of grid tread bars spaced at 1-1/2 inches O.C. nominal.
3. Tread surfaces shall have abrasive inserts locked into extruded aluminum tread rails.
4. Provide necessary and related parts, devices, anchors and other items required for proper installation.

B. Provide components single size where possible; minimize site splicing.

1. Provide minimum number of pieces possible for frames that exceed maximum length. Provide frames with hairline joints, equally spaced, complete with corner pin, splice plates and installation anchors.
2. Frame, aluminum pan and I-beams shall be shop fabricated as an assembled unit for installation in the field.

C. Shop assemble components and package with anchors and fittings.

2.5 FINISHES – FLOOR GRIDS

A. Aluminum

1. Tread rails, "U" channels; Clear Anodized.
2. Embedded Frames: Shop coating of clear acrylic.

2.6 FLOOR GRID SCHEDULE

Room	Size (Nominal Dimensions)
Vestibule 101	16’-0” long x 5’-0” wide
Vestibule 101	4’ - 0” long x 5’-0” wide
Vestibule 121	7’ – 0” long x 4- 0” wide
Operations 106	4’ – 0” long x 5- 0” wide
Operations 106	5’ – 0” long x 4- 0” wide

PART 3 – EXECUTION

3.1 EXAMINATION

A. Contractor shall verify that field measurements and recessed dimensions are as shown on shop drawings prior to releasing materials for fabrication by the manufacturer.

B. Installer shall examine conditions under which work is to be performed and shall notify the contractor in writing of unsatisfactory conditions. Installer shall not proceed until unsatisfactory conditions have been corrected in a manner acceptable to the installer.

3.2 INSTALLATION

A. Install floor grid system according to the governing regulations, the industry standards applicable to the work and the manufacturer’s written installation instructions.

B. Work shall be aligned plumb, level, and where required, flush with adjacent surfaces.

C. Anchors shall be spaced at 24 inches O.C.

3.3 ADJUSTING AND PROTECTION

A. Inspect system components for proper fit. Adjust, repair or replace components not conforming to requirements. Repair or replacement of an individual unit shall be as approved by the architect.

B. Advise the contractor of procedures required to protect the finished work from damage during the remainder of the construction period.

C. Finished units shall be without damage. Units damaged during shipping or construction shall be repaired by the contractor at the expense of the party damaging the material, according to the contract requirements.

D. Protect installation from damage by work of other Sections. After installation of frame, install temporary filler of plywood in recesses and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of Substantial Completion.

END OF SECTION 12 48 16

Section 12 50 00 – Furniture

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 specifies general requirements for furniture as noted on the Furniture Schedule.

1. Tables
2. Office Chairs
3. File Cabinets
4. Chairs
5. Desks
6 Movable Stairs

1.3 SUBMITTALS

A. Submit in compliance with Section 01 33 00 – Submittal Procedures.

B. Installer Certification: Submit for architect's approval, prior to review of product data, samples, and shop drawings, the following: A certificate of license or letter from manufacturer stating full approval of installer (furnishings contractor). Contractors unable to obtain the above-specified credentials will not be considered acceptable installers.

C. Product Data: Submit specifications, assembly, and installation instructions and general recommendations from manufacturers for each type of furnishing required. Include data substantiating that materials comply with requirements.

D. Samples for Initial Selection: Manufacturer's color charts or sections showing the full range of finishes, colors, textures, and patterns available for each exposed material.

E. Maintenance Data: Submit manufacturer's printed instructions for maintenance and installation. Include precautions against materials and methods that may be detrimental to finishes and performance.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer (material producer) with not less than five years of production experience, whose published literature clearly indicates general compliance of products with requirements of this section.

B. Installer Qualifications: Contractor with not less than five years of successful experience in installation of furnishing similar to those required for this project.

C. Source Limitations: Obtain each type of furnishing required, including accessories and mounting components, through one source from a single manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install seating until space is enclosed and weatherproof; wet work in space is complete and dry; finishes, including painting, are complete; and work above ceilings is complete. Do not install seating until ambient temperature and humidity conditions are continuously maintained at the levels anticipated for final occupancy.

B. Field Measurements: Verify seating layout by field measurements before seating fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Review delivery and storage conditions before and during installation. Comply with instructions and recommendations of manufacturer for special delivery, storage, and handling requirements. Review temporary protection requirements for furnishings during and after installation.

1.6 PRODUCT STORAGE, DELIVERY AND HANDLING

A. All shipping, storage and delivery costs for equipment furnished by the furnishings supplier.

B. Do not deliver furnishings until authorized by the General Building Contractor. Verify storage areas with the prior to delivery. Verify delivery route and building access prior to fabrication or installation.

C. Furnishings shall be wrapped and crated at the factory and shall be delivered in undamaged condition. The General Building Contractor shall be responsible for loss or damage to equipment until final inspection and acceptance by the owner. Store all furnishings and materials in such a manner as to prevent damaged to moisture, foreign material and impact.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the furniture items listed below are based on products manufactured by KI, Green Bay, WI.

B. Equivalent products from the listed alternate manufactures will be accepted contingent on compliance with the base specifications associated with the selected furnishing item. Manufacturer's wishing to submit alternate products shall submit product data sheets and/or specifications for approved alternates.

C. All products must have a minimum of a 10 year warranty and the providing manufacturer will cover all repair costs associated during this warranty period.

2.2 FURNISHINGS SCHEDULE

A. Training Tables **F-1**

1. Manufacturers: KI "Datalink" Training Table - 24"D x 72"W x 29"H w/PowerUp Left & Right Edge Locations, Folding Leg, Hinged Beam, & Urethane Edge.

a. Model: DL247229-ME-NP

b. Quantity: 13

2. Description:

a. Worksurface - Training table work surface tops to be 1-1/4" thick with a .042" thick high-pressure laminate surface, urethane edging and .045" thick backer over a 45 lb/CF density particle board core.

b. Connect modules will be available along the back edge of the work surface away from the user in either the right or left-hand corners or both locations. Two nylon carrying handles are built into the bottom of the worksurface along the front edge. The folded legs are held in place by two retractable nylon leg locks that are recessed into the bottom of the worksurface. The grommet shall be 6-3/4" x3-3/8" (o.d.) ABS grommet with a flip-up receding door. The grommet shall be identical in size to the Connect modules to allow for retrofitting.

c. Folding Leg Mechanism - Assemblies come attached to the completed table, no assembly required. The table unfolds by releasing the legs from the leg locks and raising the legs.

d. Wire Management - Tables to include hinged wire management trough for concealing standard loft, 15 amp, three prong plug with circuit breaker. 'Power Up' devices to be manually opened and closed with two-sided, bi-colored 'T'-connector for attachment to cord, which terminates with a latched connection. The cord may be either the in feed or a jumper. All jumper plugs and 'T'-connections are keyed and color-coded.

e. The PowerUp - Module shall be 7” long x 3-1/2” wide x 2-1/2” high and fit securely into a 6-1/4” x 3” cutout but still allow removal without tools. The module shall be constructed of polycarbonate with a textured finish, meeting UL-VO minimum requirements. The module shall have two receptacles rated at 15 Amps/125 Volts and two locations for data connectors. Snap-in data plates hold data connectors and allow the standard module to accommodate most manufacturers. The data connectors are not supplied with the module and shall be purchased by the customer. The module shall have a dampened spring-loaded mechanism to allow the unit to open for use and shall be able to close when not in use. The power receptacles shall open above the plane of the worksurface to avoid accidental spills into the receptacle. The data jacks shall remain stationary to avoid excess wear and tear on the wire connections and promote good transmission of communication data. The module shall come standard with 180” cord with a 3-prong plug.

B. Tables: **F-2**

1. Manufacturer: KI “Barron” Table - 60"W x 30"D x 29"H, 74P Edge, T-Base, HPL Surface & Powder-coated Base.
2. Model: B255F-74P
3. Quantity: 2
4. Description:

a. Pedestal Base Table - This system employs 14-gauge, 1 3/4" O.D. tubular 1010 steel components in fixed, folding or flip-top models. Barron includes T, TT, X, LX and cantilevered ‘T’ base combinations. LX series is furnished with 3" O.D. seamless tubular steel column. All ends capped with finished steel plugs brazed in place, ground and polished smooth. End cap joints and leg to stringer joints will be silver brazed with 505 alloy (50% silver and 50% other, including 2% nickel added for a strong joint). Adjustable glides are secured to the legs via steel inserts in foot tube (riv-nuts) which provide a 5/16" threaded hole for the glide.

b. Fixed Base - Fixed table column welded to an 8" x 8" square, 12-gauge sheet steel plate with formed ribs for added strength and 4 mounting screws (5/16" hole for a #14 screw). LX base will be welded to an 8" x 8", 1/4" sheet steel plate.

c. Surface - Tops consist of a 11/8" thick high-density particleboard core with a .020" high-pressure laminate top and .020" phenolic backing sheet. Tops are pre-drilled. Vinyl "T" molding will be press fit into particle board core. KI tables can hold a maximum of 1.5 lbs for each inch of perimeter evenly distributed over the top.

d. Brazing - Entails the joining of two metal parts by melting an alloy into the joint between the two parts. By heating the joint and melting the alloy through contact with the joint, the alloy will be pulled into the joint through a phenomenon called capillary action. This will create a strong bond between the two parts. The joint is actually stronger than the parent material. Plus, joint appearance will be clean and smooth.

C. Filing – Pedestal: **F-3**

1. Manufacturer: KI “700 Series” Pedestal – File/File Freestanding Pedestal File, Two Drawer, Letter Size, Lockable & 24"D x 15"W x 29"H.
2. Model: S7P/1524FFF
3. Quantity: 4

4. Description:

a. Shell - All pedestals are closed top design. Free standing and mobile pedestals have a continuous top surface. The top is 20-gauge cold-rolled steel (C.R.S.) with 11/8" flanges on all edges, with the front edge having an additional return formation to further add strength. The front 11/8" flange has a pre-punched hole approximately 2" from the right corner for the controlling lock. The pedestal body is a one-piece wrap-around design using 20-gauge C.R.S. The top edge is offset formed to accept the 11/8" flange of the top and to provide a flush detail. The bottom edge is flanged inward 1/8" to provide a surface to spot weld the back bottom reinforcement (when required) and the front upright box frame. The vertical front edges are channel-formed to provide additional strength and safety. The front upright assembly is a spot welded "box-frame" design, in which both front upright members are securely welded to the top reinforcement and bottom reinforcement to provide a strong, square frame. All components of the assembly are fabricated from 20-gauge C.R.S. Each corner or joint has a unique bracing design punched from the parent material. This design provides for double thickness at each corner for maximum strength. The frame assembly is inserted inside the pedestal and spot welded along the four vertical flanges of the uprights and at the bottom flange. The two back uprights are formed from 22-gauge C.R.S. and are double offset shaped. The front and back uprights are punched with square holes to allow the drawer suspensions to "clip" into the uprights. Each free standing and worksurface supporting pedestal is equipped with one 16-gauge back bottom reinforcement and a 16-gauge front glide support with threaded weld nuts to accept four adjustable glides. Mobile pedestals are fitted with two swivel and two braking twin wheel casters which are threaded into the bottom reinforcement and glide support. Pedestals without counterbalance weights are equipped with fifth wheels.

b. Drawers - Drawers are available in 3" (pencil), 6" (box) and 12" (file) heights. Fronts are screw-mounted to the drawer body. The outer front is fabricated from 22-gauge C.R.S. with a 11/4" x 12" handle recess and flanged on all four sides. The inner front liner is also fabricated from 22-gauge C.R.S. with extruded holes to accept screws and flanges on all four sides. The front and liner are spot welded together to create a 3/4" thick rigid drawer front. The drawer body is formed from 22-gauge pre-painted C.R.S. The upper edges are formed to provide a smooth edge as well as providing full length reinforcements. The box and file drawers are designed with four rows of slots to accept an adjustable divider. The drawer slides are bossed and pre-punched to accept the suspensions. The drawer back is 22-gauge pre-painted C.R.S. with a 30° form along the top edge and is mechanically clenched to the body. Each file drawer has a "Z" shaped component welded to the front liner to function as a support for one end of the hanging folders. The other end of a hanging folder is supported by locating the full-height divider in the appropriate slots.

c. Drawer Pulls - Drawers can be equipped with the following drawer pulls: classic, aluminum bow tie, nickel bow tie, aluminum metric, retro nickel and arc nickel. Drawer handles are curved metal flanges located in the middle of the drawer at the top of each front. Handles are painted black or to match the unit.

d. Suspensions - The pencil and box drawers operate on a 3/4 travel, 2-section slide assembly constructed from precision roll-formed sections, on hardened steel ball-bearings. Slides are zinc plated. The file drawers operate on full extension, 3-section slide assemblies. The sections are precision roll-formed steel and roll on hardened steel ball-bearings.

D. Moveable Stair: **F-4**

1. Manufacturers
    a. EGA Model L070
    b. C&H Products
    c. Gillis Industries
2. Quantity: 1
3. Description: Meets or exceeds OSHA standards, up to 300 lb. capacity, platform height 140", lockable wheels, and with handrails.

E. Task Chair: **F-5**

1. Manufacturer: KI "Impress Ultra" Task Chair - Adjustable Mesh Mid-Back, Upholstered Memory Foam Seat w/Pallas Grade 1 Fabric, two-way adjustable w/Width & Height Adjustment.
2. Model: KI75/JR69
3. Quantity: 8
4. Description:
    a. Mechanism – Stamped steel dual housing forms a sturdy cradle for the seat. There are two control levers. One lever actuates the pneumatic cylinder with infinite selection within the range. One lever locks the chair in one of 3 positions or actuates the free-floating mode. The Synchronized 2:1 free floating mode has adjustments of 8 degrees on seat and 16 degrees on back.
    b. Backrest – Nylon with fiberglass reinforced frame. Back mesh material is polyethylene elastomeric with polyester.
    c. Back Height – An easy to operate mechanism is installed on the back board for adjusting back height.
    d. Seat – Constructed of a 1/2" thick, saddle shape plywood with 2.5" molded foam and upholstered with fabric. The entire seat assembly is mounted to the mechanism by 4 screws. Double layer of foam. Molded memory foam is layered over molded, high-resiliency foam. Seat only.
    e. Base – 26" diameter, five blade reinforced black nylon base.
    f. Casters – The double 55mm diameter black wheels are molded of high-impact thermoplastic and are housed in a high-impact frame. Carpet or hard floor casters are available.
    g. Arm Cap – Molded Urethane two-way adjustable, by width and height. Forward-slanting T-arms with ergonomic, maximum mobility arm top. Adjustable height range of 4-1/4". Adjustable width range of 1-3/4" per side.
    h. Fabric – Pallas Grade 1: Bounce - Pomegranate

F. Task Chair: **F-6**

1. Manufacturer: KI "Impress Ultra" Stool - Adjustable Mesh Mid-Back, Upholstered Memory Foam Seat w/Pallas Grade 1 Fabric, two-way adjustable w/Width & Height Adjustment & Foot Rest Ring.
2. Model: KI74/JR69
3. Quantity: 15

4. Description:

   a. Mechanism – Stamped steel dual housing forms a sturdy cradle for the seat. There are two control levers. One lever actuates the pneumatic cylinder with infinite selection within the range. One lever locks the chair in one of 3 positions or actuates the free-floating mode. The Synchronized 2:1 free floating mode has adjustments of 8 degrees on seat and 16 degrees on back.

   b. Backrest – Nylon with fiberglass reinforced frame. Back mesh material is polyethylene elastomeric with polyester.

   c. Back Height – An easy to operate mechanism is installed on the back board for adjusting back height.

   d. Seat – Constructed of a ½" thick, saddle shape plywood with 2.5" molded foam and upholstered with fabric. The entire seat assembly is mounted to the mechanism by 4 screws. Double layer of foam. Molded memory foam is layered over molded, high-resiliency foam. Seat only.

   e. Base – 26" diameter, five blade reinforced black nylon base.

   f. Casters – The double 55mm diameter black wheels are molded of high-impact thermoplastic and are housed in a high-impact frame. Carpet or hard floor casters are available.

   g. Arm Cap – Molded Urethane two-way adjustable, by width and height. Forward-slanting T-arms with ergonomic, maximum mobility arm top. Adjustable height range of 4-1/4". Adjustable width range of 1-3/4" per side.

   h. Fabric – Pallas Grade 1: Bounce - Pomegranate

G. Guest Chair: **F-7**

1. Manufacturer: KI "Grazie" - Stackable, 4-Leg w/Casters, Armless, Fully Upholstered Seat & Back w/Pallas Grade 1 Fabric. Perfect Pivot Back Mechanism.

2. Model: GLNAPC

3. Total Quantity: 34

4. Description:

   a. Seat - Urethane foam is attached to an injection-molded polypropylene liner board, then upholstered using a draw-string process. Seat foam is molded nominal 1" thickness, and back foam is nominal 1/2" thickness. The flush-head fasteners that attach the back pad are color-matched to the polypropylene.

   b. Legs - Made from 7/8" OD x 13-gauge tubular steel. A double ring of 7/16" diameter steel wire forms the crossmember. The fixed backrest mechanism structure is formed of 1/2" diameter steel wire. All joints are welded.

   c. Frames - Finished in either baked-on electrostatically-applied 30 degree gloss epoxy powder-coating, or bright nickel-chrome plating.

   d. Backrest Articulation Mechanism - Two outer backrest supports formed from 1" diameter tubular steel are inserted into sockets molded into the backrest, and secured with screws. The backrest assembly moves over molded thermoplastic slide bushings and is supported by steel coil springs. This mechanism allows the backrest to move through 15 degrees of movement, about an axis of rotation that is through the hips of the occupant.

H. Steel Cart: **SC-1**

1. Manufacturers: Uline
2. Model: H-3037
2. Quantity: 2
3. Description: 42”L x 24”W x 35” H with 1,200 lbs load capacity, (2) shelves

PART 3 – EXECUTION

3.1 INSTALLATION

A. Set and level all non-mobile equipment to the correct height and anchor where indicated and/or required for secure installation. Use concealed anchors wherever possible. Anchors are to be non-corrosive and of adequate size for the Work.

B. Assemble and install units complying with manufacturer’s printed instructions in locations as shown on the Furniture Plan.

3.2 ADJUSTING

A. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.

B. Adjust furnishings for proper operation. Clean and polish exposed surfaces, using material and methods recommended by the manufacturer.

C. Project furnishings against damage during the remainder of construction period, complying with manufacturer’s directions.

END OF SECTION 12 50 00

Section 12 65 00 – Fixed Seating

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 fixed seating with the following:

1. Floor mounted, molded-plastic stadium chairs (fixed audience seating).

1.3 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fixed audience seating.

B. Shop Drawings: Plans, elevations, and sections through rows showing seating layout; chair widths; accessories, including locations of left and right arms; and attachments to other Work.

C. Samples for Initial Selection: Manufacturer's color charts consisting of units or sections of units showing the full range of finishes, colors, textures, and patterns available for each exposed material.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below and of same thickness and material indicated for the Work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.

1. Full size with finishes and accessories specified.

a. Approved Sample may become part of completed Work.

E. Maintenance Data: For fixed audience seating to include in maintenance manuals specified in Division 1. Include the following:

1. Precautions for cleaning materials and methods that could be detrimental to seating finishes and performance.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Contractor with not less than five years of successful experience in installation of furnishing similar to those required for this project.

B. Source Limitations: Obtain each type of seating required, including accessories and mounting components, through one source from a single manufacturer.

1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not install seating until space is enclosed and weatherproof; wet work in space is complete and dry; finishes, including painting, are complete; and work above ceilings is complete. Do not install seating until ambient temperature and humidity conditions are continuously maintained at the levels anticipated for final occupancy.

B. Field Measurements: Verify seating layout by field measurements before seating fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work. Review delivery and storage conditions before and during installation. Review temporary protection requirements for furnishings during and after installation.

PART 2 – PRODUCTS

2.1 MATERIALS AND FINISHES

A. Steel: ASTM A 36/A 36M plates, shapes, and bars; ASTM A 570/A 570M hot-rolled sheet and strip; or ASTM A 620/A 620M cold-rolled sheet, finished with manufacturer's standard baked-on coating.

1. Color: Black

B. Molded Plastic: High-density polyethylene, blow or injection molded.

1. Color: Black

2.2 FIXED AUDIENCE SEATING

A. Basis-of-Design Product: The design is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified:

1. Product: Legend; Manufactured by Hussey Seating Co, North Berwick, Maine.

B. Other Available Manufacturers:

1. American Desk, ADMC, Inc.
2. American Seating Co.
3. GDS Seating, Inc.
4. Irwin Seating Co.
5. KI, Inc.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements, and other conditions affecting fixed audience seating. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install seating in locations indicated and fastened securely to substrates according to manufacturer's written installation instructions.

B. Install seating so moving components operate smoothly and quietly.

3.3 ADJUSTING

A. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.

END OF SECTION 12 65 00

Section 12 93 00 – Site Furnishings

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 specifies general requirements for site furniture including the following:

1. Precast concrete cigarette snuffers

1.3 SUBMITTALS

A. Product Data: Submit specifications, assembly, and installation instructions and general recommendations from manufacturers for each type of site furnishing required.

B. Samples for Initial Selection: Manufacturer's color charts or sections showing the full range of finishes, colors, textures, and patterns available for each exposed material.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer (material producer) with not less than five years of production of site furnishings similar to the items included under this Section.

B. Source Limitations: Obtain each type of site furnishing required, including accessories and mounting components, through one source from a single manufacturer.

1.5 PRODUCT STORAGE, DELIVERY AND HANDLING

A. All shipping, storage and delivery costs for equipment furnished by the site furnishings supplier.

B. Do not deliver site furnishings until authorized by the General Building Contractor. Verify storage areas with the prior to delivery. Verify delivery route and building access prior to fabrication or installation.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. For basis of design, the product model numbers are based on the site furnishing manufactured by Wausau Tile, Wausau, WI; Site Furnishing Division. Equivalent products from the manufacturers listed above will be accepted contingent on compliance with specifications that meet or exceed the products specified in this Section.

1. Custom Design Precast, Weston, WI

2. Petersen Manufacturing Co., Inc., Denison, IA

2.2 SITE FURNISHINGS SCHEDULE

A. Cigarette Receptacle Snuffer (Indicated as **'SF-1'** on the Furniture Plan, sheet A903.)

1. Manufacturer: Wausau Tile Model 'TF2052'

2. Quantity: 2

3. Description: 14" square x 34" high, reinforced precast concrete pyramid shaped with Granitex surface texture, galvanized pan and stainless steel access door. Include inkjet logo.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Set and level site furnishing equipment where indicated on the drawings.

3.2 ADJUSTING

A. Repair minor abrasions and imperfections in finishes with coating that matches factory-applied finish.

B. Project site furnishings against damage during the remainder of construction period, complying with manufacturer's directions.

END OF SECTION 12 93 00

END OF DIVISION 12 – FUNISHINGS

DIVISION 31 – Earthworks

Section 31 23 00 – Excavation and Fill

PART 1 – GENERAL

1.01 SCOPE OF WORK

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

B. This section covers foundation requirements for the subject building only. This section covers all soil inside a volume bounded by the outside perimeter footings down to bottom of footing level, at which the volume expands outwards at a 1 foot downward for each 1 foot outward slope down to satisfactory native soils. Payment for the above defined earthwork is covered by this section alone. Payment and requirements for the remainder of the site earthwork is not covered by this section, but by other section(s) within the project specification.

C. The Work under this Section includes:

1. Preparing subgrades for slabs-on-grade.
2. Excavating (including rock removal) and backfilling for buildings and structures.
3. Drainage course for slabs-on-grade.
4. Dewatering.
5. Subsurface drainage backfill for walls and trenches
6. Excavating and backfilling trenches within building lines.
7. Geotextile separation type
8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.

D. Work by Roadway Contractor

1. Site clearing and grubbing.
2. Roadway excavation (including rock).
3. Bulk excavation to elevation(s) indicated on the drawings.
4. Rock removal
5. Topsoil placement and finished grading.
6. Excavation associated with static scale pit.
7. Erosion control

1.02 RELATED SECTIONS

A. Section 03 30 00 – Cast-in-Place Concrete for fine-graded granular material under vapor retarder.

B. Division 22 and 26 Sections for excavating and backfilling buried mechanical and electrical utilities and buried utility structures.

C. Section 33 46 16 – Subdrainage Systems

D. If rock is encountered, refer to the Standard Specifications for procedures.

1.03 REFERENCES

A. Geotechnical Soils Report (September 14, 2020) prepared by American Testing, Inc., Schofield, WI.

1.04 DEFINITIONS

A. Backfill: Soil materials used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations.

1. Additional Excavation: Excavation below subgrade elevations as directed by Supervising Professional. Additional excavation and replacement material will be paid for as Common Excavation per approval by Supervising Professional.

2. Bulk Excavation: Excavations more than 10 feet (3 m) in width and pits more than 30 feet (9 m) in either length or width.

3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Supervising Professional. Unauthorized excavation, as well as remedial work directed by Supervising Professional, shall be without additional compensation.

F. Fill: Soil materials used to raise existing grades.

G. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

H. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

J. Proof-rolling: loading the native soil using a fully loaded, triaxle dump truck or other heavy construction equipment to detect soft or unstable soils, which will rut, yield or pump under load.

1.05 SUBMITTALS

A. Samples: Samples, of an adequate size and sealed in airtight containers, of each proposed soil material from on-site or borrow sources shall be submitted to the supervising professional for testing prior to performance of the work of this section.

B. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:

1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.

2. Laboratory compaction curve according to ASTM D 1557 for each on-site or borrow soil material proposed for fill and backfill.

1.06 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 3740 and ASTM E 548, and acceptable to the engineer.

1.07 PROJECT CONDITIONS

A. Existing Utilities: Do not interrupt utilities serving facilities occupied by owner or others unless permitted in writing by Supervising Professional and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Supervising Professional not less than two days in advance of proposed utility interruptions.

2. Do not proceed with utility interruptions without Supervising Professional's written permission.

3. Contact utility-locator service for area where Project is located before excavating.

B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active. Coordinate this work with building demolition contractor.

PART 2 – PRODUCTS

2.01 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils:

1. ASTM D 2487 soil classification groups GW, GP, GM, SW, SP and SM, or a combination of these group symbols: free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter.

2. ASTM D2487 soil classification groups GC, SC, CL or ML may be allowed to remain in place IF:

a. The soils are determined to be native to the position encountered and remain in their natural, undisturbed state.

AND

b. The soils, as encountered, are determined to be capable of supporting the design loads imposed by the proposed structures.

3. Under no circumstances shall the soils described in paragraph 2 be used for fill or as borrow.

C. Unsatisfactory Soils: ASTM D 2487 soil classification groups MH, CH, OL, OH, and PT, or a combination of these group symbols. ASTM D2487 soil classification groups GC, SC, ML, and CL, or a combination of these group symbols shall not be used as fill.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Compacted Granular Base: Drainage Course under vapor barrier below slabs-on grade, 6" minimum.

E. Backfill and Fill: Satisfactory soil materials.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940: with at least 90% passing a 1-1/2 inch (38-mm) sieve and not more than 12 % passing a No. 200 (0.075-mm) sieve.

G. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ATM D 2940; except with 100 % passing a 1-inch (38-mm) sieve and not more than 12 % passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (38-mm) sieve, 35 percent passing a 1-inch (25-mm) sieve, and 0 to 5 percent passing a No.8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

K. Geotextile: Artificial fabric used as separation-type interface between proof-rolled native soil and subgrade fill.

2.02 GEOTEXTILE FABRIC

A. Manufacturers

1. TenCate Geosynthetics North America; Mirafi ® 500X
2. Geo-Synthetics, Inc., Waukesha, WI; Soiltex ™ ST 200W
3. US Fabrics, Inc; Cincinnati, OR; US 200

B. Description: Woven geotextile complying with AASHTO-M-288-06 for Class 3 stabilization and separation applications. Geotextile fabric to be made of 100% polypropylene slit film yarns, resistant to ultraviolet and biological deterioration, rotting, naturally encountered basics and acids.

1.	Tensile Strength (ASTM D-4632):	200 lbs.
2.	Elongation @ Break (ASTM D-4632):	15%
3.	Mullen Burst (ASTM D-3786):	400 psi
4.	Puncture Strength (ASTM D-4833):	90 lb.
5.	CBR Puncture (ASTM D-6241):	700 lbs.

2.03 ACCESSORIES

A. Warning Tape: Acid-and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam and dangerous materials.
3. Orange: Telephone and other communications
4. Blue: Water systems
5. Green: Sewer systems

PART 3 – EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water run off or airborne dust to adjacent properties and walkways.

D. Provide erosion control during the entire project as specified in Standard Specifications and elsewhere in the building specifications.

3.02 PROTECTION OF EXCAVATION

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

2. The installation of a dewatering system to keep subgrades dry and convey ground water away from excavations may be required during heavy rains. Maintain until dewatering is no longer required. Dewatering shall be considered incidental to the work of this section.

a. Areas to receive bentonite and membranes shall be dewatered to ensure surfaces are sufficiently dry for application of the waterproofing system.

3.03 EXPLOSIVES

A. Explosives: Do not use explosives.

3.04 EXCAVATION, GENERAL

A. Classified Excavation: Excavation to subgrade elevations classified as earth and rock. Rock excavations will be paid for by adjusting the Contract Sum according to unit prices included in the Contract Documents for Common Excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; together with soil, boulders, and other materials not classified as rock or unauthorized excavation.

a. Intermittent drilling; ram hammering; or ripping of material not classified as rock excavation is earth excavation.

3.05 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections. Extend excavations down to acceptable native soils.

1. Excavations for Footings, Foundations, Static Scale Tunnel, and Inspection Pits: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

3.06 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300mm) higher than top of pipe or conduit, unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches (150 mm) in nominal diameter and flat-bottomed, multiple-duct conduit units, hand excavate trench bottoms and support pipe and support pipe and conduit on an undisturbed subgrade.

2. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe circumference. Fill depressions with tamped sand backfill.

3. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.07 APPROVAL OF SUBGRADE

A. Notify engineer when excavations have reached required subgrade.

B. If engineer determines that unsatisfactory soil is present, continue excavation to a depth determined by the engineer and replace with compacted backfill or fill material as directed.

1. Additional excavation and replacement material will be paid as Common Excavation per approval by engineer.

C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.

D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water or construction activities, as directed by engineer.

3.08 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation, without altering top elevation. Lean concrete fill may be used when approved by engineer.

1. Fill unauthorized excavations under construction or utility pipe as directed by engineer.

3.09 STORAGE OF SOIL MATERIAL

A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 GEOTEXTILE PLACEMENT

A. Per the Project Geotechnical Consultants' recommendations, install separation type geotextile, after approval of subgrade, and prior to placement of the granular fill.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, damp proofing, waterproofing, and perimeter insulation.

a. Backfill shall be placed and compacted immediately upon completion of installation of positive-side waterproofing and associated materials.

2. Surveying locations of underground utilities for record documents.

3. Inspecting and testing underground utilities.

4. Removing concrete formwork.

5. Removing trash and debris

6. Removing temporary shoring and bracing and sheeting.

7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.12 UTILITY TRENCH BACKFILL

A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrel pipes and for joints, fittings and bodies of conduits.

B. Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings; fill with concrete to elevation of bottom of footings.

C. Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm) to a height of 12 inches (300 mm) over the utility pipe or conduit.

1. Carefully compact material under pipe haunches and bring backfill evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of utility system.

D. Coordinate backfilling with utilities testing.

E. Fill voids with approved backfill of satisfactory soil material to final subgrade.

F. Place and compact final backfill of satisfactory soil material to final subgrade.

G. Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 FILL

A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions and deleterious materials from ground surface before placing fills.

B. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

C. Place and compact fill material in layers to required elevations as follows:

1. Under steps and ramps, use engineered fill

2. Under building slabs, use engineered fill.

3. Under footings and foundations, use engineered fill to a minimum depth of 18 inches below all footings.

3.14 MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2% of optimum moisture content.

1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.

2. Remove replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.

2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of ½ inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 DRAINAGE COURSE

A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:

1. Compact drainage course to required cross sections and thickness to not less than 95% of maximum dry unit weight according to ASTM D 1557.

2. When compacted thickness of drainage course is 6 inches (150 mm) or less, place materials in a single layer.

3. When compacted thickness of drainage course exceeds 6 inches (150 mm), place materials in equal layers, with no layer more than 6 inches (150 mm) thick when compacted.

3.18 DRAINTILE

A. Install drainage pipe where indicated on the drawings. Refer to the structural and plumbing plans for details.

3.19 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified geotechnical engineering testing agency that may be either part of, affiliated with, or independent of the owner, to perform field quality-control testing.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Supervising Professional.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2,000 sq. ft. (186 sq. m) or less of building slab, but in no case fewer than three tests.

2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet (30 m) or less of wall length, but no fewer than two tests.

3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet (46 m) or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained, at no cost to owner.

3.20 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Supervising Professional; reshape and recompact.

3.21 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off owner’s property.

3.22 NOTIFICATION OF EXISTING CONDITIONS

A. The General Building Contractor will, upon becoming aware of subsurface or latent physical conditions differing from those disclosed by the original soil investigation work, promptly notify the Supervising Professional verbally to permit verification of the conditions, and in writing, as to the nature of the differing conditions. No claim by the General Building Contractor for any conditions differing from those anticipated in the plans and specifications and disclosed by the soil studies will be allowed unless the General Building Contractor has notified the Supervising Professional, verbally and in writing, as required above, of such differing conditions.

END OF SECTION 31 23 00

END OF DIVISION 31 – EARTHWORK

DIVISION 33 – Utilities

Section 33 21 13 – Well Pump and Equipment

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Drilling, casing, grouting, disinfection, and certification of a new domestic water well and related appurtenances suitable for commercial use.

B. Furnishing and installation of pumping equipment and controls, including submersible well pump suitable for variable speed duty, variable speed controller with pressure transducer, pressure gauge, and related appurtenances.

C. Furnishing and installing one diaphragm-style pressure tank.

D. Furnishing and installation of piping from well to building, including connection to pressure tank and installation of Building Control Valve.

1.02 RELATED SECTIONS

A. Section 31 23 33 - Utility Excavation, Backfill, and Compaction.

1.03 REFERENCES

A. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.

B. ASTM D1785 - Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40. 80, and 120.

C. ASTM D2104 - Specification for Polyethylene (PE) Plastic Pipe, Schedule 40.

D. ASTM D2239 - Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter.

E. ASTM D2447 - Specification for Polyethylene (PE) Plastic Pipe, Schedules 40 and 80, Based on Outside Diameter.

F. ASTM D3035 - Specification for Polyethylene (PE) Plastic Pipe (DR_PR) Based on Controlled Outside Diameter.

G. AWWA C901 - Standard for Polyethylene (PE) Pressure Pipe and Tubing 1/2 In. (13 mm) through 3 In. (76 mm) for Water Service.

1.04 QUALITY CONTROL

A. Driller shall have a valid Wisconsin well driller’s license and be experienced in the type of work specified.

B. Work shall be done according to NR 812.

C. During well construction make daily construction reports to the engineer.

1.05 SUBMITTALS

A. Submit Wisconsin Well Constructor’s Report to the Department of Natural Resources and to the engineer.

B. Submit test pumping report to engineer.

C. Submit water samples to State Laboratory of Hygiene for analysis. Submit laboratory results to engineer.

D. Submit manufacturer’s literature on well pump, pitless adapter, pressure tank and controls.

1.06 DRILLING SAMPLES

A. Drilling samples shall be taken at 5-foot intervals and all changes in formation. Dry and bag the samples and deliver them to the Wisconsin Geological Survey for logging.

1.07 WELL DESIGN

A. The well shall be a 6-inch well approximately 250 feet deep with approximately 105 feet in an unconsolidated formation and 145 feet in a sandstone formation. The well shall be cased to a minimum depth of 180 feet with solid wall casing. Terminate with a 48 inch long well screen. The well shall be grouted to the depth of the solid wall casing. Pump setting shall be at 150 feet.

PART 2 - PRODUCTS

2.01 CASING AND LINER PIPE

New, unused, and nonreclaimed steel pipe meeting requirements of ASTM A53; ASTM A106; ASTM A589, Type I, Grade A or B, Type II, Grade A; API 5CT; API 5D; or API 5L. Dimensions and weight of the pipe shall meet the requirements of the following table.

Minimum Steel Casing Pipe Weights and Dimensions					
Nominal Size in Inches	Weight in Lbs. per Ft.		Thickness in Inches	Diameter in Inches	
	Threaded & Coupled	Plain End		External	Internal
6	19.45	18.97	.280	6.625	6.065
6-5/8	20.00	19.49	.288	6.625	6.049
7	23.00	22.63	.317	7.000	6.366
8	29.35	28.55	.322	8.625	7.981
10	41.85	40.48	.365	10.750	10.020
12	51.15	49.56	.375	12.750	12.000

Temporary casing may be lighter weight than specified for a given diameter in the above table.

Liner pipe used for sealing off a caving or sloughing zone shall meet the requirements of the above table except that it may have a lesser wall thickness than is required by the table for the diameter of pipe used. Liner pipe shall have a minimum wall thickness of 0.216 inches.

Non-metallic PVC casing will be allowed with prior review and approval by the engineer.

2.02 WELL ACCESSORIES

Drive Shoe: Welded or threaded to the bottom of the casing being driven. Couplings may not be used for drive shoes.

Grout Shoe: Constructed of durable nontoxic material that will not impart taste or odor to water.

Drilling Aids: Approved by the Wisconsin Department of Natural Resources.

Pitless adapter: Shop assembled and tested. Approved for use in Wisconsin.

Well Cap: Type approved by Wisconsin Department of Natural Resources.

Well Screen: Continuous-slot screen composed of stainless steel, everdur, monel, or brass.

2.03 GROUT

Neat Cement Grout: A mixture of one bag of Portland cement (94 lb.) and 5 to 6 gallons of water. Powdered bentonite may be added up to a ratio of 5 pounds per 94-lb. Bag of cement. Additives to increase fluidity, control shrinkage or time of set may be used only with approval.

2.04 PUMP AND CONTROLS

A. Pump and Control Manufacturer: Goulds Pumps, Grundfos, Red Lion, Flotec or equal.

1. Submersible turbine pump.
2. Power Supply: 240 volt, 3-wire, 60 Hz, single phase.
3. Pump Characteristics:
    a. Capacity: 40 GPM
    b. HP: Max. 7-1/2 HP
    c. Speed: 3,460 RPM
    d. Outlet Size: 2”.
    e. Pump Setting: (To be determined)
    f. Head:

g.	Lift above well	127.0 Feet
h.	Lift out of well	135.0 Feet
i.	Total Head	262.0 Feet

    j. Final head conditions will be based on test pumping.

B. Controls: provide a constant pressure control system, Goulds Pumps Balanced Flow™ or equal. The controller shall be a variable speed, constant pressure controller designed for submersible well pumps. Controller shall maintain a pressure of 50 PSI. The pressure transducer and system relief valve shall be located at the pressure tank. All control signal wiring is the responsibility of the Well Contractor.

1. Accessories:
    a. Diaphragm pressure tank. The pressure tank shall be an ASME-rated and certified tank with minimum tank volume of 110 gallons and a minimum acceptance of 34 gallons.
    b. Pressure transducer
    c. Relief valve
    d. Pressure gauge
    e. Sample faucet

2.05 WATER SERVICE PIPE

A. All water service pipe shall have a minimum pressure rating of 150 psi.

B. Polyethylene Pipe: ASTM D2104, ASTM D2239, ASTM D2447, ASTM D3035, or AWWA C901.

2.06 DROP PIPE

A. All drop pipe shall have a minimum pressure rating of 150 psi.

B. PVC: ASTM D1785.

C. Galvanized Steel: ASTM A53

2.07 BEDDING AND COVER MATERIAL

A. Provide bedding and cover material meeting the requirements of ASTM D2321, Class IA, IB, II or III described as follows:

B. Class IA - Clean angular crushed stone, crushed rock, or crushed gravel conforming to the following gradation:

Sieve Size	% Passing By Weight
1”	100
3/4”	90 - 100
3/8”	20 -55
No. 4	0 - 10
No. 8	0 - 5

C. Class IB - Clean angular crushed stone, crushed rock, or crushed gravel conforming to the following gradation:

Sieve Size	% Passing By Weight
1/2”	100
3/8”	85 - 100
No. 4	10 - 30
No. 200	0 - 5

D. Class II - Clean coarse-grained soils free from organic matter, trash, debris, stones larger than 1-inch, and frozen material and classified in ASTM D2487 as follows:

1. GW - Well-graded gravels, gravel-sand mixtures, little or no fines.
2. GP - Poorly-graded gravels, gravel-sand mixtures, little or no fines.
3. SW - Well-graded sands, gravelly sands, little or no fines.
4. SP - Poorly-graded sands, gravelly sands, little or no fines.
5. Excavated trench material may be used if it meets the above material requirements.

E. Class III - Coarse-grained soils with fines free from organic matter, trash, debris, stones larger than 1-inch, and frozen material and classified in ASTM D2487 as follows:

1. GM - Silty gravels, gravel-sand-silt mixtures.
2. GC - Clayey gravels, gravel-sand-clay mixtures.
3. SM - Silty sands, sand-silt mixture.
4. SC - Clayey sands, sand-clay mixtures.
5. Excavated trench material may be used if it meets the above material requirements.

PART 3 - EXECUTION

3.01 PROTECTION OF WATER SUPPLY

Take necessary precautions during the well construction to prevent contaminated water, gasoline, or other contaminates from entering the well through the opening or by seepage through the ground surface.

Store and handle casing pipe in such a manner as to keep the possibility of contamination to a minimum.

Maintain a chlorine residual in the well during the drilling operation.

If the well becomes contaminated or water having undesirable physical or chemical characteristics enters the well because of the contractor's neglect, the contractor shall at his expense remove the contamination.

3.02 WELL CONSTRUCTION

A. Perform drilling with either rotary or percussion equipment. Meet requirements of NR 812.14.

When the drill hole shown on the Drawings is approximately the same size as the casing to be installed, the drill shall not be larger than necessary to permit the installation of the casing.

Temporary casings may be used to assist in the construction. Remove all temporary casing upon completion of the well.

Provide a drive shoe for all driven casing.

The upper drill hole may be made larger to allow installation of the casing without driving. If this method is used, the annular space between the casing and the wall of the drill hole shall be grouted.

All suspended casings and liners shall have a packer attached to the bottom and spacers shall be used to ensure a uniform annular space.

All casing and liner pipe joints shall be watertight. Joints may be welded or threaded couplings. Welding shall meet the requirements of AWS D10.12-89.

Any water needed for drilling operations is the responsibility of the contractor.

B. Plumbness: The deviation per 100 feet of well depth from plumb of the centerline of the well shall not exceed 75 percent of the well diameter.

C. Alignment: The well shall allow free passage of the pump to be permanently installed in the well to the depth of the pump setting plus 25 percent of the depth.

D. GROUTING - Remove foreign materials from the annular space to be grouted. Provide a minimum annular space of 1-1/2 inch.

Use neat cement grout.

Place grout from the bottom of the open annular space in one continuous operation, completing the placement before the initial set.

Grouting shall be performed by pressure methods.

1. Conductor Pipe - Gravity: Place the grout material into the annular space through a funnel or hopper connected to a conductor pipe. Lower the conductor pipe to the bottom of the annular space. The end of the conductor pipe shall be submerged at all times. If the grouting operation is interrupted, raise the conductor pipe above the grout level. Do not resubmerge the conductor until all air and water have been displace from the conductor.

2. Conductor Pipe - Pumped: Place the grout material into the annular space by pumping through a conductor pipe. Lower the conductor pipe to the bottom of the annular space. The end of the conductor pipe shall be submerged at all times. If the grouting operation is interrupted, raise the conductor pipe above the grout level. Do not resubmerge the conductor until all air and water have been displace from the conductor.

3. Grout Shoe: Attach a grout shoe with a check valve to the bottom of the well casing. A conductor pipe or drill stem shall be connected to the grout shoe and shall extend up through the casing to a pump. When the annular space has been filled with grout, remove the conductor pipe or drill stem. After the grout has set for a minimum of 12 hours the grout shoe may be drilled out and the well construction continued.

   The grout shall be brought up to the ground surface. The density of the grout flowing from the annular space shall be the same as the density of grout being placed. If the grout settles, the driller shall add grout to bring the level up to the specified level.

3.03 WELL DEVELOPMENT

Develop the well until the water is practically clear and free of sand according to NR 812.22.

3.04 SITE PROTECTION AND CLEANUP

Protect structures, turf, landscaping, and site structures from damage.

Discharge water pumped from the well in a manner that does not damage property or cause a nuisance.

Remove all debris and unused materials from the site, remove mud pits, and generally leave the site in a neat condition.

Provide a temporary cap during construction.

3.05 PUMPING TEST

A. Perform a yield and drawdown test at the completion of the well casing. Provide pumping equipment capable of pumping within a range of 5 GPM to 40 GPM

B. Provide all necessary equipment and piping to accurately measure the pumping rate and the water level.

C. Unless the time is extended by the engineer, the pump test shall continue for four hours. Pumping rates and corresponding water levels shall be recorded at intervals of not more than 30 minutes

D. Keep a log of the test pumping and submit the log to the engineer at the end of the test. The log shall include the following information:

1. Pump setting
2. Static water level
3. Pumping rate and water level at specified intervals
4. Recovery water levels
5. Other pertinent data

3.06 DISINFECTION

Following pumping test, thoroughly disinfect the well according to NR 812.22 (4).

303 WATER QUALITY ANALYSIS

After completion of the test pumping and after disinfection, collect water samples for testing by the State Laboratory of Hygiene or other laboratory approved by the DNR, and transport the samples to the lab. Laboratory analysis shall include: coliform, pH, hardness, iron, manganese and nitrates.

3.07 PUMP INSTALLATION

A. Provide pump with characteristics based on the test pumping.

B. Final pump setting will be based on test pumping.

C. Provide new pitless adapter and well cap.

3.08 WATER SERVICE PIPE INSTALLATION

A. Install pipe with 6.5 feet of cover.

B. Bedding and Cover: Place 4" of bedding material beneath pipe. Place bedding material around the pipe and to a level 6 inches above the pipe. Work the material in and around the pipe.

C. Provide a trace wire for the pipe.

END OF SECTION 33 21 13

Section 33 32 52 – Control System

PART 1 – GENERAL

1.01 SUMMARY

A. Provide and install control system equipment as shown and as specified.

1.02 SUBMITTALS

A. Shop Drawings: submit shop drawings for control equipment.

B. O/M Manuals: submit O/M manuals for control equipment.

1.03 REFERENCES

A. National Fire Protection Association (NFPA).

1. NFPA 70 National Electrical Code (NEC) 2014.

B. National Electrical Manufacturers Association (NEMA).

1. NEMA ICS-2 Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 V.
2. NEMA ICS-5 Industrial Control and Systems: Control Circuit and Pilot Devices.
3. NEMA 250 Enclosures for Electrical Equipment.

C. Underwriters Laboratories (UL).

1. UL508A Industrial Control Equipment.
2. The control panel shall be certified and constructed according to UL508A.

1.04 WARRANTY

A. Control system equipment manufacturer shall warranty workmanship and materials according to its standard limited warranty.

PART 2 – PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. The control system shall be the responsibility of a single vendor, unless otherwise indicated, and be manufactured by Petersen Onsite Controls, or approved equal.

2.02 FLOAT SENSORS

A. The control level float sensors shall be mercury and lead free, and noncorrosive polypropylene housing. Float sensors shall use fiber optic cable to transmit a beam of light from a transmitter in the control panel to the float sensor. The control panel receiver shall detect the presence or absence of light and operate a relay in the receiver.

B. The level detection system shall be the Model F1 Opti-Float® float sensor switches and Model TR2 dual transceivers by Cox Research and Technology, Inc., or approved equal

C. The control system shall contain the following float sensors per tank. Each float level sensor cable shall be of sufficient length to reach respective tank from control panel without splices.

D. Inspection Bay Sump Pump

- High Water Alarm

E. Septic Tank:

1. High Water Alarm (float switch provided by effluent screen manufacturer) – if applicable

F. Dose Tank:

1. High Water Alarm
2. Timer Peak Enable
3. Timer Dose Enable
4. Redundant OFF

G. Provide cable weights, connectors, brackets, and other accessories as shown on Drawings for each float switch. Float bracket and hardware shall be stainless steel; CentriPro, Xylem, or approved equal.

2.03 CONTROL PANEL

A. The control equipment shall be designed for outside operations and control, monitor, and provide power to all pumps, floats, and blower. The factory wired, remote telemetry (cellular or data line) PLC control panel provided shall contain control equipment, pump motor starting and protection equipment, power equipment, supervisory and annunciation, control relays, terminal blocks, data loggers, battery backup, and other related and pertinent miscellaneous equipment. Controls, power, supervisory, and miscellaneous electrical equipment shall be housed in a single enclosure, factory assembled, wired, and tested.

B. Design, manufacture, and test panel according to the standards of UL 508A for industrial controls. Panel shall UL labeled and serialized accordingly.

C. Contractor shall verify power onsite prior to ordering to ensure appropriate power.

D. Control panel enclosure shall be stainless steel meeting NEMA 4X requirements with hinged door and neoprene gasket. Panel shall contain the following:

1. All the components normally accessed by operating personnel shall be accessible without opening the dead front door(s). All major components and subassemblies shall be identified with laminated, engraved nameplates. A plastic-coated wiring diagram shall be supplied on inner door of the panel.
2. Control panel labeling, and documentation shall include appropriate nameplates including panel ratings, warnings, and as-built schematic drawings.
3. Separate control and alarm circuit breakers.
4. Circuit breaker and contactors and electronic overloads of adequate capacity for all equipment.
5. Float level sensor control inputs.
6. Automatic pump alternator for the dose tank.
7. AC ground fault interrupter (GFI) protection.
8. Hand-Off-Auto (HOA) selection switches on inner door for each pump.
9. Equipment run indicator lights on inner door. Indicator lights shall be within control logic and a function of the display interface module.
10. Pump cycle counts shall be included within control logic and a function of the display interface module.
11. Pump ETMs shall be included within control logic and a function of the display interface module.
12. Programmable timers for dose tank pumps capable of a repeat cycle with separate variable controls for ON and OFF time periods.
13. Audio-visual alarm with silencer switch (NEMA 4X 95 dB alarm horn and 1- watt LED alarm light with 7/8-inch red lens). Visual alarm shall be mounted on top of panel.
14. Motor operation and control equipment including but not limited to terminal blocks, separate breaker, current sensor, and contactor.
15. Color touch screen display interface module mounted on inner door shall be Allen Bradley PanelView or approved equal.
16. Protective lightning arrestor.
17. Self-adjusting, anti-condensation thermostat and heater.

E. Control panel shall be capable of the following remote telemetry functions

1. Data Collection and Utilization: logs data for system conditions and events such as pump run time, pump cycles, flow measurements, and alarm conditions.

3. Downloadable Logs: download logs into a *.dif or ADCII format for simple conversion to common spreadsheet or word processor programs.

4. Multi-level Password Security: only qualified personnel can remotely access.

5. Program Logic Rules: simple “If…then”, “ladder”, “function block”, “structured text”, or other typical programming declarations for PLCs. Rules can be written based on several operands, including the following: input/output status, point status, date, time of day, timers, and historical data.

6. Schedule functions to control digital “points” based on date or day of week or time.

7. Automatic daylight savings time adjustment.

8. Automatic call-out during alarm conditions when system failure trends are detected.

F. Control panel shall have run-time direct connection capability allowing linking panel to laptop serial port. This will allow the operator real-time access to detailed logged data and the ability to change setpoint values or other program logic or values while online.

G. Control panel operation and logic shall include:

1. Controller shall alternate drip dispersal dose tank pumps after each dose event.

2. The dose tank pumps shall have a HOA switch and automatically be prepared for actuation by having the HOA switch in the “AUTO” position; shall operate manually in the “HAND” position; and be taken out of service in the “OFF” position.

3. The dose tank pumps shall include operation with programmable timers.

4. The dose tank liquid levels shall not be allowed to go below the “redundant pump off” float. The liquid level must be high enough to overcome the “redundant pump off” float in order for the pump to be permitted to operate in automatic mode.

5. In the event of pump failure, systems shall be capable of simplex operation.

6. Dose Tank: when the liquid level rises high enough to overcome the “dose enable” float and the time clock has timed out the preset time delay (rest time between dose events), the control panel shall commence a dosing event. A pump shall engage and continue to run for the length of time required to disperse the specified dose volume and then disengage. The pump shall remain off until the internal time clock again times out the preset time delay which the pumps will alternate, and the next dosing event shall commence (as long as the timer ON/OFF “dose enable” float is up). If the liquid level raises high enough to overcome a “timer peak enable” float, the control panel shall accelerate the prescribed dosing events. A falling dose level to a “redundant pump off” float or “emergency pump off”; or rising level to the “high level alarm” float shall activate an alarm condition.

7. If a motor is called upon however does not engage, an alarm condition shall commence. During an alarm condition, the audio-visual alarm and remote notification shall be triggered. The audio alarm shall be allowed to be silenced. The visual alarm shall remain illuminated until the problem is corrected.

8. The control system shall be operable via remote operation and monitoring via a cellular access modem. Alleviating alarm conditions shall be capable remotely. A data line modem shall also be included.

H. Control panel annunciation and alarms shall include:

1. Emergency Low-level Alarm: emergency pump off shall be sensed from the “redundant OFF” float or “emergency pump OFF”. An alarm condition shall commence by displaying the respective low-level alarm within control system and activate remote notification.

2. Emergency High-level Alarm: high-level water conditions shall be sensed from the “high water alarm” float. An alarm condition shall commence by displaying the respective emergency high-level alarm within control system and activate remote notification.
3. Motor Fail Alarm: each motor shall be protected by pump fail circuit(s) and current sensors which shall communicate with the control panel when an individual motor fails to run when called upon. In the event of a motor failure, an alarm condition shall commence by displaying the respective motor failure alarm within control system and activate remote notification.
4. Power Fail Alarm: if power is lost, an alarm condition shall commence and activate remote notification.
5. Remote Notification: remote notification shall be activated by alarm conditions sensed in the control panel.
6. Alleviating alarm conditions shall be capable remotely.

PART 3 – EXECUTION

3.01 EQUIPMENT INSTALLATION

A. Install equipment according to shop drawings and manufacturer's recommendations.

B. Electrical connections shall be provided under applicable Division 26 sections, provided by Others, and follow the national electrical code.

C. Enclosure, electrical service, disconnect, electrical distribution panelboard, and associated appurtenances shall be mounted on control panel/load center mounting details, provided by Others.

3.02 MANUFACTURER SERVICES

A. Equipment manufacturer shall provide services of a factory-trained service representative for a minimum of one day to perform functions listed below. General Contractor shall coordinate visit with control panel supplier and electrical contractor.

1. Review the installation.
2. Check and adjust equipment prior to operation.
3. Check integral equipment supplied by other manufacturers.
4. Observe field tests of equipment.
5. Train owner's operator(s) in operation of equipment.

B. After start-up of equipment, service representative shall furnish a letter to engineer and owner confirming that the installation is according to manufacturer recommendations, necessary alignments and adjustments have been made, and equipment is operating properly.

C. In addition to initial services, manufacturer shall provide for a one-day inspection trip after six months of operation to inspect and adjust equipment.

3.03 SYSTEM TESTS

A. 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.

B. Demonstrate that equipment is not defective electrically, mechanically, or otherwise, and is in a safe and satisfactory operating condition.

C. Check for excessive vibration, leaks in piping and seals, electrical power input in kilowatts, and correct operation of control system and equipment.

END OF SECTION 33 32 52

Section 33 36 33 – Private Waste Disposal System

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Installation and certification of a private waste disposal system as shown on the Drawings and herein specified.

B. Installation and certification of a private waste holding tank as shown on the Drawings and here specified.

1.02 RELATED SECTIONS

A. Section 22 05 00 - Common Work Results for Plumbing.

B. Section 22 05 05 - Plumbing Materials and Equipment.

1.03 REFERENCES

A. Wisconsin Administrative Code SPS 382 - Design, Construction, Installation, Supervision, Maintenance, and Inspection of Plumbing.

B. Wisconsin Administrative Code SPS 383 - Private Onsite Wastewater Treatment Systems.

C. Wisconsin Administrative Code SPS 384 - Plumbing Products.

D. Wisconsin Administrative Code SPS 385 - Soil and Site Evaluations.

E. ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures

1.04 WORK INCLUDED

A. Connection to the sanitary sewer at the building, extension to the private on-site waste treatment system as shown on the Drawings.

B. Connection to the oil-contaminated sanitary sewer at the building and extension to the holding tank as shown on the Drawings.

1.05 SUBMITTALS

A. Submit detailed drawings on all tanks, vessels, structures and related accessories and appurtenances.

B. Submit detailed performance and dimensional information on all pumps, including performance noted for this particular installation. Pump curves shall identify design point of operation.

C. Submit manufacturer literature and wiring directions for all alarms and accessories.

D. Submit manufacture literature on all septic pipe and structures.

E. Include data concerning manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

1.06 PRODUCT APPROVAL

Proposed approval shall be previously approved by the State of Wisconsin and certification of such approval shall be submitted as part of the Shop Drawing process.

PART 2 - PRODUCTS

2.01 PRODUCTS

A. All products shall meet the requirements of SPS 384, and Section 22 05 05.

B. Septic Tank:

1. The septic tank shall be a combination, dual compartment, precast concrete structure with (3) manholes and extensions above grade. The pump chamber shall be separated from the septic chamber with a concrete barrier. Based on Crest Precast Model 1500-1500-47. Similar products by other manufacturers and fabricators will be acceptable. Only pre-cast concrete vessels will be acceptable. Steel, fiberglass, or polyethylene materials will not be acceptable.

2. The septic section shall be nominal 1,500-gallon capacity with 4-inch PVC inlet connection, inlet baffle, outlet filter with handle for easy removal, and two manholes positioned for visual observation of the inlet baffle and access to the removable outlet filter.
3. The pump chamber shall be nominal 1,500-gallon capacity with 4-inch PVC outlet connection and manhole positioned over the outlet location.
4. Provide pre-cast concrete manhole extension rings as necessary so the manhole covers are located a minimum of 18 inches above finished grade.
5. Manhole covers shall be pre-cast concrete and shall include a metal plate engraved with standard Warning signs per current WI Code requirements. Manhole covers shall include a chain and cast-in place loops to allow locking of the covers in the closed position.
6. Vessel or manhole cover shall be equipped with a 4-inch vent connection.
7. Concrete shall be nominal 5,000 PSI.
8. Tank is recommended to be rectangular in shape with approximate dimensions of 230 inches long x 100 inches wide by 66 inches high.
9. Vessel shall be pre-approved by the Wisconsin Department of Safety and Professional Services. Vessels without approval already on file at the time of Bidding will not be acceptable.

C. Holding Tank:

1. The holding tank shall be a single compartment, precast concrete structure with two manholes and extensions above grade. Based on a Crest Precast Model 5000R. Similar products by other manufacturers and fabricators will be acceptable. Only pre-cast concrete vessels will be acceptable. Steel, fiberglass, or polyethylene materials will not be acceptable.
2. The holding tank shall be nominal 5,000-gallon capacity with 4-inch PVC inlet connection, inlet baffle, one manhole positioned for visual observation of the inlet baffle.
3. Provide pre-cast concrete manhole extension rings as necessary so the manhole covers are located a minimum of 18 inches above finished grade.
4. Manhole covers shall be pre-cast concrete and shall include a metal plate engraved with standard Warning signs per current WI Code requirements. Manhole covers shall include a chain and cast-in place loops to allow locking of the covers in the closed position. Manhole cover shall be suitable for pedestrian traffic only and rated 2,000 lb. total loading capacity.
5. Vessel or manhole cover shall be equipped with a 4-inch vent connection.
6. Concrete shall be nominal 5,000 PSI.
7. Vessel dimensions shall be as noted on the Drawings.
8. Vessel shall be pre-approved by the Wisconsin Department of Safety and Professional Services. Vessels without approval already on file at the time of Bidding will not be acceptable.
9. The Plumbing Contractor shall provide and install a control system as specified in Section 333252 Control System.

D. Septic Field Pumps:

1. Two pumps shall be required for primary and standby duty.
2. Pumps shall be submersible design, cast iron construction, with integral support feet to maintain a 1” gap between the floor of the vessel and the suction opening to the pump.
3. Pumps shall be “Sewage” duty capable of passing an object ¾ inch in diameter without damage to the pump.

4. Equip pumps with a lift chain and handle. A rail system is not required. Piping shall be arranged to disconnect each pump manually at the discharge manhole while allowing the standby pump to operate. This means shall be a union or companion flange. Lift chains shall be stainless steel construction and suitable for lifting of 300 pounds weight. Provide and install a sturdy hook at the top of the inspection manhole to secure the lift chains when not in use.
5. Discharge piping shall include a check valve and a manual isolation valve for each pump. Check valves shall be installed within 18 inches of the pump connection. Isolation valves shall be installed at the top of the manhole.
6. Pumps shall have a flow capacity of 80 gallons per minute at a total dynamic head of 18 feet.

E. Septic Field Seepage Trenches:

1. The septic field shall be constructed as shown on the plan details.
2. The distribution stone shall be 1” washed crushed rock or washed gravel meeting the requirements of SPS 384.30 (6)(i).
3. The distribution stone shall be isolated from surrounding soil by a layer of Type SAS geotextile meeting the requirements of SPS 384.30 (6)(g).
4. Seepage trenches supplied for this project shall be approved by the State of Wisconsin for use in a conventional POWTS application.

F. Pipe:

1. All piping installed exterior to the building, but installed under a traffic surface, shall be Schedule 40 PVC, DWV-rated, with solvent-welded patching PVC fittings.
2. All piping installed exterior to the building, but in areas not subject to vehicle traffic shall be SDR35 PVC with Schedule 40 PVC solvent weld fittings.

PART 3 – EXECUTION

3.01 INSTALLATION

A. The contractor shall carefully examine the Design Documents with the site development and report any discrepancies or concerns to the engineer. If the area of these septic structures are sufficiently disturbed that weight bearing capacity is a concern, report this condition to the engineer and proceed no further without direction.

B. This contractor is responsible to obtain all local and State permits for the installation of the POWTS components. The owner will supply a contract for the hauling and disposal of materials within the holding tank. The contractor shall not assume any costs or responsibility for this work.

C. Coordinate the installation of the septic field with the local authorities so inspections may be made in a timely fashion.

D. Vessels:

1. Plumbing Contractor shall perform final excavation for placement of septic and holding tank. Excavate 6 inch greater in depth than base of unit and level as best possible. Do not over-excavate if located on virgin materials. If site is located on fill or accidently over-excavated, back fill with sand compacting in 3-inch lifts
2. Demonstrate suitable base to Project Representative before proceeding with additional installation. All pre-cast concrete vessels shall be installed on a solid, level base free of rocks, debris and similar.
3. Provide and install a granular base for all vessels consisting of river rock (natural product) install a minimum of 6 inches in depth. Aggregate size may not exceed 1-1/2” inches. Crushed limestone or sandstone will NOT be acceptable. Level this base and confirm proper elevation for a solid and uniform bearing capacity.
4. This site is not in a floodway and no high water conditions are anticipated. No vessel ballasting shall be required. Should groundwater be encountered during excavation, stop work and report the condition to the engineer.

5. Place the vessels and level.
6. Vessels may be backfilled with excavated materials if free of rock, debris, or similar items. Backfill in 8-inch lifts and compact with jumping jack or similar device. Do not compact with self-propelled machinery, excavators, or similar. Backfill the final 12 inches with black dirt suitable for organic growth. No ballasting is anticipated for this project site. Should the excavation yield high ground water, request direction from the Project Representative.
7. Extend manholes to 18 inches above finished grade, including the depth of the pre-cast covers. Ensure warning labels are visible and intact. Provide temporary locks on all manholes during the construction process. Mortar or glue risers to vessel and to one another. Glue manhole ring to top riser.
8. Provide and install vent into top of tanks. Vent may be routed straight up to free air. Terminate a minimum of 24 inches above final grade and install a vented cover to discourage entrance of foreign materials or bird nests in the pipe. (A fabricated PVC gooseneck with a screened elbow will be acceptable.)
9. At completion of the project, the interior of the tanks shall be thoroughly cleaned by the Plumbing Contractor. Construction debris, sand, rock, and similar materials shall be removed and disposed of. Construction fluids (excluding normal wastewater) shall be removed and disposed of, including hydraulic fluids, concrete curing compounds, etc.
10. The Plumbing Contactor shall demonstrate to the owner the correct procedures for inspecting the tank and for servicing and replacement of the pump chamber filter. Deliver to owner any spare materials.

E. Septic Field / Leach Field:

1. The soil conditions allow for a conventional septic field using dosing rather than gravity flow. Provide and install dozing piping within the seepage trenches with holes as noted and/or scheduled. Construct the septic field as shown on the drawings and per applicable Wisconsin Code.
2. Level the septic area using care not to disturb the site more than necessary.
3. Once the septic area is prepared and visible, request an inspection from the local authority to document soil conditions are in compliance with the soil test report. Report any deviations to the engineer for review.
4. Connect all piping per the Drawings. Elevated piping shall be temporarily supported until backfill is complete. Extend pumped effluent discharge from the pumps to the center of the septic field. Make connections to the dosing piping and balance flows for even distribution.
5. At this point, the contractor shall photograph the installation and key the photographs to the septic tank. Make notations on the drawings to reflect the as-built dimensions and configuration. Photographs shall be delivered to the engineer in a digital format. The engineer shall visit the site to observe the placement and piping of the field prior to any covering or backfill is installed. This contractor shall arrange for required inspections by the local authority.
6. Once inspected and approved, backfill the septic field carefully ensuring that piping is adequate supported. Backfill with materials as noted on the Drawings. Compact with manually operated jumping jacks or vibratory plate compactors in lifts not to exceed 6 inches. Last 8 inches of backfill shall be with black dirt suitable for organic growth (grass). Restore the site to rough grade elevations and smooth the surface to a manner suitable for final grading and seeding by others.

F. Control Panel and Wiring:

1. This contractor shall provide and install a means to support the control panel at the septic tank. Galvanized 1-5/8” unistrut channel installed in concrete- filled piers shall be used. Treated wood posts will not be acceptable. Construct a ladder assembly to support the control panel as well as all conduit.
2. Secure the control panel to the ladder frame.

3. The Electrical Contractor will provide and install all conduit and line voltage wiring. This contractor shall install the floats and extend the float cables through the conduit into the control panel. The Electrical Contractor shall make all final connections.
4. The floats shall be installed in the tank near the pump chamber manhole for easy visual inspection from the manhole. Install a rigid post, secured to the bottom and top of the holding tank, to secure the floats. Secure the floats to the post and adjust each float for proper level control. Post shall be constructed of a corrosion-resistant material of sufficient stiffness. 1 inch diameter stainless steel pipe is recommended. This contractor shall set the float heights as noted on the Drawings.
5. At the completion of all wiring, this contractor shall fill the pump chamber with clean water to test that the floats work correctly, and the pumps operate correctly. This test shall be scheduled with the engineer to observe the test procedure. Water for this testing may be obtained from the building. Do not run pumps dry. Test operation of the control panel with final connections to the pump left un-terminated.
6. The Plumbing Contractor shall install the alarm panel in the building, shall install the float in the holding tank, and shall be responsible for all conduit and wiring between the holding tank and the control panel.

Mount the control panel in the Inspection Bay near an electrical receptacle along the exterior wall. Verify preferred location of the control panel with the Project Representative. Panel shall be located approximately 60 inches above finished floor.

The float shall be installed in the tank near a manhole for easy visual inspection from the manhole. Install a rigid post, secured to the bottom and top of the holding tank, to secure the float. Secure the float to the post such that an alarm condition will occur when the tank is approximately 3/4 full. Post shall be constructed of a corrosion-resistant material of sufficient stiffness. 1 inch diameter stainless steel pipe is recommended.

The float cord shall be routed to a junction box located on a manhole riser, or a self- supporting conduit stub.

Route electrical conductors to the control panel in Schedule 40 PVC conduit. Conduit shall be minimum of 1 inch in size. Conduit shall be buried a minimum of 24 inches below finished grade with a red-colored warning tape installed 12 inches below finished grade.

Provide and install water-resistant conductors and make all final connections at the float and the control panel. Two -#12 conductors with RHW insulation are recommended for the control signal with a separate #12 grounding conductors. Make all wiring connections exterior to the building in a water-proof manner.

The Plumbing Contractor shall confirm the float works by manually lifting the float to simulate a high-level condition and observing the alarm sounds, the horn can be silenced, and the beacon continues to illuminate until the float is returned to the normal position.

END OF SECTION 33 36 33

Section 33 46 16 – Subdrainage Systems

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Applicable provisions of Division 1 shall govern the work under this Section.

B. Work Includes

1. Building perimeter foundation subdrainage system.
2. Filter aggregate
3. Filter fabric.

1.02 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03 30 00 – Concrete: Installation of pipe sleeves for routing through foundations.

B. Section 31 23 00 – Excavation and Fill: Utility Trench Backfill

1.03 RELATED SECTIONS

A. Section 31 23 00 – Excavation and Fill: Excavating subsoil for sub drainage system piping.

1.04 REFERENCES

A. ASTM D2729 – Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings.

1.05 SUBMITTALS

A. SD-03 Submit product data.

1.06 PROJECT RECORD DOCUMENTS

A. Accurately record location of pipe runs, connections, cleanouts and invert elevations.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

A. Polyvinyl Chloride Pipe: ASTM D2729;

1. Provide perforated, 4 inch inside diameter rigid piping at perimeter footing drain tile locations where indicated on the plans. Corrugated plastic tubing will not be accepted.

2.02 FILTER AGGREGATE

A. Coarse Filter Aggregate: Clean, well graded, natural gravel, crushed stone, free from shale, clay, organic, materials or debris.

B. Fine Filter Aggregate: Clean, natural sand; free from silt, clay, organic matter or soluble materials; graded within the following limits:

2.03 ACCESSORIES

A. Pipe Sleeve: Continuous perforated plastic.

B. Filter Fabric: Water previous type, black polyolefin.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench cut excavation base is ready to receive work, and excavations, dimensions, and elevations are prepared to maintain a consistent and constant slope.

B. Beginning of installation means acceptance of existing conditions.

3.02 PREPARATION

A. Hand trim excavations to required elevations. Correct over excavation with fill material.

3.03 INSTALLATION

A. Install and join pipe and pipe fittings according to manufacturers' instruction.

B. Lay pipe to slope gradients noted on drawings with minimum pitch of 1/16" per foot.

C. Install coarse filter aggregate at sides and over and top of pipe. Provide top cover compacted thickness of 12 inches.

D. Place filter fabric over leveled top surfaces of filter aggregate cover prior to subsequent backfilling operations.

E. Connect to precast concrete sump basin in Scale Tunnel 001.

3.04 PROTECTION

A. Protect pipe and filter aggregate cover from damage or displacement until backfilling operation begins.

END OF SECTION 33 46 16

END OF DIVISION 33 – UTILITIES

54. SWEF Building, Plumbing, Item SPV.0060.101.

A Description

This item consists of the plumbing work for the SWEF building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure SWEF Building, Plumbing, completed according to the contract and accepted, as a single complete unit of work.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.101	SWEF 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.

DIVISION 22 – PLUMBING

Section 22 00 00 – Plumbing Table of Contents

TABLE OF CONTENTS

END SECTION 22 00 00

Section 22 05 00 – Common Work Results for Plumbing

PART 1 – GENERAL

SCOPE

This section includes information common to two or more technical plumbing specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

RELATED WORK

Not Used

REFERENCE

Applicable provisions of Division 1 govern work under this section.

This section applies to all Division 22 00 00 sections of plumbing.

STANDARDS

Abbreviations of standards organizations referenced in this and other sections are as follows:

AGA	American Gas Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASPE	American society of Plumbing Engineers
ASSE	American Society of Sanitary Engineering
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
CISPI	Cast Iron Soil Pipe Institute
CGA	Compressed Gas Association
EPA	Environmental Protection Agency
FS	Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
GAMA	Gas Appliance Manufacturers Association
IAPMO	International Association of Plumbing & Mechanical Officials
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NSF	National Sanitation Foundation
PDI	Plumbing and Drainage Institute
UL	Underwriters Laboratories Inc.

Standards referenced in this section:

ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
D.O.T.	Standard Specifications for Road and Bridge Construction, State of Wisconsin, Dept. of Transportation
UL1479	Fire Tests of Through-Penetration Firestops
UL723	Surface Burning Characteristics of Building Materials

LEAD FREE REQUIREMENTS

All materials that contact potable water shall be lead free. Lead free refers to the wetted surface of pipe, fittings and fixtures in potable water systems that have a weighted average lead content ≤0.25% per the Federal Safe Drinking Water Act as amended January 4, 2011, Section1417.

This requirement applies to all of the subsequent Plumbing Specification Sections and Plumbing Drawings and supersedes any part or model number that may conflict with this requirement.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

All products and materials used are to be new, undamaged, clean and in good condition. Existing products and materials are not to be reused unless specifically indicated.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

CONTINUITY OF EXISTING SERVICES

Do not interrupt or change existing services without prior written approval from the owner's Project Representative. When interruption is required, coordinate scheduling of down-time with the owner to minimize disruption to his activities. Unless specifically stated, all work involved in interrupting or changing existing services is to be done during normal working hours.

PROTECTION OF FINISHED SURFACES

Refer to Division 1, General Requirements, Protection of Finished Surfaces.

SLEEVES AND OPENINGS

Refer to Division 1, General Requirements, Sleeves and Openings.

SEALING AND FIRESTOPPING

Sealing and firestopping of sleeves/openings between piping, etc. and the sleeve or structural opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

OFF SITE STORAGE

Prior approval by DOT and the A/E will be needed. No material will be accepted for off-site storage unless shop drawings for the material have been approved.

CODES

Comply with requirements of Wisconsin Administrative Code.

CERTIFICATES AND INSPECTIONS

Refer also to Division 1, General Conditions, Permits, Regulations, Utilities and Taxes.

Obtain and pay for all required State installation inspections except those provided by the architect/engineer. Deliver the originals of inspection certificates and test records to the owner's project representative. Include copies of the certificates and test records in the Operating and Maintenance Instructions.

SUBMITTALS

Refer to Division 1, General Conditions, Submittals.

Not more than two weeks after award of contract but before any shop drawings are submitted, contractor to submit the following plumbing system data sheet. List piping material type for each piping service on the project, ASTM number, schedule or pressure class, joint type, manufacturer and model number where appropriate. List valves and specialties for each piping service, fixture and equipment with manufacturer and model number. The approved plumbing system data sheet(s) will be made available to the DFD Project Representative for their use on this project.

PLUMBING SYSTEM DATA SHEET

Item	Pipe Service/Sizes	Manufacturer/Model No.	Remarks
Pipe			
Fittings			
Unions			
Valves:			
Ball			
Butterfly			
Balancing			
Check			
Other			
Pipe Specialties:			
Thermometers			
Press Gauges			
Strainers			
Building Penetrations			
Hangers & Supports			
Insulation			
Plbg. Specialties:			
Floor/Roof Drains			
Cleanouts			
Water Hammer Arrestors			
Backflow Preventers			
Wall/Yard Hydrants			
Hose Bibbs			
Trap Primers			
Wash Machine Boxes			
Plbg. Fixtures			
Plbg. Equipment			

Shop drawing submittals are to be bound, labeled, contain the project manual cover page and a material index list page showing item designation, manufacturer and additional items supplied with the installation. Submit for all equipment and systems as indicated in the respective specification 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. Include wiring diagrams of electrically powered equipment.

Submit sufficient quantities of data sheets and shop drawings to allow the following distribution:

- Operating and Maintenance Manuals 2 copies
- DOT 1 copy
- Architect/Engineer 1 copy

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

- Records of tests performed a to certify compliance with system requirements.
- Manufacturer's wiring diagrams for electrically powered equipment.
- Certificates of inspection by regulatory agencies.
- Valve schedules.
- Lubrication instructions, including list/frequency of lubrication.
- Parts lists for fixtures, equipment, valves and specialties.
- Manufacturer’s installation, operation and maintenance recommendations for fixtures, equipment, valves and specialties.
- Additional information as indicated in the technical specification sections.

TRAINING OF OWNER PERSONNEL

Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project. Include not less than four hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup, operation and shutdown procedures for all equipment. All training to be during normal working hours. Videotape all instructions and provide owner with copy.

RECORD DRAWINGS

Refer to Division 1, General Requirements, Record Drawings.

PART 2 - PRODUCTS

ACCESS PANELS AND DOORS

LAY-IN CEILINGS:

Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4-foot configuration provided under Section 09500 are sufficient; no additional access provisions are required unless specifically indicated.

CONCEALED SPLINE CEILINGS:

Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used will be provided under Section 09500.

METAL PAN CEILINGS:

Removable sections of ceiling tile held in position by a pressure fit will be provided under Section 09500.

PLASTER WALLS AND CEILINGS:

16-gauge frame with not less than a 20-gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public or secured areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the item needing service; minimum size is 12" by 12".

IDENTIFICATION

STENCILS:

Not less than 1-inch-high letters/numbers for marking pipe and equipment.

ENGRAVED NAME PLATES:

White letters on a black background, 1/16-inch-thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

SNAP-AROUND PIPE MARKERS:

One-piece, preformed, vinyl construction, snap-around or strap-around pipe markers with applicable labeling and flow direction arrows, ¾" min. size for lettering. Provide nylon ties on each end of pipe markers. Equal to Seton Setmark.

VALVE TAGS:

Round brass tags with 1/2-inch numbers, 1/4 inch system identification abbreviation, 1-1/4 inch minimum diameter, with brass jack chains, brass "S" hooks or one piece nylon ties around the valve stem, available from EMED Co., Seton Name Plate Company, or W. H. Brady.

UNDERGROUND WARNING TAPE:

Detectable underground warning tape, 5.0 mil overall thickness, 6" width, .0035" thick aluminum foil core with polyethylene jacket bonded to both sides. Color code tape and print caution along with name of buried service in bold letters on face of tape. Thor Enterprises Magnatec or equal by Carlton, MSI Marking Services, Seton.

UNDERGROUND TRACER WIRE:

All underground non-metallic sewers/mains and water services/mains shall be provided with tracer wire installations. Tracer wire installations shall conform with Section 182.0715(2r) of Wisconsin Statutes and prevailing Department of Safety and Professional Services Chapter 384 requirements. Tracer wire shall be continuous solid copper or steel plastic coated with split bolt or compression-type connectors.

BEDDING AND BACKFILL

Bedding up to a point 12" inches above the top of the pipe shall be thoroughly compacted sand or crushed stone chips meeting the following gradations:

Gradation for Bedding Sand

Sieve Size	% Passing (by Wt)
1 inch	100
No. 16	45 - 80
No. 200	2 - 10

Gradation for Crushed Stone Chip Bedding

Sieve Size	% Passing (by Wt)
1/2 inch	100
No. 4	75 - 100
No. 100	10 - 25

Backfill above the bedding in lawn areas shall be thoroughly compacted excavated material free of large stones, organic, perishable, and frozen materials.

Backfill above the bedding under existing and future utilities, paving, sidewalks, curbs, roads and buildings shall be granular materials, pit run sand, gravel, or crushed stone, free from large stones, organic, perishable, and frozen materials.

SEALING AND FIRESTOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Manufacturers: 3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or approved equal.

All firestopping systems shall be provided by the same manufacturer.

Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.

Submittals: Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Use firestop putty, caulk sealant, intumescent wrapstrips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

NON-RATED PENETRATIONS:

In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the cored opening or a water-stop type wall sleeve. The operating bolts of the mechanical type seal shall be accessible from the interior of the building.

At pipe penetrations of non-rated interior partitions, floors and exterior walls, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.

PART 3 - EXECUTION

EXCAVATION AND BACKFILL

Perform all excavation and backfill work necessary to accomplish indicated plumbing systems installation. Excavate to bottom of pipe and structure bedding, 4" in stable soils, 6" in rock or wet trenches and 8" in unstable soil. Finish bottoms of excavations to true, level surface.

Tunnel or remove sidewalk and curb in areas of excavation to the nearest joint. Remove pavements, curbs and gutters to neat and straight lines to the limits of removal. Make sawcut lines parallel to existing joints, or parallel or perpendicular to pavement edges to form a neat patch. Carefully remove remaining pavement within the sawcut area. Leave existing base materials between the area disturbed by the work and the sawcut line undisturbed by the sawcutting, pavement removal, or pavement replacement processes.

Strip topsoil from area to be excavated, free from subsoil and debris, and store for later respreading.

At no time place excavated materials where they will impede surface drainage unless such drainage is being safely rerouted away from the excavation.

Excavate whatever materials are encountered as required to place at the elevations shown, all pipe, manholes, and other work. Remove debris and rubbish from excavations before placing bedding and backfill material.

Remove surplus excavated materials from site.

Verify the locations of any water, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of the excavation and cap.

Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment necessary to keep all excavation pits and trenches and the entire subgrade area safe under all circumstances and at all times. No excavation shall be left unattended without adequate protection.

Elevations shown on the plans are subject to such revisions as may be necessary to fit field conditions. No adjustment in compensation will be made for adjustments up to 2 feet above or below the grades indicated on the plans.

Install lines passing under foundations with minimum of 1-1/2-inch clearance to concrete and ensure there is no disturbance of bearing soil.

Bed pipe up to a point 12" above the top of the pipe. Take care during bedding, compaction and backfill not to disturb or damage piping.

Mechanically compact bedding and backfill to prevent settlement. The initial compacted lift to not exceed 24" compacted to 95% density per Modified Proctor Test (ASTM D-1557). Subsequent lifts under pavements, curbs, walks and structures are not to exceed 12" and be compacted to 95% density per Modified Proctor Test. In all other areas where construction above the excavation is not anticipated within 2 years, mechanically compact backfill in lifts not exceeding 24" to 90% density per Modified Proctor Test. Route the equipment over each lift of the material so that the compaction equipment contacts all areas of the surface of the lift.

SHEETING, SHORING AND BRACING

Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavation. Shore and underpin to properly support adjacent or adjoining structures. Abandon in place shoring, sheet piling and underpinning below the top of the pipe, or, if approved in advance by the engineer, maintained in place until other permanent support approved by the engineer is provided.

DEWATERING

Provide, operate and maintain all pumps and other equipment necessary to drain and keep all excavation pits, trenches and the entire subgrade area free from water under all circumstances. Obtain general permit from the Wisconsin Department of Natural Resources district office for discharge of construction dewatering effluent. Obtain well permit from the Wisconsin Department of Natural Resources district office for dewatering wells discharging more than 70 GPM. Comply with permit requirements.

ROCK EXCAVATION

Remove rock encountered in the excavation to a minimum dimension of 6 inches outside the pipe. Rock excavation includes all hard, solid rock in ledges, bedded deposits and unstratified masses, all-natural conglomerate deposits so firmly cemented as to present all the characteristics of solid rock; which material is so hard or so firmly cemented that in the opinion of the engineer it is not practical to excavate and remove same with a power shovel except after thorough and continuous drilling and blasting. Rock excavation includes rock boulders of 1/2 cubic yard or more in volume.

Rock excavation will be computed on the basis of the depth of rock removed and a trench width 2 feet larger than the outside diameter of the pipe where one pipe is laid in the trench and 3 feet larger than the combined outside diameter where two pipes are laid in the trench. Include 6" pipe and structure bedding in rock excavation. Include rock excavation shown on the plans in the Base Bid.

SURFACE RESTORATION

Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off all waste disposal areas and clean up all areas used for the storage of materials or the temporary deposit of excavated earth. Remove all surplus material, tools, and equipment.

Lawns: Topsoil with 4" of clean, friable, fertile topsoil conforming to standard spec 625, free from debris, lumps, rocks, roots, plants and seeds. Grade surfaces to match adjacent elevations. Rake smooth, free of lumps and debris. Seed with good quality nursery seed conforming to standard spec 630, be uniform, dense, free from weeds and consist of approximately 35% Kentucky blue grass and the balance perennial rye and fescue. Maintain lawn areas for one month after installation. Contractor will be responsible for necessary watering and mowing. Do necessary weeding, repair, or reseeding until uniform catch is obtained.

Curb and Gutter: Concrete curb and gutter conforming to city requirements and D.O.T. Section 601, Type D or A.

Sidewalk and Walkways: Non-reinforced concrete conforming to D.O.T. Section 602, thickness to match existing, cross slope of one-fourth inch per foot, scored into squares approximately equal to width.

CONCRETE WORK

Cast-in-place concrete within the building will be performed by the Division 3 Contractor unless otherwise noted. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support or installation of plumbing piping, fixtures, specialties and equipment. Coordinate locations of equipment, pipe penetrations in wet areas, etc. with the Division 3 Contractor.

Plumbing related cast-in-place concrete on the exterior of the building to be provided by this contractor in conformance with requirements of Division 3. This includes piping thrust restraints, pipe supports, hydrant supports, manholes, catch basins, grease traps, septic tanks, distribution boxes, valve pits, meter pits, cleanout cover pads, yard hydrant pads, etc.

CUTTING AND PATCHING

Refer to Division 1, General Requirements, Cutting and Patching.

BUILDING ACCESS

Arrange for the necessary openings in the building to allow for admittance or removal of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

EQUIPMENT ACCESS

Install all piping, conduit and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Plumbing Contractor and installed by the General Contractor.

Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

COORDINATION

Coordinate all work with other contractors prior to installation. Any work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

Verify that all devices are compatible for the type of construction and surfaces on which they will be used.

IDENTIFICATION

Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion.

Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

Identify interior piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where accessible piping passes through walls or floors. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.

Identify all exterior buried piping for entire length with underground warning tape except for sewer piping which is routed in straight lines between manholes or cleanouts. Place tape 6"-12" below finished grade along entire length of pipe. Extend tape to surface at building entrances, meters, hydrants, and valves. Where existing underground warning tape is broken during excavation, replace with new tape identifying appropriate service and securely spliced to ends of existing tape.

Identify valves with brass tags bearing a system identification and a valve sequence number. Identify medical gas and vacuum valves with brass tags and wall or cabinet mounted color-coded engraved nameplate with the following "(Type of Gas) Shutoff Valve for (Location or Zone)". Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device, located in another room or not visible from device. Provide a typewritten valve schedule and pipe identification schedule indicating the valve number and the equipment or areas supplied by each valve and the symbols used for pipe identification; locate schedules in mechanical room and in each Operating and Maintenance manual. Schedule in mechanical room to be framed under clear plastic.

LUBRICATION

Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication according to the manufacturer's instructions until the work is accepted by the owner. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

SLEEVES

Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall. In existing poured concrete walls where penetration is core drilled, pipe sleeve is not required.

Pipe sleeves are not required in interior non-rated drywall, plaster or wood partitions and sleeves are not required in existing poured concrete walls where penetrations are core drilled.

Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

In all piping floor penetrations, fire rated, and non-fire rated, top of sleeve shall extend 1 inch above the adjacent finished floor. In existing floor penetrations, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure.

For floor penetrations through existing floors in mechanical and wet locations listed below, core drill opening and provide 1-1/2” x 1-1/2” x 1/8” galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from entering the penetration. Provide urethane caulk between angles and floor and fasten angles to floor a minimum of 8” on center. Seal corners watertight with urethane caulk. Or core drill sleeve openings large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting non-shrink grout/cement.

Wet locations include:

- Inspection Bay and Tunnel/Inspection Areas

SEALING AND FIRESTOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Install approved product according to the manufacturer's instructions where a pipe penetrates a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support substantial weight.

NON-RATED PARTITIONS:

In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, according to manufacturer's instructions.

At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

END OF SECTION 22 05 00

Section 22 05 13 – Common Motor Requirements for Plumbing Equipment

PART 1 – GENERAL

SCOPE

This sections includes requirements for single and three phase motors that are used with equipment specified in other sections.

RELATED WORK

Section 22 42 00 - Commercial Plumbing Fixtures.

Section 22 30 00 - Plumbing Equipment for equipment requiring motors.

Division 26 00 00 - Electrical - Electrical for power wiring, starters, and other electrical devices

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
ANSI/NEMA MG-1	Motors and Generators
ANSI/NFPA 70	National Electrical Code

SHOP DRAWINGS

Include with the equipment which the motor drives the following motor information: motor manufacturer, voltage, phase, hertz, rpm, full load efficiency, full load power factor, service factor, NEMA design designation, insulation class, and frame type.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

ELECTRICAL COORDINATION

All starters, disconnects, relays, wire, conduit, pushbuttons, pilot lights, and other devices required for the control of motors or electrical equipment are provided by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

Electrical drawings and/or specifications show number and horsepower rating of all motors furnished by this contractor, together with their actuating devices if these devices are furnished by the Electrical Contractor. Should any discrepancy in size, horsepower rating, electrical characteristics or means of control be made to any motor or other electrical equipment after contracts are awarded, contractor is to immediately notify the architect/engineer of such discrepancy. Costs involved in any changes required due to equipment substitutions initiated by this contractor will be the responsibility of this contractor.

The A/E must coordinate specified voltages with the Electrical Consultant for the project. The Electrical Contractor will provide all power wiring and the Plumbing Contractor will provide all control wiring. Control wiring shall conform to Division 16 requirements for Control Wiring.

Furnish project specific wiring diagrams to Electrical Contractor for all equipment and devices furnished by this contractor and indicated to be wired by the Electrical Contractor.

PRODUCT CRITERIA

Motors to conform to all applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by U.L. for the service specified.

Select motors for conditions in which they will be required to perform, i.e., general purpose, splashproof, explosion proof, standard duty, high torque or any other special type as required by the equipment or motor manufacturer's recommendations.

Furnish motors for starting according to utility requirements and compatible with starters as specified.

PART 2 - PRODUCTS

SINGLE PHASE, SINGLE SPEED MOTORS

Use NEMA rated 115-volt, single phase, 60 hertz motors for all motors 1/3 HP and smaller.

Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class A insulation. Service factor to be not less than 1.35.

PART 3 - EXECUTION

INSTALLATION

When motor will be flexible coupled to the driven device, mount coupling to the shafts according to the coupling manufacturer's recommendations. Using a dial indicator, check angular misalignment of the two shafts; adjust motor position as necessary so that the angular misalignment of the shafts does not exceed 0.002 inches per inch diameter of the coupling hub. Again, using the dial indicator, check the shaft for run-out to assure concentricity of the shafts; adjust as necessary so that run-out does not exceed 0.002 inch.

Lubricate all motors requiring lubrication.

END OF SECTION 22 05 13

Section 22 05 14 – Plumbing Specialties

PART 1 – GENERAL

SCOPE

This section includes specifications for floor drains, roof drains, cleanouts, backflow preventers, water hammer arrestors and other miscellaneous plumbing specialties.

RELATED DOCUMENTS

Section 22 11 00 - Facility Water Distribution
Section 22 13 00 - Facility Sanitary Sewerage
Section 22 14 00 - Facility Storm Drainage
Section 22 05 23 - General-Duty Valves for Plumbing Piping

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

REFERENCE STANDARDS

ANSI A112.21.1 - Floor Drains.

ANSI A112.26.1/PDI WH-201 Water Hammer Arrestors.

ASSE 1001 - Pipe Applied Atmospheric Type Vacuum Breakers.

ASSE 1010 - Water Hammer Arrestors.

ASSE 1011 - Hose Connection Vacuum Breakers.

ASSE 1012 - Backflow Preventers with Intermediate Atmospheric Vent.

ASSE 1013 - Reduced Pressure Principle Backflow Preventers.

ASSE 1018 - Trap Seal Primer Valves.

ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining, Anti-Backflow Type.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

SHOP DRAWINGS

Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

PART 2 - PRODUCTS

FLOOR DRAINS

(Refer to Schedule on the Drawings.)

Products by Josam, J.R. Smith, Sioux Chief, or Zurn will be acceptable.

Trap Guards

Manufacturer: ProSet Systems Trap Guard, JR Smith Quad Close, Sure Seal or approved equal.

Flexible elastomeric PVC construction diaphragm trap guard for installation in new and existing floor drains, hub drains, and trench drains. Trap guard to prevent trap evaporation and waste backflow. Size as applicable to the drain outlet size, up to 4” size.

HUB DRAINS

(Refer to Schedule on the Drawings.)

TRENCH DRAINS

Manufacturer: Aco, Josam, Neenah, Smith, Tyler, Watts, Zurn.

TD 1: Modular precast polymer concrete, cast iron or polyester fiberglass trench sections with presloped 4" wide radiused interior waterways, knockouts, endcaps, cast iron frame and slotted ductile iron grate, extra heavy duty rated, stainless steel grate holdowns.

CLEANOUTS

Manufacturer: Josam, Smith, Wade, Watts, Zurn.

INTERIOR CONCRETE FLOOR AREAS: Enameled cast iron body with round or square adjustable scoriated polished nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400- / ZN-1400-T.

INTERIOR CERAMIC TILE FLOOR AREAS: Enameled cast iron body with square adjustable scoriated nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400-T.

INTERIOR VINYL TILE FLOOR AREAS: Enameled cast iron body with round adjustable scoriated nickel bronze cover, tapered threaded ABS closure plug. Zurn ZN-1400.

INTERIOR CARPETED FLOOR AREAS: Enameled cast iron body with round adjustable scoriated nickel bronze cover and secured carpet marker, tapered threaded ABS closure plug. Zurn Z-1400-CM.

INTERIOR FINISHED WALL AREAS: Line type cleanout tee with tapered threaded ABS cleanout plug, round polished stainless steel access cover secured with machine screw. Zurn Z-1446-(Note: Screw shall not pass completely through the ABS plug, trim screw as necessary)

INTERIOR EXPOSED VERTICAL STACKS: Line type cleanout tee with tapered threaded ABS closure plug. Zurn Z-1445.

INTERIOR HORIZONTAL LINES: Cast iron hub with tapped ferrule and tapered threaded ABS or PVC closure plug, or no-hub coupling and blind plug.

EXTERIOR PAVED AREAS: Cast iron hub or plug with tapered threaded ABS or PVC closure plug, cast iron frost sleeve and cover set in 24" square by 4" min. thick reinforced concrete pad top or surrounding pavement, crowned for drainage. Neenah R-1976 with non-ferrous securing screw.

EXTERIOR UNPAVED AREAS: Cast iron hub or plug with tapered threaded ABS or PVC closure plug, cast iron or PVC frost sleeve and cover set in 24” square by 4” min. thick reinforced concrete pad top. Neenah R-1976 with non-ferrous securing screw.

WATER HAMMER ARRESTORS

Manufacturer: PPP Industries, Sioux Chief, Wade, Watts.

ANSI A112.26.1, ASSE 1010; sized in accordance with PDI WH 201, precharged piston type constructed of hard drawn Type K copper, threaded brass adapter, brass piston with o-ring seals, FDA approved silicone lubricant, suitable for operation in temperature range 35 to 150 degrees F, maximum 250 psig working pressure, 1500 psig surge pressure. Watts series 15.

HOSE CONNECTION VACUUM BREAKERS: ASSE 1011, brass or bronze construction, EPDM diaphragm and seat, rated for 125 psig and 180^{o}F. Watts 8 (interior application).

PIPE APPLIED ATMOSPHERIC TYPE VACUUM BREAKERS: ASSE 1001, same size as pipe, brass or bronze construction, silicone disc, rated for 125 psig and 160^{o}F. Watts 288A.

ANTI-SIPHON PRESSURE TYPE VACUUM BREAKERS: ASSE 1020, same size as pipe, brass or bronze construction, silicone disc, plastic seat, stainless steel spring, inlet and outlet ball shutoff valves, test port ball valves, rated for 150 psig and 110^{o}F. Watts 800M4QT

HIGH HAZARD ANTI-SIPHON, ANTI-SPILL VACUUM BREAKERS: ASSE 1056, same size as pipe, brass or bronze construction, silicone rubber discs, stainless steel springs, inlet and outlet ball shutoff valves, with test cocks, anti-spill design, rated for 150 psig and 180 deg. F max.. Watts 008QT.

DUAL CHECK WITH ATMOSPHERIC VENT FOR CO_2 POST MIX VENDING MACHINES: 3/8”, stainless steel body and parts, dual check with third ball check outlet, rated for 150 psig and 140oF. Watts 9BD.

INTERMEDIATE ATMOSPHERIC VENTED BACKFLOW PREVENTERS: ASSE 1012, same size as pipe, with intermediate atmospheric vent between independent check valves, bronze body with union ends, stainless steel springs, rated for 175 psig and 210°F. Watts 9DM.

WALL HYDRANTS

Manufacturer: Josam, Smith, Wade, Watts, Woodford, Zurn.

HB-1: Freezeproof automatic draining wall hydrant with exposed chrome plated bronze wall plate, 3/4" inlet, 3/4" hose thread ASSE 1019-93 backflow preventer outlet, copper or bronze casing, loose key operator. Woodford model 65 series

HB-2: Freezeproof automatic draining wall hydrant in flush mounted cast brass wall box with locking door, 3/4" inlet, 3/4" hose thread ASSE 1019-93 backflow preventer outlet, loose key operator, polished brass finish. Woodford model B65, RB65, B67 or RB67 series.

HB-3: Bronze or brass construction hose faucet/valve, cast iron handwheel, replaceable disc, hose thread spout, with ASSE 1011 backflow preventer outlet, 3/4" size. Watts model SC-8-3.

TRAP PRIMER VALVES

Manufacturers: Ancon, PPP Industries, Smith, Watts.

Bronze body, O-ring seals, integral threaded outlet vacuum breaker, adjustable, in conformance with ANSI/ASSE 1018. PPP model P-1/P-2.

SAFINGS

Manufacturers: Noble, Oatey.

Chlorinated polyethylene sheeting, 40 mils thick, ASTM D4068, joined with CPE solvent; or 3 lb./sq. ft. sheet lead.

VENT FLASHINGS

Manufacturers: Semco, Oatey.

Formed 3 lb./sq. ft. lead flashing with minimum base size of 15"x17".

Single Ply Membrane Roofs: Flashing boot of material compatible with roofing membrane with base flange for adhering to membrane and stainless steel drawband for securing to vent pipe.

PART – 3 EXECUTION

INSTALLATION

Coordinate location and setting of plumbing specialties with adjacent construction. Install in accordance with manufacturers recommendations.

Set floor drains, trench drains and cleanouts level and plumb adjusted to finished floor elevation, roof elevation or finished wall location. Locate where serviceable. Allow minimum of 18" clearance around cleanouts for rodding. Lubricate threaded cleanout plugs with graphite and oil, teflon tape or waterproof grease. Install trap primer connections where indicated. Provide deep seal traps on floor drains and hub drains installed in mechanical rooms, penthouses or rooms with excessive positive or negative pressure.

Floor drains and hub drains installed in public restrooms, locker rooms, seldom used rooms, and areas with minute drainage flow shall have installations of combination trap evaporation/backflow preventer diaphragm installations.

Install water hammer arrestors where indicated and at quick closing valve installations.

Mount wall hydrants recessed in exterior wall construction with valve plug extended beyond interior side of building insulation. Slope to drain to exterior. Install so discharge is 18" min. above finished grade. Set wall box in grout or caulk and fill exterior wall penetration with insulation.

Mount hose bibbs securely fastened to wall where indicated. Provide water hammer arrestor in line to hose bibb.

Install safing at floor drains above grade. Extend 12" beyond drains in all directions. Cover entire floor in showers and extend 6" up in walls above curbs and to a height of 6' (3" wide each direction) in corners. Install on concrete floor that is smooth and free of debris. Seal all joints and connect to drain body clamp. Safing is subject to standing water leak test. Install safing at all built-up shower installations. (Note: spray-on and brush applied liquid safing is not acceptable).

Flash vent penetrations through roof. Turn down top of lead flashing into vent pipe. Tighten drawband of membrane boot to vent pipe. Adhere base flashing to deck or membrane. Provide waterproof patch around penetration on existing roofs.

END OF SECTION 22 05 14

Section 22 05 15 – Piping Specialties

PART 1 – GENERAL

SCOPE

This section contains specifications for plumbing piping specialties for all piping systems.

RELATED WORK

Section 22 11 00 - Facility Water Distribution
Section 22 13 00 - Facility Sanitary Sewerage
Section 22 05 23 - General-Duty Valves for Plumbing Piping
Section 22 07 00 - Plumbing Insulation
Section 22 30 00 - Plumbing Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM B650 Electrodeposited Engineering Chromium Coatings on Ferrous Substrates

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC – General Conditions of the Contract, Equals and Substitutions.

SHOP DRAWINGS

Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, approvals, test data, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

All piping specialties are to be rated for the highest pressures and temperatures in the respective system according to ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 - PRODUCTS

THERMOMETERS

Ashcroft, Marsh, Taylor, H. O. Trerice, Ametek/U. S. Gauge, Weiss, Wika, Weksler.

Stem Type: Cast aluminum case, 9 inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red indicating fluid, black lettering against a white background, with scale ranges as follows:

Service	Hot Water
Scale Range, ^{o}F	30 - 180
Increment, ^{o}F	2

THERMOMETER SOCKETS

Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

PRESSURE GAUGES

Ametek/U. S. Gauge, Ashcroft, Marsh, Taylor, H. O. Trerice, Weiss, Wika, Weksler.

Cast aluminum case of not less than 4.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale, with scale range as follows:

Service	Hot Water	Cold Water	Compressed Air
Scale Range, psig	0-100	0-100	0-200
Increment, psig	1	1	2

Pressure Snubbers: Bronze construction, 300 psig working pressure, 1/4" size.

Gauge Valves: Use ball valves as specified in Section 22 05 23 - General-Duty Valves for Plumbing Piping.

STRAINERS

Armstrong, Illinois, Keckley, Metraflex, Mueller Steam, Sarco, Watts.

Y type; cast bronze body, ASTM B62; 20 mesh stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; sweat, threaded or flanged body rated at not less than 150 psi WOG.

PART 3 – EXECUTION

THERMOMETERS

Stem Type: Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

THERMOMETER SOCKETS

Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

PRESSURE GAUGES

Install in locations where indicated on the drawings and/or details, with scale range appropriate to the system operating pressures.

Pressure Snubbers: Install in gauge piping for all gauges used on water services.

Gauge Valves: Install at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.

STRAINERS

Install all strainers where indicated allowing sufficient space for the screens to be removed. Install a ball valve in the tapped screen retainer.

END OF SECTION 22 05 15

Section 22 05 23 – General Duty Valves for Plumbing Piping

PART 1 – GENERAL

SCOPE

This section includes valve specifications for all Plumbing systems except where indicated under

RELATED WORK.

Section 22 05 14 - Plumbing Specialties

Section 22 30 00 - Plumbing Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

SUBMITTALS

Schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

ANSI Z21.22 - Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems.

ASSE 1003 - Water Pressure Reducing Valves for Domestic Water Supply Systems.

Where valve types (ball, butterfly, etc.) are specified for individual plumbing services (i.e., domestic water, gas, etc.), each valve type shall be of the same manufacturer unless prior written approval is obtained from the owner.

Valves to be line size unless specifically noted otherwise.

PART 2 - PRODUCTS

WATER SYSTEM VALVES

All water system valves to be rated at not less than 125 water working pressure at 240 degrees F unless noted otherwise.

BALL VALVES:

3" and smaller: Two- or three-piece bronze body; sweat ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 600 psig WOG. Provide valve stem extensions for valves installed in all piping with insulation. Apollo 70-200, Jomar T/S 100, Hammond 8511, Milwaukee BA150, Nibco S580-70, Watts B-6001.

SWING CHECK VALVES:

3" and smaller: Bronze body, sweat ends, Y-pattern, regrindable bronze seat, renewable bronze disc, Class 125, suitable for installation in a horizontal or vertical line with flow upward. Crane 1342, Hammond IB941, Nibco S413B, Watts CVYS, Jomar, Apollo and Milwaukee equals.

SPRING LOADED CHECK VALVES:

2" and smaller: Bronze body, sweat or threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, Class 125, teflon seat unless only bronze available. ConBraCo 61 series, Mueller 203BP, Nibco S480Y, Val-Matic S1400 series, Watts equal.

STOP AND WASTE VALVES:

1” and smaller, Bronze body, sweat or threaded ends, 400 psi WOG, stainless steel ball and stem, full port ball valve, with threaded drain cap, Watts B-6300/6301 SS series. Apollo, Jomar Hammond, Milwaukee or Nibco manufacturer.

BALANCE VALVES:

2" and smaller: Two- or three-piece bronze body ball valve, sweat or threaded ends, chrome plated brass ball, glass filled teflon seat, threaded packing nut, with adjustable memory stop position indicator and extended handle stem, suitable for 400 psig water working pressure at 240 degrees F. Watts B-6000/B-6001 BS Apollo, Grinnell, Hammond, Jomar, Milwaukee Or Nibco manufacturer.

DRAIN VALVES:

3/4-inch ball valve with integral threaded hose adapter, sweat or threaded inlet connections, with threaded cap and chain on hose threads, Watts B-6000-CC/B-6001-CC series.

NATURAL GAS SYSTEMS

SHUT-OFF VALVES:

4” and smaller: Ball or eccentric plug valve, bronze or cast-iron body, 2” and under threaded ends, 2-1/2” and over flanged ends, chrome plated bronze ball, bronze or nickel-plated cast-iron plug, TFE or Hycar seats and seals, lever handle, 175 psi W.O.G., U.L listed for use as natural gas shut-off. Apollo 80-100, DeZurik 425, Milwaukee, Nibco and Watts equals.

GAS PRESSURE REGULATORS:

2” and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150 psi W.O.G., -20 degrees F to 150 degrees F.

SPECIALTY VALVES AND VALVE ACCESSORIES

GAUGE VALVES:

Use 1/4" ball valves. Needle valves and gauge cocks will not be accepted.

WATER PRESSURE REDUCING VALVES:

Bronze body, diaphragm operated, with an integral thermal expansion bypass valve, inlet union, stainless steel strainer, renewable monel or stainless-steel seat and adjustable reduced pressure range, 300 psig at 160 degrees F. Pre-set for the scheduled pressure. A. W. Cash, Conbraco, Watts, Wilkins.

SAFETY RELIEF VALVES:

Bronze body, temperature and pressure actuated, stainless steel stem and spring, thermostat with non-metallic coating, test lever, suitable for 125 psig water working pressure at 240 degrees F, sized for full BTUH input and operating pressure of equipment, with valve capacity on metal label. For equipment less than or equal to 200,000 BTUH input, provide AGA, UL or ASME listed and labeled valve. Provide ASME listed and labeled valve for larger equipment. Bell & Gossett, A. W. Cash, Conbraco, Watts, Wilkins. Temperature and pressure relief valve shall be sized per AGA rating for BTUH input, Re: COMM 82.40(5)(d).

PART 3 - EXECUTION

GENERAL

Properly align piping before installation of valves. Install and test valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

Mount valves in locations which allow access for operation, servicing and replacement.

Provide valve handle extensions for all valves installed in insulated piping.

Install all valves with the stem in the upright or horizontal position. If possible, install butterfly valves with the stem in the horizontal position. Valves installed with the stems down will not be accepted.

Prior to flushing of piping systems, place all valves in the full-open position.

SHUT-OFF VALVES

Install shut-off valves at each piece of equipment, at each branch take-off from mains for isolation or repair and elsewhere as indicated.

BALANCING VALVES

Install where indicated on the drawings and details for balancing of flow in pumped hot water recirculation piping systems.

Upon project completion, adjust each valve and set position stop. Balance system to minimum flow in return piping branches needed to maintain even supply water temperature throughout building.

DRAIN VALVES

Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, downstream of riser isolation valves, equipment locations specified, or detailed, other locations required for drainage of systems and elsewhere as indicated.

SPRING LOADED CHECK VALVES

Install a spring-loaded check valve in each circulating pump discharge line, each clearwater sump pump discharge line and elsewhere as indicated.

SWING CHECK VALVES

Install swing check valves in recirculation branch lines and elsewhere as indicated. Provide weighted swing check valves at sanitary sump pump discharges.

PRESSURE REDUCING VALVES

Provide ball valve and strainer at inlet and ball valve at outlet. Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve.

SAFETY RELIEF VALVES

Install relief valves on all pressure vessels and elsewhere as indicated. Inlet and outlet piping connecting to valves must be the same size as valve connections or larger. Pipe discharge to drain where indicated or to floor.

GAS PRESSURE REGULATORS

When the gas pressure regulator is equipped with a vent connection, run a connection size vent to outside air according to codes. Use a larger size vent when required by the manufacturer's installation instructions.

END OF SECTION 22 05 23

Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment

PART 1 – GENERAL

SCOPE

This section includes specifications for supports of all plumbing equipment and materials as well as piping system anchors.

RELATED WORK

Section 03100 & 03300 - Concrete formwork and cast-in-place concrete for equipment pads.

Section 22 07 00 - Plumbing Insulation for insulation protection at support devices.

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

REFERENCE STANDARDS

MSS SP-58

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

DESCRIPTION

Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for building piping.

Do not hang any mechanical item directly from a metal deck or run piping so its rests on the bottom chord of any truss or joist.

Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

Protect insulation at all hanger points; see Related Work above.

SHOP DRAWINGS

Schedule of all hanger and support devices indicating attachment methods and type of device for each pipe size and type of service.

All submittals are to comply with submission and content requirements specified with in section [17 00 00].

DESIGN CRITERIA

Materials and application of pipe hangers and supports shall be according to MSS Standard Practice SP-58 unless noted otherwise.

Piping connected to pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of one hundred pipe diameters or three supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100-pipe diameter/3 support distance.

PART 2 – PRODUCTS

MANUFACTURERS

Anvil, B-Line, Pate, Piping Technology, Roof Products & Systems or approved equal.

STRUCTURAL SUPPORTS

Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported tanks and equipment. All of this steel may not be specifically indicated on the drawings.

PIPE HANGERS AND SUPPORTS

HANGERS FOR PIPE SIZES 1/2" THROUGH 2":

Carbon steel, adjustable swivel ring. B-Line B3170NF, Anvil 69 or 70.

Carbon steel, adjustable clevis, standard. B-Line B3100, Anvil 260.

HANGERS FOR PIPE SIZES 2" AND LARGER:

Carbon steel, adjustable clevis, standard. B-Line B3100, Anvil 260.

MULTIPLE OR TRAPEZE HANGERS:

Steel channels with welded spacers and hanger rods.

WALL SUPPORT:

Carbon steel welded bracket with hanger. B-Line 3068 Series, Anvil 194 Series.

Perforated, epoxy painted finish, 16-12-gauge, min., steel channels securely anchored to wall structure, with interlocking, split-type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Anvil type PS 200 H with PS 1200 clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Anvil PS 1400 series.

VERTICAL SUPPORT:

Carbon steel riser clamp. B-Line B3373, Anvil 261 for above floor use.

FLOOR SUPPORT:

Carbon steel pipe saddle, stand and bolted floor flange. B-Line B3088T/B3093.

COPPER PIPE SUPPORTS:

All supports, fasteners, clamps, etc. directly connected to copper piping shall be copper plated or polyvinylchloride coated. Where steel channels are used, provide isolation collar between supports/clamps/fasteners and copper piping.

PIPE HANGER RODS

STEEL HANGER RODS:

Threaded both ends, threaded one end, or continuous threaded, complete with adjusting and lock nuts.

Size rods for individual hangers and trapeze support as indicated in the following schedule.

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	½
1810	5/8
2710	¾
3770	7/8
4960	1
8000	1-1/4

BEAM CLAMPS

MSS SP-58 Types 19 and 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, ½, and 5/8-inch diameter. Furnish with a hardened steel cup point set screw. B-Line B3036L/B3034, Anvil 86/92.

MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2-inch diameter. B-Line B3054, Anvil 228.

CONCRETE INSERTS

POURED IN PLACE:

MSS SP-58 Type 18 wedge type to be constructed of a black carbon steel body with a removable malleable iron nut that accepts threaded rod to 7/8-inch diameter. Wedge design to allow the insert to be held by concrete in compression to maximize the load carrying capacity. B-Line B2505, Anvil 281.

MSS SP-58 Type 18 universal type to be constructed of black malleable iron body with a removable malleable iron nut that accepts threaded rod to 7/8-inch diameter. B-Line B3014N, Anvil 282.

DRILLED FASTENERS:

Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

ANCHORS

Use welding steel shapes, plates, and bars to secure piping to the structure.

PART 3 - EXECUTION

INSTALLATION

Size, apply and install supports and anchors in compliance with manufacturers recommendations.

Install supports to provide for free expansion of the piping system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

Coordinate hanger and support installation to properly group piping of all trades.

Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes or continuous insert channels for the supporting steel. Where continuous insert channels are used, pipe supporting devices made specifically for use with the channels may be substituted for the specified supporting devices provided that similar types are used, and all data is submitted for prior approval.

Size and install hangers and supports, except for riser clamps, for installation on the exterior of piping insulation. Where a vapor barrier is not required, hangers may be installed either on the exterior of pipe insulation or directly on piping.

Perform welding according to standards of the American Welding Society.

HANGER AND SUPPORT SPACING

Install hangers to provide minimum 1/2-inch space between finished covering and adjacent work.

Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

Use hangers with 1-1/2-inch minimum vertical adjustment.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of these specifications.

Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Horiz. Spacing	Max. Vert. Spacing
Copper	1/2" through 3/4"	5'-0"	10'-0"
Copper	1" through 1-1/4"	6'-0"	10'-0"
Copper	1-1/2" through 2-1/2"	8'-0"	10'-0"
Steel	1/2" through 1-1/4"	7'-0"	15'-0"
Steel	1-1/2" through 6"	10'-0"	15'-0"
Plastic	Drain and Vent	4'-0"	10'-0"
Plastic	1" or less	32"	4'-0"
Plastic	1-1/4" and over	4'-0"	6'-0"

RISER CLAMPS

Support vertical piping with clamps secured to the piping and resting on the building structure or secured to the building structure below at each floor.

CONCRETE INSERTS AND CONTINUOUS INSERT CHANNELS

Select size based on the manufacturer's stated load capacity and weight of material that will be supported. Locate continuous insert channels on 6'-0" maximum centers and 2'-0" from corners. Furnish inserts to the General Contractor for placement in concrete formwork. Use inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4-inch size. Where concrete slabs form finished ceiling, provide inserts that are flush with the slab surface.

ANCHORS

Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

END OF SECTION 22 05 29

Section 22 07 00 – Plumbing Insulation

PART 1 – GENERAL

SCOPE

This section includes insulation specifications for plumbing piping and equipment.

RELATED WORK

Section 22 05 00 - Common Work Results for Plumbing
Section 22 11 00 - Facility Water Distribution
Section 22 13 00 - Facility Sanitary Sewerage
Section 22 05 29 - Hangers and Supports for Plumbing Piping and Equipment
Section 22 30 00 - Plumbing Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM B209	Aluminum and Aluminum Alloy Sheet and Plate
ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C302	Density of Preformed Pipe Insulation
ASTM C303	Density of Preformed Block Insulation
ASTM C518	Heat Flux and Thermal Transmission Properties
ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM E84	Surface Burning Characteristics of Building Materials
MICA	National Commercial & Industrial Insulation Standards
NFPA 225	Surface Burning Characteristics of Building Materials
UL 723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

DESCRIPTION

Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:

- Pipe Insulation
- Equipment Insulation

Install all insulation according to the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the DFD Project Representative.

DEFINITIONS

Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

SHOP DRAWINGS

Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

PART 2 - PRODUCTS

MATERIALS

Materials or accessories containing asbestos will not be accepted.

Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

- Insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 150.

INSULATION AND JACKETS

Manufacturers: Armstrong, Certainteed Manson, Childers, Dow, Extol, Halstead, H.B. Fuller, Imcoa, Knauf, Owens-Corning, Pittsburgh Corning, Rubatex, Johns-Mansville, or approved equal.

Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

RIGID FIBERGLASS INSULATION:

Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

SEMI-RIGID FIBERGLASS INSULATION:

Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F, minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450 degrees F. Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.

White kraft reinforced foil vapor barrier all service jacket, factory applied to insulation with a maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

ELASTOMERIC INSULATION:

Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75 degrees F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor transmission of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20 degrees F to 220 degrees F on piping and 180 degrees F where adhered to equipment.

PVC FITTING COVERS AND JACKETS:

White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be .02 inch (20 mil).

METAL JACKETS:

.016-inch-thick aluminum or .010-inch-thick stainless steel with safety edge.

INSULATION INSERTS AND PIPE SHIELDS

Manufacturers: B-Line, Pipe Shields, Value Engineered Products

Construct inserts with calcium silicate, minimum 140 psi compressive strength. Piping 12” and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180-degree coverage on bottom of supported piping and full 360-degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.

Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered pre-manufactured product described above. On low temperature systems, extruded polystyrene may be substituted for calcium silicate provided insert and shield length and gauge are increased to compensate for lower insulation compressive strength.

Pre-compressed 20# density molded fiberglass blocks, Hamfab or equal, of same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1”x 6” block for piping through 2-1/2” and three 1” x 6” blocks for piping through 4”. Submit shield schedule to demonstrate equivalency to pre-engineered/pre-manufactured product described above.

Wood blocks will not be accepted.

ACCESSORIES

All products shall be compatible with surfaces and materials on which they are applied and be suitable for use at operating temperatures of the systems to which they are applied.

Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be .015 inch for aluminum and .010 inch for stainless steel.

Tack fasteners to be stainless steel ring grooved shank tacks.

Staples to be clinch style.

Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

Finishing cement to be ASTM C449.

Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

Bedding compounds to be non-shrinking and permanently flexible.

Vapor barrier coatings to be non-flammable, fire resistant, polymeric resin.

Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

PART 3 - EXECUTION

INSTALLATION

Install insulation, jackets and accessories according to manufacturer’s instructions and under ambient temperatures and conditions recommended by manufacturer. Surfaces to be insulated must be clean and dry.

Do not insulate systems or equipment which are specified to be pressure tested or inspected, until testing, inspection and any necessary repairs have been successfully completed.

Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Cover and seal exposed fiberglass insulation when insulation is terminated, no raw fiberglass insulation is allowed. Provide neat and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates. Install with longitudinal joints facing wall or ceiling.

Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

Use full-length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

Insulation shall be continuous through sleeves and openings. Vapor barriers shall be maintained continuous through all penetrations.

Provide a complete vapor barrier for insulation on the following systems:

- Cold water (potable and non-potable)
- Equipment piping with a surface temperature below 65 degrees F

PIPING, VALVE, AND FITTING INSULATION

GENERAL:

Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive. Additionally, secure with staples along seams and butt joints. Coat staples with vapor barrier mastic on systems requiring vapor barrier.

Water supply piping insulation shall be continuous throughout the building and installed adjacent to and within building walls to a point directly behind the fixture that is being supplied.

Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

INSULATION INSERTS AND PIPE SHIELDS:

Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22-gauge pipe shields are used.

FITTINGS AND VALVES:

Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built-up insulation of the same thickness as adjoining insulation. Cover insulation with fabric reinforcing and mastic or where temperatures do not exceed 150 degrees, PVC fitting covers. Secure PVC fitting covers with tack fasteners and 1-1/2" band of mastic over ends, throat, seams or penetrations. On systems requiring vapor barrier, use vapor barrier mastic.

ELASTOMERIC:

Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces.

PIPE INSULATION SCHEDULE:

Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation Types	Insulation	Thickness	By Pipe	Size	In Inches
		1" to 2 and smaller:	1 ¼" to 4"	2 ½"	5" to 6"	8" and Larger
Hot Water Supply	Rigid Fiberglass	1	1	1.5	1.5	1.5
Hot Water Circulating	Rigid Fiberglass	1	1	1.5		
Cold Water	Rigid Fiberglass	.5	.5	1	1	1
Tempered Water	Rigid Fiberglass	.5	.5	1		
Non-Potable Cold Water	Rigid Fiberglass	.5	.5	1		
Non – Potable Hot Water	Rigid Fiberglass	1	1	1.5		
All Horizontal Storm Piping and 4'-0" of vertical piping thereafter and Rood Drain Bodies	Rigid Fiberglass	.5	.5	.5	.5	.5
Clearwater Waste	Rigid Fiberglass	*.5	.5	.5	.5	.5

* = Elastomeric and Phenolic types are acceptable

The following piping and fittings are not to be insulated:

- Chrome plated exposed supplies and stops (except where specifically noted).
- Water hammer arrestors.
- Piping unions and flanges for systems not requiring a vapor barrier.

EQUIPMENT INSULATION

Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.

SEMI-RIGID FIBERGLASS:

Apply insulation to equipment shells using weld pins, bonding adhesive, banded and wired in place. Fill all joints, seams and depressions with insulating cement to a smooth, even surface. Cover with reinforcing fabric and two coats of mastic. Use vapor barrier mastic on systems requiring a vapor barrier.

ELASTOMERIC:

Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints. Place insulation with edge joints firmly butted pressing to surface for full adhesion. Seal seams and joints vapor tight.

EQUIPMENT INSULATION SCHEDULE:

Provide equipment insulation as follows:

Equipment	Insulation Type	Thickness	Remarks
Storage Tanks	Semi-Rigid Fiberglass	2”	
Water Meter	Elastomeric	½ “	Sheet Type, fabricated for ease of removal and replacement when service is required.
Water Softener	Elastomeric	½:”	Sheet Type, fabricated for ease of removal and replacement when service is required.
Water Filters	Elastomeric	½”	Sheet type, pipe size type or combination of both. Fabricated for ease of removal and replacement when testing and servicing is required.
R.P.B.P.	Elastomeric	½”	Sheet type, pipe size type or combination of both. Fabricated for ease of removal and replacement when testing and servicing is required.

END OF SECTION 22 07 00

Section 22 11 00 – Facility Water Distribution

PART 1 – GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings for this project.

RELATED WORK

22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

22 05 14 - Plumbing Specialties

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI A21.4 ANSI A21.11 ANSI A21.51

ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ANSI B16.29	Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
ASTM B32	Solder Metal
ASTM B88	Seamless Copper Water Tube
ASTM B280	Seamless Copper Tube for Air Conditioning and Refrigeration Field Service
ASTM B813	Liquid and Paste Fluxes for Soldering Applications of Copper and Copper Alloy Tube
ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2241	Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2464	Threaded Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 80
ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2513	Thermoplastic Gas Pressure Pipe, Tubing, and Fittings
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2657	Heat Fusion Joining of Polyolefin Pipe and Fittings
ASTM D2774	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3222	Unmodified Poly Vinylidene Fluoride (PVDF) Molding Extrusion and Coating Materials
ASTM D4101	Propylene Plastic Injection and Extrusion Materials
ASTM F437	Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80
ASTM F438	Socket Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 40
ASTM F441	Chlorinated Poly Vinyl Chloride (CPVC Plastic Pipe, Schedules 40 and 80
ASTM F493	Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings

ASTM F656	Primers for Use in Solvent Cement Joints of Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
AWS A5.8	Brazing Filler Metal
AWWA C104	Cement Mortar Lining for Ductile Iron Pipe and Fittings for Water
AWWA C105	Polyethylene Encasement for Ductile Iron Piping for Water
AWWA C110	Ductile Iron and Gray Iron Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C111	Rubber Gasket Joints for Ductile Iron and Gray Iron Pressure Pipe and Fittings
AWWA C151	Ductile Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids
AWWA C153	Ductile Iron Compact Fittings, 3 In. Through 48 In., for Water and Other Liquids
AWWA C600	Installation of Ductile Iron Water Mains and Their Appurtenances
AWWA C651	Disinfecting Water Mains
AWWA C900	Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In., for Water Distribution

SHOP DRAWINGS

Schedule from the contractor indicating the ASTM, AWWA or CISPI specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

Statement from manufacturer on his letterhead that pipe furnished meets the ASTM, AWWA or CISPI specification contained in this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC – General Conditions of the Contract, Equals and Substitutions.

Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the state.

DELIVERY, STORAGE, AND HANDLING

Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

Cover pipe to prevent corrosion or deterioration 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. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM, AWWA or CISPI specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system.

Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at contractor's option. Where the grade or type is not specified, contractor may choose from those commercially available.

Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at contractor's option.

WELDER QUALIFICATIONS

Welding procedures, welders, and welding operators for all building service piping to be according to certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

Before any polyethylene fusion welding is performed, contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures according to the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

The architect or engineer reserves the right to test the work of any welder employed on the project, at the state's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

PART 2 - PRODUCTS

BELOW GROUND 2-1/2" AND SMALLER:

Type K copper water tube, O (annealed) temper, ASTM B88; with cast copper pressure fittings, ANSI B16.18; wrought copper pressure fittings, ANSI B16.22; lead free (<.2%) solder, ASTM B32; flux, ASTM B813; or cast copper flared pressure fittings, ANSI B16.26.

BELOW GROUND 3" AND LARGER

Ductile iron pipe, mechanical or push on joint, thickness Class 52, AWWA C151; with standard thickness cement mortar lining, AWWA C104; ductile iron or gray iron mechanical joint cement mortar lined fittings, Class 250, AWWA C110; ductile iron mechanical joint compact fittings, Class 350, AWWA C153; rubber gasket joints with non-toxic gasket lubricant, AWWA C111. Provide 8 mil tube or sheet polyethylene encasement of iron pipe and pipe fittings, AWWA C105.

PVC pressure pipe, DR 18, Class 150, AWWA C900 and C905; with integral bell and elastomeric gaskets, ASTM D3139. Fittings and fitting polyethylene encasement to be same as noted above for ductile iron.

UNDERGROUND TO INTERIOR BUILDING ENTRANCE PIPING 3” AND LARGER

Ductile iron as specified above with factory threaded and machined flanges.

THRUST RESTRAINTS FOR UNDERGROUND PIPING

Asphaltic or epoxy coated ductile iron follower gland mechanical joint restraint with gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference, low alloy steel T-bolts and UL listing or Factory Mutual approval. For PVC pipe joint bells, use epoxy or primer coated ductile iron bell and serrated ring restraints or gripping wedge restraints and torque limiting twist-off nuts around the pipe circumference with low alloy steel tie bolts. Restraint to have minimum pressure rating and safety factor equal to or greater than pressure rating and safety factor of pipe and be designed specifically for the pipe material it’s applied on.

DIELECTRIC UNIONS AND FLANGES

Watts Regulator Company, Lochinvar, Wilkins or EPCO Sales, Inc., dielectric unions 2" and smaller; dielectric flanges 2" and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets, having a pressure rating of not less than 175 psig at 180 degrees.

UNIONS AND FLANGES

Unions, flanges and gasket materials to have a pressure rating of not less than 150 psig at 180 degrees. Gasket material for flanges and flanged fittings shall be teflon type. Treated paper gaskets are not acceptable.

2" AND SMALLER COPPER

ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

PART 3 - EXECUTION GENERAL

Install pipe and fittings according to reference standards, manufacturers recommendations and recognized industry practices.

PREPARATION

Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

ERECTION

Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

Maintain piping in clean condition internally during construction.

Provide clearance for installation of insulation, access to valves and piping specialties.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

COPPER PIPE JOINTS

Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

THREADED PIPE JOINTS

Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

SOLVENT WELDED PIPE JOINTS

Install according to ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of two installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturers recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the DFD Project Representative.

PUSH-ON GASKETED PIPE CONNECTIONS

Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

DOMESTIC WATER

Maintain piping system in clean condition during installation. Remove dirt and debris from assembly of piping as work progresses. Cap open pipe ends where left unattended or subject to contamination.

Install exterior water piping below predicted frost level according to COMM Table 82.30- 6, but in no case less than 6' bury depth to top of pipe. Maintain minimum of 8' horizontal distance between 2-1/2" and larger water piping and sanitary sewer piping. Maintain minimum of 30" horizontal and 12" vertical distance, water on top, between 2" and smaller water piping and sanitary sewer piping. Where water piping crosses a sanitary sewer, provide minimum 18" vertical clearance and waterproof PVC water pipe sleeve (reference sanitary sewer materials) sealed at both ends for distance of 10' from sewer in both directions.

Provide thrust restraints for 3" and larger exterior water piping joints, hydrants, caps, plugs, fittings and bends of 22-1/2 degrees or more. Field apply continuous anti-corrosion coating to rodded restraint components. Protect mechanical joints, nuts and bolts from concrete cover. Cover with 8 mil sheet or tube polyethylene material sleeve.

Install interior water piping with drain valves where indicated and at low points of system to allow complete drainage. Install shutoff valves where indicated and at the base of risers to allow isolation of portions of system for repair. Do not install water piping within exterior walls.

Prior to use, isolate and fill system with potable water. Allow to stand 24 hours. Flush each outlet proceeding from the service entrance to the furthest outlet for minimum of 1 minute and until water appears clear. Fill system with a solution of water and chlorine containing at least 50 parts per million of chlorine and allow to stand for 24 hours. Alternately a solution containing at least 200 parts per million of chlorine may be used and allowed to stand for 3 hours. Flush system with potable water until chlorine concentration is no higher than source water level.

Wait 24 hours after final flushing. Take samples of water for lab testing. The number and location of samples shall be representative of the system size and configuration and are subject to approval by engineer. Test shall show the absence of coliform bacteria. If test fails, repeat disinfection and testing procedures until no coliform bacteria are detected. Submit test report indicating date and time of test along with test results.

UNIONS AND FLANGES

Install a union or flange at each connection to each piece of equipment and at other items which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

PIPING SYSTEM LEAK TESTS

Isolate or remove components from system which are not rated for test pressure. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

Entire test must be witnessed by the Division's representative. All pressure tests are to be documented on Division of Facilities Development forms to be provided to the contractor.

System	Test Medium	Initial Test Pressure	Duration	Final Test Pressure	Duration
*Below Ground Domestic Water	Water	Water	N/A	200 psig	2 hr
Above Ground Domestic Water	Water	Water	N/A	100 psig	8 hr
Above Ground Non-potable Water	Water	Water	N/A	100 psig	8 hr
Below Ground Non-potable Water	Water	Water	N/A	100 psig	8 hr

* Leakage on exterior mains 3" and larger may not exceed leakage calculated as follows:

$$\text{GPH Allowable Leakage} = \frac{(\text{Feet of Pipe})\,(\text{Inches Dia. of Pipe})\,(\text{Test Pressure})5}{133{,}200}$$

END OF SECTION 22 11 00

PIPING SYSTEM TEST REPORT

State of Wisconsin

Department of Transportation

Date Submitted:

Project Name:

Location:_____State Project No:

Contractor:

□ Plumbing □ Fire 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:

Section 22 13 00 – Facility Sanitary Sewerage

PART 1 – GENERAL

SCOPE

This section contains specifications for plumbing pipe and pipe fittings, and tracer wire for this project.

RELATED WORK

22 05 29 - Hangers and Supports for Plumbing Piping and Equipment

22 05 14 - Plumbing Specialties

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI A21.4 ANSI A21.11 ANSI A21.51

ANSI B16.5	Pipe Flanges and Flanged Fittings
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM D1785	Poly Vinyl Chloride (PVC) Plastic Pipe
ASTM D2241	Poly Vinyl Chloride (PVC) Pressure-Rated Pipe (SDR Series)
ASTM D2466	Poly Vinyl Chloride (PVC) Plastic Pipe Fittings, Schedule 40
ASTM D2564	Solvent Cements for Poly Vinyl Chloride (PVC) Plastic Pipe and Fittings
ASTM D2665	Poly Vinyl Chloride (PVC) Plastic Drain, Waste and Vent Pipe and Fittings
ASTM D2729	Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D2774	Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
ASTM D2855	Making Solvent Cemented Joints with Poly Vinyl Chloride (PVC) Pipe and Fittings
ASTM D3034	Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings
ASTM D3139	Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
ASTM D3212	Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals

SHOP DRAWINGS

Schedule from the contractor indicating the ASTM specification number of the pipe being proposed along with its type and grade if known at the time of submittal, and sufficient information to indicate the type and rating of fittings for each service.

Statement from manufacturer on his letterhead that pipe furnished meets the ASTM specification contained in this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC – General Conditions of the Contract, Equals and Substitutions.

Order all copper, cast iron, steel, PVC and polyethylene pipe with each length marked with the name or trademark of the manufacturer and type of pipe; with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the state.

DELIVERY, STORAGE, AND HANDLING

Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

Cover pipe to prevent corrosion or deterioration 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. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system.

Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in ventilation plenum spaces, including plenum ceilings.

Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 type F pipe is specified, grade A type E or S, or grade B type E or S may be substituted at contractor's option. Where the grade or type is not specified, contractor may choose from those commercially available.

Where ASTM B88, type L H (drawn) temper copper tubing is specified, ASTM B88, type K H (drawn) temper copper tubing may be substituted at contractor's option.

WELDER QUALIFICATIONS

Welding procedures, welders, and welding operators for all building service piping to be according to certified welding procedures of the National Certified Pipe Welding Bureau and Section 927.5 of ASME B31.9 Building Services Piping or AWS 10.9 Qualification of Welding Procedures and Welders for Piping and Tubing. Before any metallic welding is performed, contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section 927.6 of ASME B31.9 Building Services Piping.

Before any polyethylene fusion welding is performed, contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures according to the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

The architect or engineer reserves the right to test the work of any welder employed on the project, at the State's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project and all defective welds replaced.

PART 2 - PRODUCTS

SANITARY WASTE AND VENT INTERIOR ABOVE GROUND

PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

INTERIOR BELOW GROUND

PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

EXTERIOR BELOW GROUND 10" AND SMALLER

Non-reinforced concrete sewer, storm drain and culvert pipe, Class III, ASTM C14; rubber gasket joints, ASTM C443; bell and spigot ends with opposing shoulder or confined O- ring seal configuration, ASTM C302.

PRESSURIZED BELOW GROUND 3" AND SMALLER

PVC plastic pipe, Schedule 40, Class 12454-B (PVC 1120), ASTM D1785; PVC plastic drain, waste and vent pipe and fittings, ASTM D2665; socket fitting patterns, ASTM D3311; primer, ASTM F656; solvent cement, ASTM D2564.

Type K copper water tube, H (drawn) temper, ASTM B88; with cast copper drainage fittings (DWV), ANSI B16.23; wrought copper drainage fittings (DWV), ANSI B16.29; lead free (<.2%) solder, ASTM B32; flux, ASTM B813.

PRESSURIZED BELOW GROUND 3" AND LARGER

PVC pressure pipe, DR 18, Class 150, AWWA C900; with integral bell and elastomeric gaskets, ASTM D3139. Fittings and fitting polyethylene encasement to be same as noted above for ductile iron.

PIPE INDICATOR TAPE

Tracer wire shall be solid 14 gage, 600 volt, type TW

PART 3 - EXECUTION GENERAL

Install pipe and fittings according to reference standards, manufacturers recommendations and recognized industry practices.

PREPARATION

Cut pipe ends square. Ream ends of piping to remove burrs. Clean scale and dirt from interior and exterior of each section of pipe and fitting prior to assembly.

TRACER WIRE

Tracer wire shall be run along pipe from structure to structure. Wire shall be taped to each length of pipe at a minimum of two (2) points. A maximum of one (1) splice will be allowed between each structure. Use detectable warning tape over all piping.

Install detectable warning tape into manhole by drilling and sealing tape 300mm (12”) from top of structure into sidewall. Install detectable warning tape to be accessible at cover of clean-out if the pipe does not terminate at a manhole. Test tracer wire for connectivity after backfilling.

ERECTION

Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. Coordinate locations of plumbing piping with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Where copper or steel piping is embedded in masonry or concrete, provide protective sleeve covering of elastomeric pipe insulation.

Install underground warning tape 6"-12" below finished grade above all exterior below ground piping. Where existing underground warning tape is encountered, repair and replace.

Maintain piping in clean condition internally during construction.

Provide clearance for installation of insulation, access to valves and piping specialties.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

Install all valves and piping specialties, including items furnished by others, as specified and/or detailed. Provide access to valves and specialties for maintenance. Make connections to all equipment, fixtures and systems installed by others where same requires the piping services indicated in this section.

WELDED PIPE JOINTS

Make all welded joints by fusion welding according to ASME Codes, ANSI B31, and State Codes where applicable. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half the diameter of the main.

THREADED PIPE JOINTS

Use a thread lubricant or teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

SOLVENT WELDED PIPE JOINTS

Install according to ASTM D2855 "Making Solvent Cemented Joints With PVC Pipe and Fittings". Saw cut piping square and smooth. Tube cutters may be used if they are fitted with wheels designed for use with PVC/CPVC pipe that do not leave a raised bead on pipe exterior. Support and restrain pipe during cutting to prevent nicks and scratches. Bevel ends 10-15 degrees and deburr interior. Remove dust, drips, moisture, grease and other superfluous materials from pipe interior and exterior. Check dry fit of pipe and fittings. Reject materials which are out of round or do not fit within close tolerance. Use heavy body solvent cement for large diameter fittings.

Maintain pipe, fittings, primer and cement between 40 and 100 degrees during application and curing. Apply primer and solvent using separate daubers (3" and smaller piping only) or clean natural bristle brushes about 1/2 the size of the pipe diameter. Apply primer to the fitting socket and pipe surface with a scrubbing motion. Check for penetration and reapply as needed to dissolve surface to a depth of 4-5 thousandths. Apply solvent cement to the fitting socket and pipe in an amount greater than needed to fill any gap. While both surfaces are wet, insert pipe into socket fitting with a quarter turn to the bottom of the socket. Solvent cement application and insertion must be completed in less than 1 minute. Minimum of two installers is required on piping 4" and larger. Hold joint for 30 seconds or until set. Reference manufacturer recommendations for initial set time before handling and for full curing time before pressure testing. Cold weather solvent/cement may be utilized only under unusual circumstances and when specifically approved by the DFD Project Representative.

MECHANICAL JOINT PIPE CONNECTIONS

Comply with AWWA C600/C605 installation requirements. Clean pipe end and socket. Clean and lubricate pipe end, socket and gasket with soapy water or gasket lubricant. Place gland and gasket, properly oriented, on pipe end. Insert pipe end fully into socket and press gasket evenly into recess keeping joint straight. Press gland evenly against gasket, insert bolts and hand tighten nuts. Make joint deflection prior to tightening bolts. Evenly tighten bolts in sequence to recommended torque.

PUSH-ON GASKETED PIPE CONNECTIONS

Clean pipe end, bell, gasket seat and gasket of dirt or debris. Coat end of pipe and gasket with gasket lubricant. Ensure pipe is supported off the ground so lubricant does not pick up dirt. Push spigot end into gasket bell with levered pipe joining tool recommended by pipe manufacturer. Large diameter exterior mains may be joined by pushing end of pipe section with backhoe against wood blocking over pipe end. Insert to fully seated position or to reference mark on pipe.

SANITARY WASTE AND VENT

Verify invert elevations and building elevations prior to installation. Install exterior piping pitched to drain at indicated elevations and slope. Install interior piping pitched to drain at minimum slope of 1/4" per foot where possible and in no case less than 1/8" per foot for piping 3" and larger.

Install exterior piping below predicted frost level and not less than 5' bury depth to top of pipe wherever possible. Where piping is located above predicted frost level, provide frost protection according to SPS 382.30(11)(c).

Flush piping inlets (floor drains, hub drains, mop basins, fixtures, etc.) with high flow of water at completion of project to demonstrate full flow capacity. Remove blockages and make necessary repairs where flow is found to be impeded.

PIPING SYSTEM LEAK TESTS

Isolate or remove components from system which are not rated for test pressure. Perform final testing for medical and lab gas with all system components in place. Test piping in sections or entire system as required by sequence of construction. Do not insulate or conceal pipe until it has been successfully tested.

If required for the additional pressure load under test, provide temporary restraints at fittings or expansion joints. Backfill underground water mains prior to testing with the exception of thrust restrained valves which may be exposed to isolate potential leaks.

For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

For air or nitrogen tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

Inspect system for leaks. Where leaks occur, repair the area with new materials and repeat the test; caulking will not be acceptable.

Entire test must be witnessed by the Division's representative. All pressure tests are to be documented on *Division of Facilities Development* forms to be provided to the contractor.

	Test	Initial Test		Final Test	
System	Medium	Pressure	Duration	Pressure	Duration
Sanitary Waste and Vent	Water	Water	N/A	10' water	2 hr
Pressurized Sanitary Waste & Vent	Water	Water	N/A	100 psig	2 hr

END OF SECTION 22 13 00

Section 22 13 60 – Sanitary Sumps, Pumps, and Accessories

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 22 13 00 - Facility Sanitary Sewerage
Section 22 05 23 - General-Duty Valves for Plumbing Piping

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, materials of construction, ratings, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

Pump curves shall identify design point of operation.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.

Pumps shall meet or exceed operating efficiencies scheduled.

Provide all pumps with motors, impellers, drive assemblies, bearings, coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts.

Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless specified otherwise.

Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

Test all pumps, clean and paint before shipment. The manufacturer shall certify all pump ratings.

All pumps to operate without excessive noise or vibration.

After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.

PART 2 - PRODUCTS

SANITARY EFFLUENT SUMP PUMPS AND SUMPS

MANUFACTURERS:

Goulds, Liberty, Little Giant or Zoeller

PUMPS:

Pump shall be a fully-assembled sump pump suitable for effluent duty only, with integral base mounting and support feet to keep pump above the base of the sump.

Refer to the Schedule on the Drawings for pump capacity requirements.

Pump shall include an integral lifting handle.

Pump shall be hermetically sealed allowing for infrequent submersion in liquid.

SUMPS:

Sumps shall be polyethylene molded one-piece construction with separate top.

Refer to the Schedule on the Drawings for sump dimensions and capacities.

Provide sumps with gasketed polyethylene covers and stainless steel fasteners. Covers shall be suitable for pedestrian traffic only.

Underground discharge and vent connections are recommended for this project. Provide field-installable rubber hubs for connecting the discharge and vent piping to the side of the sump.

ACCESSORIES:

Equip the pump discharge with a non-metallic check valve and a non-metallic isolation valve. Valve shall be located within the sump vessel.

PART 3 - EXECUTION

INSTALLATION

Plumbing Contractor shall excavate for sump. Excavate to depth needed and do not over-excavate. Set sump on a minimum of 3 inches of gravel or crushed rock base. Level and compact base prior to setting sump. Manual compaction will be acceptable.

Ensure connecting piping is adequately supported. Backfill carefully and compact in 3 inch lifts. Backfill with water is encouraged around piping.

Sanitary sumps shall be set so the rim of the sump is flush with finished floor elevation. Provide temporary covers for concrete pouring or supply new covers after completion of all concrete work. Do not install the pump or valves within the sump until all concrete work is complete.

Make all piping connections as shown or indicated.

The sump pump is supplied with an integral float, cord and plug assembly. The Plumbing Contractor is responsible for all electrical wiring with the exception of a receptacle. Ensure the sump is corrected connected and set and is not obstructed by any field piping. No separate alarm will be required for this sump pump.

END OF SECTION 22 13 60

Section 22 30 00 – Plumbing Equipment

PART 1 – GENERAL

SCOPE

This section includes specifications for water heaters, water softeners, pumps and other equipment used for plumbing applications.

RELATED DOCUMENTS

Section 22 05 23 - General-Duty Valves for Plumbing Piping

Section 22 05 15 - Piping Specialties

Section 22 05 13 - Common Motor Requirements for Plumbing Equipment.

Section 22 07 00 - Plumbing Insulation

Division 26 00 00 - Electrical

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Article 7.

Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

SHOP DRAWINGS

Include data concerning dimensions, capacities, materials of construction, ratings, certifications, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

PART 2 - PRODUCTS

HIGH EFFICIENCY COMMERCIAL GAS FIRED WATER HEATER

Manufacturers: A.O. Smith, Bradford White, Bock, Lochinvar, State.

Type: Gas fired sealed combustion condensing commercial storage water heater, minimum 92% thermal efficiency. Design to be AGA certified with 3-year tank warranty and 1 year parts warranty.

Tank: Steel glass lined tank rated for 150 psig complete with multiple removable magnesium anode rods or single impressed current anode rod, submerged combustion chamber, 4” tank access hand hole, foam insulation, painted steel jacket, brass drain valve and temperature and pressure relief valve.

Burner: Top mounted down fired premix low NOx power burner.

Controls: 120-volt, 1 phase, 60 Hz electronic controls, intermittent spark or hot surface ignition, operating thermostat with 110^{o}-180^{o}F adjustable temperature control, energy cutoff with manual reset, blower pressure switch, gas valve and pressure regulator.

Vent: 3" or 4” PVC, CPVC or ABS combustion air intake and flue gas outlet with DWV solvent weld fittings.

WATER SOFTENERS

Manufacturers: Capital, Custom-Care, Hellenbrand, Water Right.

Tanks: Fiberglass reinforced mineral tank constructed of molded high density polyethylene inner shell reinforced by exterior fiberglass winding and epoxy resin. NSF approved and rated for 150 psig. Mount slotted or lateral hub PVC distributor in tank with underbedding gravel.

Mineral: High-capacity ion exchange mineral, FDA approved, Sybron/Ionac, Rohm & Haas, Resintech or Puralite. Uniform beads rated for removal of 30,000 grains of hardness as calcium carbonate when regenerated with 15 lbs. of salt. Design for minimum 50% resin bed freeboard.

Valve: Top mount brass valve with motor drive, hydraulically balanced piston, seal and spacers, adjustable brine flow control, backwash flow control, adjustable capacity and regeneration settings. Provide bypass ball valve arrangement.

Controls: Factory wired and tested controls with transformer and labeled terminal block for single consisting of the following:

- Electronic Meter and 480 Microprocessor with LED Display for Delayed Regeneration.

Brine Tank: High density polyethylene brine tank with high salt platform, PVC brine measuring and float valve, PVC injector. Contractor to provide initial salt fill.

Ratings: Maximum 10 MG/L hardness leakage, 110^{o}F maximum operating temperature, 30-100 psig operating pressure, 120/60/1 electrical.

Accessories:

- Inlet and outlet sampling valves, inlet and outlet pressure gauges with shutoff valve.

IN-LINE SYSTEM LUBRICATED CENTRIFUGAL PUMPS

Manufacturer: Bell and Gossett, Grundfos, Taco.

Type: Horizontal single stage close coupled system lubricated in-line pumps, 125 psig maximum working pressure at operating temperature of 225^{O}F. continuous. The manufacturer shall certify all pump ratings. All pumps to operate without excessive noise or vibration.

Casing: Bronze or stainless steel; flanged suction and discharge connection.

Impeller: Bronze, stainless steel or thermoplastic, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.

Bearings: System lubricated carbon sleeve bearings.

Shaft: Stainless steel or ceramic.

Seal: Stainless steel can isolating rotor and stator.

Motor: Provide pump with impedance protected motor sized for non-overloading over the entire pump curve. Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

EXPANSION TANKS

Manufacturer: Amtrol, Bell and Gossett, Wessels.

Vertical steel precharged hydro-pneumatic expansion tank, 125 psi ASME labeled construction, complete with replaceable flexible butyl rubber bladder, system connection fitting, Schrader type air charge fitting, steel base ring stand, factory prime and enamel painted exterior finish, ASME relief valve. Materials exposed to water to be NSF or FDA approved for potable water service.

PART 3 - EXECUTION

INSTALLATION

Install plumbing equipment where indicated according to manufacturer's recommendations. Coordinate equipment location with piping, ductwork, conduit and equipment of other trades to allow sufficient clearances. Locate equipment and arrange plumbing piping to provide access space for servicing all components.

Set commercial water heaters, commercial water softeners on concrete housekeeping pads. Adjust and level equipment.

Connect equipment to water and drain piping using unions or flanges and isolation valves.

Size temperature and relief valves per CSA ratings. Pipe temperature and pressure relief valves to floor drain or floor as indicated.

Startup and test equipment adjusting operating and safety controls for proper operation.

Cycle softeners and adjust for specified exchange rate, regeneration time, consumption, backflow rate, etc. Provide initial salt fill of brine tank.

Adjust compression tank precharge to scheduled minimum operating pressure prior to connecting to system.

END OF SECTION 22 30 00

Section 22 42 00 – Commercial Plumbing Fixtures

PART 1 – GENERAL

SCOPE

This section includes specifications for plumbing fixtures, faucets and trim.

RELATED WORK

Section 22 11 00 - Facility Water Distribution
Section 22 13 00 - Facility Sanitary Sewerage
Section 22 14 00 - Facility Storm Drainage
Section 22 05 29 – Hangers and Supports for Plumbing Piping and Equipment
Section 22 05 14 - Plumbing Specialties

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

QUALITY ASSURANCE

Substitution of Materials: Refer to Section GC - General Conditions of the Contract, Equals and Substitutions.

Plumbing products requiring approval by the State of Wisconsin Dept. of Safety and Professional Services must be approved or have pending approval at the time of shop drawing submission.

SHOP DRAWINGS

Include data concerning sizes, utility sizes, rough in-dimensions, capacities, materials of construction, ratings, weights, trim, finishes, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

ANSI A112.6.1M-88 - Supports for Off-the Floor Plumbing Fixtures for Public Use.

ANSI A112.18.1-94 - Finished and Rough Brass Plumbing Fixture Fittings.

ANSI A112.19.2M-82 - Vitreous China Plumbing Fixtures.

ANSI A112.19.5-79(R1990) - Trim for Water Closet Bowls, Tanks and Urinals.

ARI-1010-94 - Drinking Fountains and Self-Contained Mechanically Refrigerated Drinking Water Coolers.

ASSE 1011-93 - Hose Connection Vacuum Breakers.

ENERGY EFFICIENCY REQUIREMENTS

Plumbing fixtures must meet the following maximum water usage requirements which are based upon Federal Energy Management Program (FEMP) performance requirements.

- Lavatory Faucets, flow of 2 gpm or less and .25 gallon per cycle or less (based on inlet pressure of 60 p.s.i.)
- Urinal Flush Valves, 1.0 gallon per flush or less.
- Water Closet Flush Valves, 1.6 gallon per flush or less.

PART 2 - PRODUCTS

PLUMBING FIXTURES

Manufacturers: Fixture descriptions establish fixture type, quality, materials, features and size. Products of the following manufacturers determined to be equal by the architect/engineer will be accepted.

- Water Closets - American Standard, Kohler, Zurn
- Water Closet Seats - Bemis, Beneke, Centoco, Olsonite Sperzel
- Urinals – American Standard, Kohler, Zurn
- Lavatories – American Standard, Kohler, Zurn
- Faucets - Chicago Faucet, Kohler, Speakman, Symmons, Zurn
- Drains - Chicago Faucet, Engineered Brass Co., Kohler, McGuire
- Stops and Supplies - Chicago Faucet Co., McGuire. (Heavy Duty Type Only)
- Flush Valves - Coyne & Delany, Sloan Royal, Zurn AV
- Traps - Kohler, McGuire, Dearborn, Engineered Brass Co. (17-gauge Min.)
- Carriers and Supports - Josam, Smith, Wade, Watts Drainage, Zurn
- Sinks - American Standard, Elkay, Just, Kohler
- Laundry Trays - Fiat, Mustee, Stern-Williams
- Mop Basins - Fiat, Mustee, Stern-Williams
- Electric Water Coolers - Elkay, Halsey Taylor, Haws, Filtrine, Oasis, Sunroc
- Emergency Eyewash Fountains and Showers - Bradley, Chicago Faucet Co., Guardian, Haws, Speakman

Refer to Schedule on Drawings.

PART 3 - EXECUTION

INSTALLATION

Install plumbing fixtures according to manufacturer’s instructions. Set level and plumb. Secure in place to counters, floors and walls providing solid bearing and secure mounting. Bolt fixture carriers to floor and wall. Secure rough-in fixture piping to prevent movement of exposed piping.

Install each fixture with trap easily removable for servicing and cleaning. Install fixture stops in readily accessible location for servicing.

Install barrier free fixtures in compliance with IBC 1108 and 3408, COMM 52, 69 and Federal ADA Accessibility Guidelines. Install barrier free lavatory traps parallel and adjacent to wall and supplies and stops elevated to 27" above floor to avoid contact by wheelchair users.

Provide unions at water connections to drinking fountains and electric water coolers.

Each fixture shall have a stop valve installation to control the fixture. Stop valves shall be heavy duty type with brass stems and screwed or sweat inlet connections. Compression type inlets are not acceptable.

Cover pipe penetrations with escutcheons. Exposed traps, stops, piping and escutcheons to be chrome plated brass, same items in concealed locations may be of rough brass finish.

Set floor mounted water closets, floor mounted service sinks; counter mounted lavs and sinks; lav and sink faucets and drains with full setting bed of flexible non-staining plumber's putty. Cover exposed water closet bolts with bolt covers.

Set mop basins to floor and wall with grout or silicone sealant.

Seal openings between walls, floors and fixtures with mildew-resistant silicone sealant same color as fixture.

Test fixtures to demonstrate proper operation. Replace malfunctioning units or components. Adjust valves for intended water flow rate to fixtures without splashing, noise or overflow. Adjust self-closing lavatory faucets to 15 second cycle. Adjust shower valve temperature limit stops to 110-degree maximum outlet temperature.

Protect fixtures during construction. At completion clean plumbing fixtures and trim using manufacturer's recommended cleaning methods and materials.

END OF SECTION 22 42 00

Section 22 70 01 – Interior Oil Interceptors and Accessories

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 22 13 00 - Facility Sanitary Sewerage

REFERENCE

Applicable provisions of Division 1 govern work under this section.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Contractor shall submit manufacturer's standard literature on the proposed product showing dimensions of unit, materials of construction, exact locations of inlet and outlet, vent tappings, weight of unit, and unit flow and storage capacities.

Provide specific information for unit proposed for this project, including exact covers proposed, exact riser rings, ballasting requirements, etc.

PRODUCT APPROVAL

Proposed approval shall be previously approved by the State of Wisconsin and certification of such approval shall be submitted as part of the Shop Drawing process.

PART 2 - PRODUCTS

OIL SEPARATEOR (OS-1)

Based on Schier Model OS-75.

Steel products of similar performance by J.R. Smith, Rockford, or Wade will be acceptable.

Pre-cast concrete products meeting the State of Wisconsin requirements will also be acceptable.

Base product shall be a sand/oil separator constructed of high density polyethylene suitable for below grade installation, with adjustable riser system, built-in flow control, integral vent connections.

Unit nominal capacities and dimensions shall be as follow:

- 4" inlet connection suitable for PVC pipe.
- 4" outlet connection suitable for PVC pipe.
- Maximum flow rate of 75 GPM
- Minimum liquid holding capacity of 125 gallons
- Maximum oil storage capacity of 80 gallons
- Maximum sand holding capacity of 19 gallons
- Fluid operating temperatures ranging from 32-150 degrees.

Substitute products using external flow control means will be acceptable.

Man-hole cover shall be suitable for pedestrian traffic only and rated 2,000 lb. total loading capacity.

PART 3 - EXECUTION

Plumbing Contractor shall perform final excavation for placement of oil interceptor. Excavate 6 inch greater in depth from base of unit and level as best possible. Do not over-excavate if located on virgin materials. If site is located on fill or accidently over-excavated, back fill with sand compacting in 3 inch lifts. Demonstrate suitable base to Project Representative before proceeding with additional installation.

The Plumbing Contractor shall provide and install a gravel base for the interceptor with a minimum thickness of 3 inches. Gravel shall be natural river rock or a similarly natural and hard product. Crushed limestone or sandstone will NOT be acceptable. Level this base and confirm proper elevation for a solid and uniform bearing capacity.

Set interceptor in place ensuring proper slope of drain lines into and out of interceptor.

Backfill around interceptor taking care to ensure unit does not move. Excavated materials may be used for majority of backfill if clean and free of debris and rocks larger than 1.5 inches in nominal diameter. Compact in 6 inch lifts.

No ballasting is anticipated for this project site. Should the excavation yield high ground water, request direction from the Project Representative.

Once backfill reaches top of the interceptor, adjust the riser for finished floor elevations. Backfill around the riser with gravel or crushed rock. Remaining area of backfill may be excavated materials. Compact in 3 inch lifts. At 12 inches below finished grade, obtain subbase materials from the General Contractor and place per his direction. Compact as directed for subbase under concrete slabs.

The General Contractor will provide and install all final concrete and floor finishes. Plumbing Contactor shall be available for final height adjustments during concrete pours.

Piping connections shall be made during backfill procedures. Make solid connections to interceptor, including inlet piping, outlet piping, and vent piping. Solvent weld joints directly to PVC are recommended. Fully support piping over excavation when installing piping. Confirm pipes have adequate slope.

At completion of the project, the interior of the oil interceptor shall be thoroughly cleaned by the Plumbing Contractor. Construction debris, sand, rock and similar materials shall be removed and disposed of. Construction fluids (excluding normal wastewater) shall be removed and disposed of, including hydraulic fluids, concrete curing compounds, etc.

The Plumbing Contactor shall demonstrate to the owner the correct procedures for inspecting the interceptor and for periodic oil extraction. Deliver to owner any spare materials.

END OF SECTION 22 70 01

Section 22 70 02 – Exterior Holding Tanks and Accessories

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 22 13 00 - Facility Sanitary Sewerage

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM C913 Standard Specification for Precast Concrete Water and Wastewater Structures

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Contractor shall submit manufacturer's standard literature on the proposed product showing dimensions of unit, materials of construction, exact locations of inlet and vent tappings, weight of unit, and unit flow and storage capacities.

Provide specific information for unit proposed for this project, including exact covers proposed, exact riser rings, ballasting requirements, etc.

PRODUCT APPROVAL

Proposed approval shall be previously approved by the State of Wisconsin and certification of such approval shall be submitted as part of the Shop Drawing process.

PART 2 - PRODUCTS

EXTERIOR HOLDING TANK FOR GREASY AND OIL WASTES

This vessel shall be provided to collect all sanitary waste from the vehicle inspection bays.

Based on Crest Precast Model 5000R

Similar products by other manufacturers and fabricators will be acceptable. Only pre-cast concrete vessels will be acceptable. Steel, fiberglass, or polyethylene materials will not be acceptable.

Field-formed concrete vessels will not be acceptable.

Unit nominal capacities and dimensions shall be as follow:

- Tank shall have a minimum storage capacity of 5,000 gallons. Tanks of larger capacity will be acceptable.
- 4" inlet connection suitable for PVC pipe.
- Include a minimum of 2 manholes with precast concrete risers and air-tight, cast iron covers.
- Tank is recommended to be rectangular in shape with approximate dimensions of 230 inches long x 100 inches wide by 88 inches high.

Man-hole cover shall be suitable for pedestrian traffic only and rated 2,000 lb. total loading capacity. Manhole rings and covers shall be ductile iron, air-tight with gaskets, and permanently labeled with safety access warnings in full compliance with Wisconsin Plumbing Code.

HIGH LEVEL ALARM

The Plumbing Contractor shall provide and install an alarm panel to signal a high water level in the holding tank.

Recommended product is a SJE Rhombus “Tank Alert XT” with:

- 120 VAC power supply.
- NEMA Type 3R enclosure
- Red-colored beacon mounted on the unit enclosure. Beacon cannot be turned off in an alarm condition.
- Alarm horn with “Test/Silence” switch mounted on cover of unit.
- Nema 5-15P cord and plug for power supply to unit.
- Separate float switch with 15 feet of water-tight cable hermetically sealed to the float.

PART 3 - EXECUTION

Plumbing Contractor shall perform final excavation for placement of holding tank. Excavate 6 inch greater in depth than base of unit and level as best possible. Do not over-excavate if located on virgin materials. If site is located on fill or accidently over-excavated, back fill with sand compacting in 3 inch lifts. Demonstrate suitable base to Project Representative before proceeding with additional installation.

The Plumbing Contractor shall provide and install a gravel base for the vessel with a minim thickness of 6 inches. Gravel shall be natural river rock or a similarly natural and hard product. Crushed limestone or sandstone will NOT be acceptable. Level this base and confirm proper elevation for a solid and uniform bearing capacity.

Set vessel in place ensuring proper slope of drain lines into vessel.

Backfill around vessel taking care to ensure unit does not move. Excavated materials may be used for majority of backfill if clean and free of debris and rocks larger than 1.5 inches in nominal diameter. Compact in 6 inch lifts.

No ballasting is anticipated for this project site. Should the excavation yield high ground water, request direction from the Project Representative.

Once backfill reaches top of the vessel, place suitable quantity and size of risers such that the manholes will be located 18 inches above finished grade. Mortar or glue risers to vessel and to one another. Glue manhole ring to top riser.

Provide and install vent into top of holding tank. Vent may be routed straight up to free air. Terminate a minimum of 24 inches above final grade and install a vented cover to discourage entrance of foreign materials or bird nests in the pipe. (A fabricated PVC gooseneck with a screened elbow will be acceptable.)

Backfill the final 12 inches with black dirt suitable for organic growth.

At completion of the project, the interior of the holding tank shall be thoroughly cleaned by the Plumbing Contractor. Construction debris, sand, rock and similar materials shall be removed and disposed of. Construction fluids (excluding normal wastewater) shall be removed and disposed of, including hydraulic fluids, concrete curing compounds, etc.

The Plumbing Contactor shall demonstrate to the owner the correct procedures for inspecting the holding tank. Deliver to owner any spare materials.

HIGH LEVEL ALARM

The Plumbing Contractor shall install the alarm panel in the building, shall install the float in the holding tank, and shall be responsible for all conduit and wiring between the holding tank and the control panel.

Mount the control panel in the Inspection Bay near an electrical receptacle along the exterior wall. Verify preferred location of the control panel with the Project Representative. Panel shall be located approximately 60 inches above finished floor.

The float shall be installed in the tank near a manhole for easy visual inspection from the manhole. Install a rigid post, secured to the bottom and top of the holding tank, to secure the float. Secure the float to the post such that an alarm condition will occur when the tank is approximately 3/4 full. Post shall be constructed of a corrosion-resistant material of sufficient stiffness. 1 inch diameter stainless steel pipe is recommended.

The float cord shall be routed to a junction box located on a manhole riser, or a self-supporting conduit stub.

Route electrical conductors to the control panel in Schedule 40 PVC conduit. Conduit shall be minimum of 1 inch in size. Conduit shall be buried a minimum of 24 inches below finished grade with a red-colored warning tape installed 12 inches below finished grade.

Provide and install water-resistant conductors and make all final connections at the float and the control panel. (2) -#12 conductors with RHW insulation are recommended for the control signal with a separate #12 grounding conductors. Make all wiring connections exterior to the building in a water-proof manner.

The Plumbing Contractor shall confirm the float works by manually lifting the float to simulate a high level condition and observing the alarm sounds, the horn can be silenced, and the beacon continues to illuminate until the float is returned to the normal position.

END OF SECTION 22 70 02

END OF DIVISION 22 – PLUMBING

55. SWEF Building, Heating and Ventilation, Item SPV.0060.102.

A Description

This item consists of the HVAC work for the SWEF building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure SWEF Building, Heating and Ventilating, completed according to the contract and accepted, as a single complete unit of work.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.102	SWEF Building, Heating and Ventilation	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.

DIVISION 23 – HVAC

Section 23 00 00 – HVAC Table of Contents

TABLE OF CONTENTS

END SECTION 23 00 00

Section 23 05 00 – Common Work Results for HVAC

PART 1 – GENERAL

SCOPE

This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

RELATED WORK

Section 23 05 13 - Common Motor Requirements for HVAC.

Section 23 33 00 - Air Duct Accessories.

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

Abbreviations of standards organizations referenced in other sections are as follows:

AABC	Associated Air Balance Council
ABMA	American Boiler Manufacturers Association
ADC	Air Diffusion Council
AGA	American Gas Association
AMCA	Air Movement and Control Association
ANSI	American National Standards Institute
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
AWS	American Welding Society
CGA	Compressed Gas Association
CTI	Cooling Tower Institute
EPA	Environmental Protection Agency
GAMA	Gas Appliance Manufacturers Association
IEEE	Institute of Electrical and Electronics Engineers
ISA	Instrument Society of America
MCA	Mechanical Contractors Association
MICA	Midwest Insulation Contractors Association
MSS	Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
NBS	National Bureau of Standards
NEBB	National Environmental Balancing Bureau
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association. Inc.
UL	Underwriters Laboratories Inc.
ASTM E814	Standard Test Method for Fire Tests of Through-Penetration Fire Stops

ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials

UL1479 Fire Tests of Through-Penetration Firestops

UL723 Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the performance from the system into which these items are placed. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

PROTECTION OF FINISHED SURFACES

Refer to Division 1, General Requirements, Protection of Finished Surfaces.

Furnish one can of touch-up paint for each different color factory finish which is to be the final finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

SLEEVES AND OPENINGS

Refer to Division 1, General Requirements, Sleeves and Openings.

SEALING AND FIRESTOPPING

Sealing and firestopping of sleeves/openings between ductwork, piping, etc. and the sleeve, structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing. These individuals hired shall normally and routinely be employed in the sealing and fireproofing occupation.

SUBMITTALS

Refer to Division 1, General Conditions, Submittals.

Submit for all equipment and systems as indicated in the respective specification 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.

Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor starter schedule on the electrical drawings. Include a statement on the shop drawing transmittal to the architect/engineer that the equipment submitted, and the motor starter schedule are in agreement or indicate any discrepancies. See related comments in Section 23 05 13 in Part 1 under Electrical Coordination.

Include wiring diagrams of electrically powered equipment.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

- Records of tests performed a to certify compliance with system requirements.
- Certificates of inspection by regulatory agencies.
- Valve schedules.
- Lubrication instructions, including list/frequency of lubrication.

OFF SITE STORAGE

Generally, ductwork, metal for making ductwork, duct lining, sleeves, pipe/pipe fittings and similar rough-in material will not be accepted for off-site storage. For material that can be stored off site, no material will be accepted for off-site storage unless shop drawings for that material have been approved.

CERTIFICATES AND INSPECTIONS

Refer also to Division 1 General Conditions, Permits, Regulations, Utilities and Taxes.

Obtain and pay for all required State installation inspections except those provided by the architect/engineer according to Wis Adm Code Section ILHR 50.12. Deliver originals of these certificates to the project representative. Include copies of the certificates in the Operating and Maintenance Instructions.

OPERATING AND MAINTENANCE INSTRUCTIONS

Refer to Division 1, General Requirements, Operating and Maintenance Instructions.

Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:

- Copies of all approved shop drawings.
- Manufacturer's wiring diagrams for electrically powered equipment.
- Records of tests performed to certify compliance with system requirements.
- Certificates of inspection by regulatory agencies.
- Temperature control record drawings and control sequences.
- Parts lists for manufactured equipment.
- Valve schedules.
- Lubrication instructions, including list/frequency of lubrication done during construction.
- Warranties.
- Additional information as indicated in the technical specification sections.

TRAINING OF OWNER PERSONNEL

Instruct user agency personnel in the proper operation and maintenance of systems and equipment provided as part of this project; video tape all training sessions. Include not less than 16 hours of instruction, using the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for all equipment. All training to be during normal working hours.

RECORD DRAWINGS

Refer to Division 1, General Requirements, Record Drawings.

In addition to the data indicated in the General Requirements, maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

PART 2 - PRODUCTS

ACCESS PANELS AND DOORS

Lay-in Ceilings:

Removable lay-in ceiling tiles in 2 X 2 foot or 2 X 4-foot configuration provided under Section 09500 are sufficient; no additional access provisions are required unless specifically indicated.

Concealed Spline Ceilings:

Removable sections of ceiling tile held in position with metal slats or tabs compatible with the ceiling system used will be provided under Section 09500.

Metal Pan Ceilings:

Removable sections of ceiling tile held in position by a pressure fit will be provided under Section 09500.

Plaster Walls and Ceilings:

16-gauge frame with not less than a 20-gauge hinged door panel, prime coated steel for general applications, stainless steel for use in toilets, showers, and similar wet areas, concealed hinges, screwdriver operated cam latch for general applications, key lock for use in public areas, UL listed for use in fire rated partitions if required by the application. Use the largest size access opening possible, consistent with the space and the equipment needing service; minimum size is 12" by 12".

IDENTIFICATION

STENCILS:

Not less than 1-inch-high letters/numbers for marking pipe and equipment.

SNAP-ON PIPE MARKERS:

Cylindrical self-coiling plastic sheet that snaps over piping insulation and is held tightly in place without the use of adhesive, tape or straps. Not less than 1-inch-high letters/numbers and flow direction arrows for piping marking. W. H. Brady, Seton, Marking Services, or equal.

ENGRAVED NAME PLATES:

White letters on a black background, 1/16-inch-thick plastic laminate, beveled edges, screw mounting, Setonply Style 2060 by Seton Name Plate Company or Emedolite- Style EIP by EMED Co., or equal by Marking Services, or W. H. Brady.

VALVE TAGS:

Round brass tags with 1/2-inch numbers, 1/4-inch system identification abbreviation, 1-1/4-inch minimum diameter, with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company, Marking Services, or W. H. Brady.

SEALING AND FIRESTOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Manufacturers:

3M, Hilti, Rectorseal, STI/SpecSeal, Tremco, or approved equal.

All firestopping systems shall be provided by the same manufacturer.

Submittals:

Contractor shall submit product data for each firestop system. Submittals shall include product characteristics, performance and limitation criteria, test data, MSDS sheets, installation details and procedures for each method of installation applicable to this project. For non-standard conditions where no UL tested system exists, submit manufacturer's drawings for UL system with known performance for which an engineering judgement can be based upon.

Product:

Fire stop systems shall be UL listed or tested by an independent testing laboratory approved by the Department of Commerce.

Use a product that has a rating not less than the rating of the wall or floor being penetrated. Reference architectural drawings for identification of fire and/or smoke rated walls and floors.

Contractor shall use firestop putty, caulk sealant, intumescent wrap strips, intumescent firestop collars, firestop blocks, firestop mortar or a combination of these products to provide a UL listed system for each application required for this project. Provide mineral wool backing where specified in manufacturer's application detail.

NON-RATED PENETRATIONS:

Pipe Penetrations Through Below Grade Walls:

In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the uninsulated pipe and the cored opening or a water-stop type wall sleeve.

Pipe Penetrations:

At pipe penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between pipe insulation and sleeve. For non-rated drywall, plaster or wood partitions where sleeve is not required use urethane caulk in annular space between pipe insulation and wall material.

Duct Penetrations:

Annular space between duct (with or without insulation) and the non-rated partition or floor opening shall not be larger than 2". Where existing openings have an annular space larger than 2", the space shall be patched to match existing construction to within 2" around the duct.

Where shown or specified, pack annular space with fiberglass batt insulation or mineral wool insulation. Provide 4" sheet metal escutcheon around duct on both sides of partition or floor to cover annular space.

PART 3 - EXECUTION

EXCAVATION AND BACKFILL

Perform all excavation and backfill work to accomplish indicated mechanical systems installation according to Division 31 - Earthwork. Blasting will not be allowed without written permission of the architect/engineer and the user agency.

Install lines passing under foundations with minimum of 1-1/2-inch clearance to concrete and ensure there is no disturbance of bearing soil.

CONCRETE WORK

All cast-in-place concrete will be performed by the Division 3 Contractor unless otherwise noted. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for support of mechanical equipment.

CUTTING AND PATCHING

Refer to Division 1, General Requirements, Cutting and Patching.

BUILDING ACCESS

Arrange for the necessary openings in the building to allow for admittance of all apparatus. When the building access was not previously arranged and must be provided by this contractor, restore any opening to its original condition after the apparatus has been brought into the building.

EQUIPMENT ACCESS

Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance and service. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for all equipment and specialties. Access doors in general construction are to be furnished by the Mechanical Contractor and installed by the General Contractor.

Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings which do not require access panels.

COORDINATION

Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, diffusers, register, grilles, and recessed or semi-recessed heating and/or cooling terminal units installed in/on architectural surfaces.

Coordinate all work with other contractors prior to installation. Any installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

Cooperate with the test and balance agency in ensuring Section 23 05 93 specification compliance. Verify system completion to the test and balance agency (flushing, pressure testing, chemical treatment, filling of liquid systems, proper pressurization and air venting of hydronic systems, clean filters, clean strainers, duct and pipe systems cleaned, controls adjusted and calibrated, controls cycled through their sequences, etc.), ready for testing, adjusting and balancing work. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, temperature controls, etc., required for functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work.

IDENTIFICATION

Identify equipment in mechanical equipment rooms by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment such as cabinet heaters and ceiling fans in occupied spaces.

Where stenciling is not appropriate for equipment identification, engraved name plates may be used.

Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background for stenciling or provide Snap-On pipe markers as specified in Part 2 – Products.

Identify valves with brass tags bearing a system identification and a valve sequence number. Valve tags are not required at a terminal device unless the valves are greater than ten feet from the device or located in another room not visible from the terminal unit. Provide a typewritten valve schedule indicating the valve number and the equipment or areas supplied by each valve; locate schedules in each mechanical room and in each Operating and Maintenance manual. Schedules in mechanical rooms to be framed under clear plastic.

Use engraved name plates to identify control equipment.

Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5-inch height lettering reading, “SMOKE DAMPER” or “FIRE DAMPER”. Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

LUBRICATION

Lubricate all bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication according to the manufacturer's instructions until the work is accepted by DFD. Maintain a log of all lubricants used and frequency of lubrication; include this information in the Operating and Maintenance Manuals at the completion of the project.

SLEEVES

PIPE SLEEVES:

Provide galvanized sheet metal sleeves for pipe penetrations through interior and exterior walls to provide a backing for sealant or firestopping. Patch wall around sleeve to match adjacent wall construction and finish. Grout area around sleeve in masonry construction. In finished spaces where pipe penetration through wall is exposed to view, sheet metal sleeve shall be installed flush with face of wall.

Pipe sleeves are not required in interior non-rated drywall, plaster or wood partitions and sleeves are not required in existing poured concrete walls where penetrations are core drilled.

Pipe sleeves in new poured concrete construction shall be schedule 40 steel pipe (sized to allow insulated pipe to run through sleeve), cast in place.

Extend the top of sleeve 1 inch above the adjacent floor in piping floor penetrations located in the mechanical rooms and wet locations listed below. In finished areas sleeves shall be flush with rough floor.

For floor pipe penetrations through existing floors in mechanical rooms and wet locations listed below, core drill opening and provide 1-1/2”x 1-1/2” x 1/8” galvanized steel angles fastened to floor surrounding the penetration or group of penetrations to prevent water from getting to penetration. Provide urethane caulk between angles and floor and fasten angles to floor minimum 8” on center. Seal corners watertight with urethane caulk. Or core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. If the pipe penetrating the sleeve is supported by a pipe clamp resting on the sleeve, weld a collar or struts to the sleeve that will transfer weight to existing floor structure

For pipe penetrations through existing floors located in food service areas, core drill sleeve opening large enough to insert schedule 40 sleeve and grout area around sleeve with hydraulic setting, non-shrink grout. Size sleeve to allow insulated pipe to run through sleeve and paint the sleeve.

Pipe sleeves are not required in cored floor pipe penetrations through existing floors that are not located in mechanical rooms, food service areas or wet locations listed above.

DUCT SLEEVES:

Duct sleeves are not required in non-rated partitions or floors.

Provide sleeve required for fire dampers in fire-rated partitions and floors. Reference fire damper details on drawings.

For duct penetrations through mechanical room floors and wet locations listed below, provide 1-1/2”x 1-1/2” x 1/8” galvanized steel angles fastened to floor around the perimeter of the duct opening to prevent water from getting to floor opening. Provide urethane caulk between angles and floor and fasten angles to floor 8” on center. Seal corners watertight with urethane caulk.

Wet locations include:

- Inspection Bay

SEALING AND FIRESTOPPING

FIRE AND/OR SMOKE RATED PENETRATIONS:

Install approved product according to the manufacturer's instructions where pipes penetrate a fire/smoke rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier.

Where firestop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Firestop mortar alone is not adequate to support any substantial weight.

NON-RATED PARTITIONS:

In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the pipe and tighten in place, according to manufacturer's instructions.

At all interior partitions and exterior walls, pipe penetrations are required to be sealed. Apply sealant to both sides of the penetration in such a manner that the annular space between the pipe sleeve or cored opening and the pipe or insulation is completely blocked.

Duct penetrations through non-rated partitions shall require sheet metal escutcheons with fiberglass or mineral wool insulation fill for spaces that include laboratories, clean rooms, animal rooms, kitchens, cart washrooms, janitor closets, cart washrooms, toilet rooms, mechanical rooms, conference rooms, private consultation rooms, and where noted on drawings elsewhere.

END OF SECTION 23 05 00

Section 23 05 13 – Common Motor Requirements for HVAC Equipment

PART 1 – GENERAL

SCOPE

This section includes requirements for single phase motors that are used with equipment specified in other sections.

RELATED WORK

Division 26 00 00 - Electrical

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI/IEEE 112	Test Procedure for Polyphase Induction Motors and Generators
ANSI/NEMA MG-1	Motors and Generators
ANSI/NFPA 70	National Electrical Code

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include with the equipment which the motor drives the following motor information: motor manufacturer, horsepower, voltage, phase, hertz, rpm, full load efficiency. Include project wiring diagrams prepared by the contractor specifically for this work.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

1. Lubrication instructions, including list/frequency of lubrication.
2. Table noting full load power factor, service factor, NEMA design designation, insulation class and frame type for each motor provided.

ELECTRICAL COORDINATION

All starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, pushbuttons, pilot lights, and other devices required for the control of motors or electrical equipment are furnished and installed by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

Electrical drawings and/or specifications show number and horsepower rating of all motors furnished by this contractor, together with their actuating devices if these devices are furnished by the Electrical Contractor. Should any discrepancy in size, horsepower rating, electrical characteristics or means of control be found for any motor or other electrical equipment after contracts are awarded, contractor is to immediately notify the architect/engineer of such discrepancy. Costs involved in any changes required due to equipment substitutions initiated by this contractor will be the responsibility of this contractor. See related comments in Section 23 05 00 - Common Work Results for HVAC, under Shop Drawings.

Electrical Contractor will provide all power wiring and control wiring, except temperature control wiring.

Furnish project specific wiring diagrams to Electrical Contractor for all equipment and devices furnished by this contractor and indicated to be wired by the Electrical Contractor.

PRODUCT CRITERIA

Motors to conform to all applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by U.L. for the service specified.

Select motors for conditions in which they will be required to perform, i.e., general purpose, splashproof, explosion proof, standard duty, high torque or any other special type as required by the equipment or motor manufacturer's recommendations.

Furnish motors for starting according to utility requirements and compatible with starters as specified.

PART 2 - PRODUCTS

SINGLE PHASE, SINGLE SPEED MOTORS

Use NEMA rated 115-volt, single phase, 60 hertz motors for all motors 1/3 HP and smaller.

Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class A insulation. Service factor to be not less than 1.35.

MOTORS USED ON VARIABLE FREQUENCY DRIVES

In addition to the requirements specified above, the motor must be suitable for use with the drive specified in Section 23 05 14, including but not limited to motor cooling. Motor shall comply with NEMA MG1 Part 31 to provide windings capable to withstand up to 1600 peak Volts with a rise time of 0.1 µs. Provide bearing protection grounding rings to bleed current from the motor shaft to the motor casing. Manufacturers: Aegis SGR, Inpro/Seal CDR, or equal.

PART 3 - EXECUTION

INSTALLATION

Mount motors on a rigid base designed to accept a motor, using shims if required under each mounting foot to get a secure installation.

When motor will be flexible coupled to the driven device, mount coupling to the shafts according to the coupling manufacturer's recommendations. Using a dial indicator, check angular misalignment of the two shafts; adjust motor position as necessary so that the angular misalignment of the shafts does not exceed 0.002 inches per inch diameter of the coupling hub. Again, using the dial indicator, check the shaft for run-out to assure concentricity of the shafts; adjust as necessary so that run-out does not exceed 0.002 inch.

When motor will be connected to the driven device by means of a belt drive, mount sheaves on the appropriate shafts according to the manufacturer's instructions. Use a straight edge to check alignment of the sheaves; reposition sheaves as necessary so that the straight edge contacts both sheave faces squarely. After sheaves are aligned, loosen the adjustable motor base so that the belt(s) can be added and tighten the base so that the belt tension is according to the drive manufacturer's recommendations. Frequently recheck belt tension and adjust if necessary, during the first day of operation and again after 80 hours of operation.

Verify the proper rotation of each three-phase motor as it is being wired or before the motor is energized for any reason.

Lubricate all motors requiring lubrication. Record lubrication material used and the frequency of use. Include this information in the maintenance manuals.

END OF SECTION 23 05 13

Section 23 05 15 – Piping Specialties

PART 1 – GENERAL

SCOPE

This section contains specifications for HVAC piping specialties for all piping systems.

RELATED WORK

Section 23 11 00 - Facility Fuel Piping
Section 23 05 23 - General-Duty Valves for HVAC Piping
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 07 00 - HVAC Insulation
Section 23 21 13 - Hydronic Piping

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Required for all items in this section. Include materials of construction, dimensional data, ratings/capacities/ranges, pressure drop data where appropriate, and identification as referenced in this section and/or on the drawings.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

All piping specialties are to be rated for the highest pressures and temperatures in the respective system according to ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

PART 2 - PRODUCTS

THERMOMETERS

Manufacturers: Ashcroft, Marsh, Taylor, H. O. Trerice, U. S. Gauge, Weiss, Weksler.

Stem Type, cast aluminum case, nine-inch scale, clear acrylic window. adjustable angle brass stem with stem of sufficient length so the end of the stem is near the middle of a pipe without reducing the thickness of any insulation, red indicating fluid, black lettering against a white background, with scale ranges as follows:

Service	Scale Range, °F	Min. Increment, °F
Hot Water	30 - 240	2
Chilled Water	0 - 100	1
Glycol Water	30-130	2
Condenser Water	0 - 120 or	1
	30 - 130	1

THERMOMETER SOCKETS

Brass with threaded connections suitable for thermometer stems and temperature control sensing elements in pipeline. Furnish with extension necks for insulated piping systems.

HOSE CONNECTON CAPS

Hose connection caps shall be pressure rated for 150 psig at 180 deg F.

PRESSURE GAUGES

Manufacturers: Ametek/U. S. Gauge Division, Ashcroft, Marsh, Taylor, H. O. Trerice, Weiss, Weksler.

Cast aluminum case of not less than 2.5 inches in diameter, double strength glass window, black lettering on a white background, phosphor bronze bourdon tube with bronze bushings, recalibration from the front of the dial, 99% accuracy over the middle half of the scale, 98.5% accuracy over the remainder of the scale, with scale range as follows:

Service	Scale Range, psig	Min. Increment, psig
Hot Water	0-100	5
Chilled Water	0-100	5
Glycol Water	0-100	5
Condenser Water	0-100	5

Pressure Snubbers:

Bronze construction, suitable for system working pressure, 1/4" size.

Gauge Valves:

Use valves as specified in Section 23 05 23 - General-Duty Valves for HVAC Piping. For water systems, use 1/4" ball valves. For steam systems, use 1/4" gate valves suitable for system working pressure.

STRAINERS

Manufacturers: Armstrong, Hoffman, Illinois, Keckley, Metraflex, Mueller Steam, or Sarco.

WATER SYSTEMS:

Y type; cast iron body; stainless steel screens; bolted or threaded screen retainer tapped for a blowoff valve; threaded body in sizes through 2 inch and rated at not less than 175 psi WOG; flanged body in sizes over 2 inch and rated at not less than 125 psi WOG at 240°F. Screen to be 20 mesh for line sizes 2 inch and less, 0.125-inch perforations for line sizes 2-1/2 inch through 4 inch, and 0.25-inch perforations for line sizes 5 inch and larger.

EXPANSION TANKS

Manufacturers: Amtrol/Thrush, Armstrong Pumps, Bell and Gossett, Taco, Wessels.

BLADDER TYPE:

Steel construction, tested and stamped according to Section 8D of the ANSI/ASME Code and furnished with the National Board Form U-1, rated for not less than 125 psig working pressure, precharged with air to the initial fill pressure indicated on the drawings, butyl replaceable bladder suitable for fluid temperatures to 220°F, and furnished with a tank drain connection, system connection, mounting saddles for horizontal installation or base for vertical installation, prime coated, size/capacity as indicated on the drawings. Tank and bladder construction must allow field replacement of the bladder on its failure.

AIR SEPARATORS

Manufacturers: Amtrol/Thrush, Armstrong Pumps, Bell and Gossett, Taco.

1-1/2 inch and smaller: Cast iron construction, suitable for in-line installation, top and bottom connections for use with expansion tanks specified above, rated at not less than 125 psig at 220°F.

2 inch and larger: Welded steel construction, ASME constructed and stamped for a working pressure not less than 125 psig at 220°F, threaded or flanged connections for 2-inch size, flanged or grooved connections if grooved piping is allowed for all sizes over 2 inch, suitable for use with expansion tanks specified above, drain connection at the bottom of unit, vent/tank connection at the top of unit, suitable for the system flow rates as indicated on the drawings. Include a galvanized or stainless-steel strainer with provisions in the unit shell for strainer removal. Provide a blowdown connection located so that the inside surface of the strainer can be cleaned by draining the system fluid through the blowdown connection.

AIR VENTS

MANUAL KEY TYPE VENTS:

Bell and Gossett Model 4V; Eaton/Dole Model 9, 9B, or 14A.

Bronze body with nonferrous internal parts, screwdriver operated, designed to relieve air from the system when vent is opened, rated at not less than 125 psig at 220°F.

MANUAL BALL VALVE VENTS:

Provide 1/4" ball valves for manual venting of air handling unit coils and where indicated elsewhere on drawings and details. Reference specifications section 23 05 23.

AUTOMATIC VENTS:

Thrush Model 720, Bell and Gossett Model 107, Watson McDaniel Model AV813W

Cast iron body with nonferrous internal parts, designed to vent air automatically with float principle without allowing air to enter the system, rated at not less than 125 psig at 220°F.

SUCTION DIFFUSERS

Manufacturers: Amtrol/Thrush, Armstrong Pumps, Bell and Gossett, Taco.

Designed to replace the suction line strainer and the long entrance pipe at a pump suction; constructed with a strainer blowdown connection, provisions for a field supplied support foot, and bolted flange for strainer removal and cleaning; rated at not less than 125 psi working pressure at not less than 250°F.

PART 3 - EXECUTION

THERMOMETERS

STEM TYPE:

Install in piping systems as indicated on the drawings and/or details using a separable socket in each location.

DIAL TYPE FOR AIR TEMPERATURE MEASUREMENT:

Install in ductwork where detailed or specified. Support capillary inside duct so it measures a uniform sample of air. Mount readout so it is readily visible on a portion of ductwork that is not externally insulated or on a sheet metal angle support secured to a nearby structural element.

THERMOMETER SOCKETS

Install at each point where a thermometer or temperature control sensing element is located in a pipeline.

PRESSURE GAUGES

Install in locations where indicated on the drawings and/or details, including any gauge piping, with scale range appropriate to the system operating pressures.

PRESSURE SNUBBERS:

Install in gauge piping for all gauges used on water services.

GAUGE VALVES

Install at each gauge location as close to the main as possible and at each location where a gauge tapping is indicated.

STRAINERS

Install all strainers where indicated on the project details, allowing sufficient space for the screens to be removed. Rotate screen retainer where required by the installation so blowdown can remove accumulated dirt from the strainer body.

WATER SYSTEMS:

Install a ball valve for blowdown in the tapped screen retainer; valve to be the same size as the tapping.

WATER FILTERS

Install water filter in a bypass arrangement around system pump where indicated on the drawings. Allow sufficient clearance at the top of the unit for filter removal and replacement. Anchor filter support stand to a housekeeping pad. Install a shutoff valve upstream and downstream of the filter. Install a pressure gauge with gauge valves, piped so the pressure differential across the filter can be read.

Install the 50-micron filters after the piping system has been cleaned and flushed. Install one set of 10-micron filters when the 50-micron filters need replacing. Give the other set of 10-micron filters and the other set of 50-micron filters to the owner.

EXPANSION TANKS

Install tanks where indicated on the drawings, coordinating concrete base installation with the General Contractor or fabricating steel supports to suit the application. Install all specified tank accessories.

BLADDER TANKS:

Verify proper air charge, recharge as necessary. Install an isolation valve in the piping connecting the tank to the system. In the piping between the tank and the isolation valve, install a pressure gauge and a drain valve with a hose adapter. Install a drain valve with hose adapter in the drain connection of the tank. Make sure that all drains are accessible, and a hose can be attached.

AIR SEPARATORS

Mount in hot and/or chilled water lines as indicated on the drawings/details. Install ball valve with hose adapter in bottom blowdown connection.

Open the drain valve and blowdown the strainer after system cleaning and again after 30 days of operation.

AIR VENTS

MANUAL KEY TYPE VENTS:

Install at all high points where air may collect and not be carried by the system fluid. Use a soft Type L copper "pigtail" so the vent can be positioned for venting and collecting any water that might escape.

MANUAL BALL VALVE VENTS:

Install on air handling coils and where indicated elsewhere as shown on drawings and details.

AUTOMATIC VENTS:

Install on the top of air separators on systems using bladder type expansion tanks. Install at other locations as indicated on the drawings or details. All locations to have a ball valve installed upstream of the vent for maintenance purposes.

SUCTION DIFFUSERS

Install at each pump suction connection for end suction pumps where shown. Provide sufficient space for removal of the strainer. Install a capped drain valve in the blowdown connection. Install support below the suction diffuser so the weight of the suction piping does not rest on the pump suction connection.

Install a pressure gauge across the suction diffuser, valved so that a single gauge can be used to read the inlet pressure and the outlet pressure across the strainer. Use gauge valves as specified with the gauges. This gauge can be the same one used to read pressures across the pump. Select gauge range appropriate to the system pressures.

Open the drain valve and blowdown the strainer after system cleaning and again after 30 days of operation. If the unit is furnished with a fine mesh startup strainer, remove this strainer after the system has been flushed and cleaned.

On applications involving open systems, such as but not limited to cooling towers, remove the fine mesh startup strainer prior to pump operation if the suction diffuser includes such a strainer.

END OF SECTION 23 05 15

Section 23 05 23 – General Duty Valves for HVAC Piping

PART 1 – GENERAL

SCOPE

This section includes valve specifications for all HVAC systems except where indicated under Related Work.

RELATED WORK

Section 23 05 15 - Piping Specialties

REFERENCE

Applicable provisions of Division 1 govern work under this section.

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SUBMITTALS

Refer to division 1, General Conditions, Submittals.

Contractors shall submit a schedule of all valves indicating type of service, dimensions, materials of construction, and pressure/temperature ratings for all valves to be used on the project. Temperature ratings specified are for continuous operation.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

Where valves are specified for individual mechanical services (i.e., hot water heating, steam, etc.) all valves shall be of the same manufacturer unless prior written approval is obtained from DFD.

PART 2 - PRODUCTS

MANUFACTURERS

Anvil, Apollo, Armstrong, Bell & Gossett, Cash-Acme, Dresser Consolidated, Conval, Crane, Anderson Greenwood and Crosby, Danfoss-Flomatic, DeZurik, Durco, Fisher, Grinnell, Griswold, Hammond, Hancock, Hoffman, Jamesbury, Keystone, Kunkle, Leslie, Lunkenheimer/Cincinnati, Metraflex, Milwaukee, Mueller, Newco, Nexus, Nibco, Powell, RP&C, Sarco, Spence, Stockham, Taco, Tasco, Thrush-Amtrol, Vogt, Watts, or approved equal.

WATER SYSTEM VALVES

All water system valves to be rated at not less than 125 psig water working pressure at 240°F unless noted otherwise.

BALL VALVES:

2" and smaller: Two piece bronze body; threaded or soldered ends, as appropriate to the pipe material; stainless steel or chrome plated brass/bronze ball; conventional port; glass filled teflon seat; threaded packing gland follower; blowout-proof stem; 600 psig WOG.

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Apollo 70-100/200 series, Hammond 8301/8311, Milwaukee BA100/150, Nibco T/S 585-70, Stockham S206/216.

2-1/2" and over: Ball valves will not be accepted in sizes over 2 inch.

BUTTERFLY VALVES:

2" and smaller: Use ball valves; butterfly valves will not be accepted in sizes 2 inch and smaller.

2-1/2" and larger: Cast iron body; stainless steel shaft; Teflon, nylatron, or acetal bearings; EPDM resilient seat. Disk to be bronze, aluminum-bronze, nickel plated ductile iron, cast iron with welded nickel edge, or 316 - stainless steel. Pressure rated to 150 psig. Valve assembly to be bi-directionally bubble tight to 150 psig with no downstream flange/pipe attached. Nylon coated ductile iron discs are not acceptable. Polymid or polyamide coated valves are not acceptable.

Valve stems shall allow operators to clear insulation without interference. Provide stem extensions when valve operators interfere with pipe insulation.

Use threaded lug type valves for installation with class 125/150 flanges.

Centerline series 200, DeZurik BOS-CL, Keystone Fig. 222, Nibco LD2000 (2-1/2”-12”)/LD1000 (14” and above), Bray Series 31H, Victaulic 300 series (2-1/2”-12”)/709 series (14”-24”).

Provide ten-position lever actuators for valves 6" and smaller. Provide worm gear operators for valves 8" and larger.

Where butterfly valves are indicated or specified to be installed at the location of a flow sensing device, provide the butterfly valves with a memory stop.

GLOBE VALVES:

Do not use globe valves for water service, except in temperature control applications.

SWING CHECK VALVES:

2" and smaller: Class 125, bronze body, threaded or soldered ends, regrindable seat, bronze disc, threaded cap, suitable for installation in a horizontal or vertical line with flow upward.

Crane 137/1342, Hammond IB912/IB940, Lunkenheimer 2144/2145, Milwaukee 509/1509, Nibco T-413-B/S-413-B, Powell 578/1825, Stockham B-309/B-319.

2-1/2" and larger: Class 125, cast iron body, flanged ends, bronze trim, bolted cap, renewable bronze seat and disc, non-asbestos gasket, suitable for installation in a horizontal or vertical line with flow upward.

Crane 373, Hammond IR1124, Lunkenheimer 1790, Milwaukee F2974, Nibco F918, Powell 559, Stockham G-931.

SPRING LOADED CHECK VALVES:

2" and smaller: Class 125, bronze body, threaded, solder or wafer ends, bronze trim, stainless steel spring, teflon seat unless only bronze available.

APCO 300 series, ConBraCo 61 series, Mueller 303BP, Nibco T-480-Y/S-480-Y, Val-Matic 1400 series.

2-1/2" and larger: Class 125, cast iron or semi-steel body, wafer or globe flanged type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required. Valves with ductile iron in contact with the working fluid will not be accepted.

APCO 600 series, Metraflex 900 series, Milwaukee 1800 series, Mueller Steam 101M-AP/105M-AP, Nibco F910 series, Val-Matic 1800 series, Victaulic series 716.

BALANCE VALVES:

2" and smaller: Bronze or copper alloy body with calibrated ball, globe or venturi/valve arrangement, integral pointer and calibrated scale to register degree of valve opening, memory stop, drain tapping, threaded or soldered ends, with or without integral unions, P/T or Shraeder pressure taps with integral check valves and seals, adjustable memory stop, suitable for 200 psig water working pressure at 250°F.

Armstrong CBV, Bell & Gossett Circuit Setter Plus, Griswold Quickset, Nexus Orturi, Nibco 1710 Series, Taco Accu-Flo, Tour & Anderson STAS/STAD, Victaulic series 786/787.

2-1/2" and larger: Use butterfly valves as specified in this section along with a flow sensing device as specified in Section 23 05 15.

DRAIN VALVES:

Use 3/4 inch ball valve with threaded hose adapter except strainer blowdown valves to be the same size as the blowdown connection.

COMBINATION SHUT-OFF, CHECK, AND BALANCE VALVES:

2 inch and larger: Cast or ductile iron body, threaded or flanged or grooved end connections, stainless steel spring, bronze disc with EPDM seat, calibrated memory stop, backseating valve stem, inlet and outlet pressure tappings, capable of being repacked under full line pressure, and suitable for a minimum working pressure of 175 psig at 240°F when used in hot water heating systems.

Armstrong Flo-Trex, Bell & Gossett Triple Duty, Taco Multi-Purpose Valve, Thrush-Amtrol Tri-Flow.

WATER PRESSURE REDUCING VALVES:

Brass or bronze body, diaphragm operated, with an integral anti-syphon check valve, inlet strainer, and adjustable reduced pressure range but pre-set for the scheduled pressure, 125 psig at 225°F.

Bell & Gossett, Cash-Acme, or Watts.

WATER RELIEF VALVES:

Iron or bronze body, direct pressure actuated, teflon seat, stainless steel stem and spring, suitable for 125 psig water working pressure at 240° F and ASME stamped, with Btu capacity and set point as scheduled.

Bell & Gossett, Cash-Acme, Consolidated, Kunkle, Watts.

NATURAL GAS SYSTEMS

SHUT OFF VALVES:

2" and smaller: Ball valve, bronze body, threaded ends, chrome-plated bronze or stainless steel ball, full or conventional port, teflon seat, blowout-proof stem, two-piece construction, suitable for 150 psig working pressure, U.L. listed for use as natural gas shut-off.

GAS PRESSURE REGULATORS:

2" and smaller: Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150 psi W.O.G., -20°F to 150°F.

SPECIALTY VALVES AND VALVE ACCESSORIES

GAUGE VALVES:

Water Service: Use 1/4" ball valves.

STEM EXTENSIONS:

Provide stem extensions when valve operators interfere with pipe insulation.

PART 3 - EXECUTION

GENERAL

Properly align piping before installation of valves in an upright position; operators installed below the valves will not be accepted.

Install valves in strict accordance with valve manufacturer's installation recommendations. Do not support weight of piping system on valve ends.

Install all temperature control valves.

Install all valves with the stem in the upright position. Valves may be installed with the stem in the horizontal position only where space limitations do not allow installation in an upright position or where large valves are provided with chain wheel operators. Where valves 2-1/2" and larger are located more than 12'-0" above mechanical room floors, install valve with stem in the horizontal position and provide a chain wheel operator. Valves installed with the stems down, will not be accepted.

Install stem extensions when shipped loose from valve.

Prior to flushing of piping systems, place all valves in the full-open position.

SHUT-OFF VALVES

Install shut-off valves at all equipment, at each branch take-off from mains, and at each automatic valve for isolation or repair.

WATER SYSTEM:

Butterfly valves installed at the location of a flow sensing device are to have a memory stop.

BALANCING VALVES

Provide balancing valves for all major equipment and at each major branch takeoff and at the discharge of each pump as indicated on drawings and details.

CALIBRATED BALANCE VALVES:

Install where indicated on the drawings and details for balancing of hydronic systems. Retain the shipping container for use as removable insulation.

DRAIN VALVES

Provide drain valves for complete drainage of all systems. Locations of drain valves include low points of piping systems, equipment locations specified, or detailed including reheat coils, other locations required for drainage of systems.

SAFETY RELIEF VALVES

Use air pressure to clean piping prior to installation of safety relief valves.

Install relief valves in locations indicated on drawings, downstream of all pressure reducing valves, and on all boilers.

Install valves in the vertical position, with drain holes, including those from dip pan elbows, piped to the nearest drain.

Inlet and outlet piping connecting to valves must be the same size as valve connections or larger.

SPRING LOADED CHECK VALVES

Install a spring-loaded check valve in each pump discharge line where two pumps operate in parallel and no combination shutoff, check and balancing valve is being used.

SWING CHECK VALVES

Provide swing check valves where specified, detailed, and at steam condensate lines where they rise at outlet of traps. In such cases, provide isolation valves to allow repair or replacement of check valve.

COMBINATION SHUT-OFF, CHECK, AND BALANCING VALVES

Contractor may use combination shut-off, check and balancing valves where separate shut-off valve, check valve, and balancing valve are specified or detailed in pump discharge piping.

PRESSURE REDUCING VALVES

Provide gate valve and strainer at inlet. Provide gate valve at outlet.

Install pressure gauges to indicate inlet and outlet pressure at each pressure reducing valve according to Section 23 05 15 - Piping Specialties.

Use eccentric reducers at inlet and outlet of reducing valves where connections are not the same size as adjacent piping.

GAS PRESSURE REGULATORS

When the gas pressure regulator is equipped with a vent connection, run a connection size vent to outside air according to codes. Use a larger size vent when required by the manufacturer's installation instructions.

END OF SECTION 23 05 23

Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment

PART 1 – GENERAL

SCOPE

This section includes specifications for supports of all HVAC equipment and materials as well as piping system anchors

RELATED WORK

Section 23 07 00 - HVAC Insulation

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

REFERENCE STANDARDS

MSS SP-58 Materials, Design, Manufacture, Selection, Application, and Installation

QUALITY ASSURANCE

Refer to Division 1, General Conditions, Equals and Substitutions.

DESCRIPTION

Provide all supporting devices as required for the installation of mechanical equipment and materials. All supports and installation procedures are to conform to the latest requirements of the ANSI Code for pressure piping.

Do not hang any mechanical item directly from a metal deck or run piping so it rests on the bottom chord of any truss or joist.

Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

Protect insulation at all hanger points; see Related Work above.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Schedule of all hanger and support devices indicating shields, attachment methods, and type of device for each pipe size and type of service. Reference section 23 05 00.

DESIGN CRITERIA

Materials and application of pipe hangers and supports shall be according to MSS Standard Practice SP-58 unless noted otherwise.

Piping connected to base mounted pumps, compressors, or other rotating or reciprocating equipment is to have vibration isolation supports for a distance of 100 pipe diameters or 3 supports away from the equipment, whichever is greater. Standard pipe hangers/supports as specified in this section are required beyond the 100-pipe diameter/3 support distance.

Piping flexible connections and vibration isolation supports are required for piping connected to coils that are in a fan assembly where the entire assembly is mounted on vibration supports; the vibration isolation supports are required for a distance of 100 pipe diameters or 3 supports away from the equipment, whichever is greater. Piping flexible connection and vibration isolation supports are not required when the fan section is separately and independently isolated by means of vibration supports and duct flexible connections. Standard pipe hangers/supports as specified in this section are required when there are no vibration isolation devices in the piping and beyond the 100-pipe diameter/3 support distance.

Piping supported by laying on the bottom chord of joists or trusses will not be accepted.

Fasteners depending on soft lead for holding power or requiring powder actuation will not be accepted.

Allow sufficient space between adjacent pipes and ducts for insulation, valve operation, routine maintenance, etc.

PART 2- PRODUCTS

PIPE HANGER AND SUPPORT MANUFACTURERS

Anvil, B-Line, Fee and Mason, Kindorf, Michigan Hanger, Unistrut, or approved equal. Anvil figure numbers are listed below; equivalent material by other manufacturers is acceptable.

STRUCTURAL SUPPORTS

Provide all supporting steel required for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels, beams, etc. to suspend or floor support tanks and equipment.

PIPE HANGERS AND SUPPORTS

HANGERS FOR STEEL PIPE SIZES 1/2" THROUGH 2":

Carbon steel, adjustable, clevis, black finish. Anvil figure 65 or 260.

HANGERS FOR STEEL PIPE SIZES 2-1/2" AND OVER:

Carbon steel, adjustable, clevis, black finish. Anvil figure 260.

Adjustable steel yoke, cast iron roll, double hanger. Anvil figure 181.

MULTIPLE OR TRAPEZE HANGERS:

Steel channels with welded spacers and hanger rods if calculations are submitted.

WALL SUPPORT:

Welded steel bracket with hanger. B-Line 3068 Series, Anvil 194 Series.

Perforated epoxy painted finish, 16-12-gauge min., steel channels securely anchored to wall structure with interlocking, split type, bolt secured, galvanized pipe/tubing clamps. B-Line type S channel with B-2000 series clamps, Anvil type AS200 H with AS 1200 clamps. When copper piping is being supported, provide flexible elastomeric/thermoplastic isolation cushion material to completely encircle the piping and avoid contact with the channel or clamp, equal to B-Line B1999 Vibra Cushion or provide manufacturers clamp and cushion assemblies, B-Line BVT series, Anvil cushion clamp assembly.

FLOOR SUPPORT FOR PIPE SIZES THROUGH 4":

Cast iron adjustable pipe saddle, locknut nipple, floor flange, and concrete pier or steel support.

COPPER PIPE SUPPORT:

Carbon steel ring, adjustable, copper plated, or polyvinylchloride coated.

INSULATION PROTECTION SHIELDS:

Galvanized carbon steel of not less than 18 gauge for use on insulated pipe 2-1/2 inch and larger. Minimum shield length is 12 inches. Equal to Anvil figure 167.

STEEL HANGER RODS:

Threaded both ends, threaded one end, or continuous threaded, black finish.

Size rods for individual hangers and trapeze support as indicated in the following schedule.

Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.) (650°F Maximum Temp.)	Rod Diameter (inches)
610	3/8
1130	1/2
1810	5/8
2710	3/4
3770	7/8
4960	1
8000	1-1/4

Provide rods complete with adjusting and lock nuts.

WOOD STRUCTURE SUPPORTS

Carbon steel pipe short strap for piping ½" through 2". Fastened with two No. 24 x 2 (minimum size) wood screws. Anvil Figure 262.

Carbon steel coach screw rods machine threaded on opposite ends, minimum 3/8" diameter. Anvil Figure 142.

Carbon steel side beam bracket with minimum 3/8" rod size and fastened with minimum ½" x 3" lag screws. Anvil Figure 207

BEAM CLAMPS

MSS SP-58 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of 3/8, 1/2-, and 5/8-inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Anvil figure 86.

MSS SP-58 Type 28 or Type 29 forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1-1/2-inch diameter but limited in application to pipe sizes 8 inch and less without prior approval. Anvil figure 228.

CONCRETE INSERTS

Carbon steel expansion anchors, vibration resistant, with ASTM B633 zinc plating. Use drill bit of same manufacturer as anchor. Hilti, Rawl, Redhead.

ANCHORS

Use welding steel shapes, plates, and bars to secure piping to the structure.

PIPE PENETRATIONS THROUGH ROOF

Multiple Pipe Penetrations:

Refer to acceptable Equipment Curb types listed above for curb specifications. An 8" high (minimum) curb height is required. The coping cap shall be constructed from laminated acrylic clad thermoplastic (ABS) with graduated step boots to accommodate various size pipes, stainless steel fastening screws for cover, stainless steel band clamps for securing boots around the pipe, and stainless-steel band clamp or mechanical locking seal for securing boots around the ABS coping cap flanges.

Single Pipe Penetrations:

A stack flashing penetration may be utilized for single pipe penetrations through built up roofs and single ply membrane roofs. Utilize high temperature sealant for all high temperature applications. This includes but is not limited to steam condensate vent piping, steam safety relief piping, and flues.

A single pre-manufactured boot may be utilized for single pipe penetrations through single ply membrane roofs only.

PART 3 - EXECUTION

INSTALLATION

Install supports to provide for free expansion of the piping and duct system. Support all piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

Piping shall be supported independently from ductwork and all other trades.

Where piping can be conveniently grouped to allow the use of trapeze type supports, use standard structural shapes for the supporting steel.

Perform all welding according to standards of the American Welding Society. Clean surfaces of loose scale, rust, paint or other foreign matter and properly align before welding. Use wire brush on welds after welding. Welds shall show uniform section, smoothness of weld metal and freedom from porosity and clinkers. Where necessary to achieve smooth connections, joints shall be dressed smooth.

HANGER AND SUPPORT SPACING

Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

Support riser piping independently of connected horizontal piping.

Adjust hangers to obtain the slope specified in the piping section of this specification.

Space hangers for pipe as follows:

Pipe Material	Pipe Size	Max. Spacing
Steel	1/2" through 1-1/4"	6'-6"
Steel	1-1/2" through 6"	10'-0"
Steel	8" through 12"	14'-0"
Steel	14" and over	20'-0"
Thermoplastic	All sizes	6'-0"
Copper	1/2" through 1-1/4"	5'-0"
Copper	1-1/2" and larger	8'-0"

ANCHORS

Install where indicated on the drawings and details. Where not specifically indicated, install anchors at ends of principal pipe runs and at intermediate points in pipe runs between expansion loops. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

EQUIPMENT CURBS

Secure bottom of support flat on roof deck. Secure equipment to curb according to equipment manufacturer's instructions. Flashing and counter flashing by the General Contractor.

Fill the entire void space with compressible fiberglass insulation.

PIPE PENETRATION THROUGH ROOF

Install at points where pipes penetrate roof. Install as shown on the drawings, as detailed and according to the manufacturer's installation instructions. Flashing and counterflashing by the General Contractor.

END OF SECTION 23 05 29

Section 23 05 93 – Testing, Adjusting, and Balancing for HVAC

PART 1 – GENERAL

SCOPE

This section includes air and water testing, adjusting and balancing for the entire project.

RELATED WORK

Section 23 05 00 Common Work Results for HVAC

Section 23 07 00 HVAC Insulation

Section 23 09 23 Direct Digital Control System for HVAC

REFERENCE

Applicable provisions of the General Conditions, Supplementary General Conditions and General Requirements in Division 1 govern work under this section.

REFERENCE STANDARDS

AABC	National Standards for Total System Balance, Sixth Edition, 2002.
ASHRAE	ASHRAE Handbook, 2007 HVAC Applications, Chapter 37, Testing Adjusting and Balancing.
NEBB	Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Seventh Edition, 2005.
TABB	Tab Procedural Guide, First Edition, 2003.

DESCRIPTION

The contractor will separately contract with an independent test and balance agency to perform all testing, adjusting, and balancing of air and hydronic systems required for this project. Work related to the testing, adjusting, and balancing that must be performed by the installing mechanical contractor is specified in other section of these specifications.

Provide total mechanical systems testing, adjusting and balancing. Requirements include the balance of air and water distribution, adjustment of new and existing systems and equipment to provide design requirements indicated on the drawings, electrical measurement and verification of performance of all mechanical equipment, all according to standards published by AABC, NEBB, or TABB.

Test, adjust and balance all air and hydronic systems so that each room, piece of equipment or terminal device meets the design requirements indicated on the drawings and in the specifications.

Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and according to the completion schedule established for this project.

Verify that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

QUALITY ASSURANCE

QUALIFICATIONS

An independent Firm specializing in the Testing and Balancing of HVAC systems for a minimum of three years. A Firm not engaged in the commerce of furnishing or providing equipment or material generally related to HVAC work other than that specifically related to installing Testing and Balancing components necessary for work in this section such as, but not limited to sheaves, pulleys, and balancing dampers.

A certified member of AABC or certified by NEBB or TABB in the specific area of work performed. Maintain certification for the entire duration of the project.

Technicians on this project must have satisfactorily completed work on a minimum of three projects of at least 50% in size, and of similar complexity. Size is defined as the quantity of each specific individual item requiring testing and balancing such as, but not limited to, equipment, devices, terminal devices, and grilles and diffusers.

PRE-INSTALLATION MEETING AND SCHEDULING

The test and balance agency is required to attend a pre-installation meeting with all other project contractors before the construction process is started. The test and balance agency shall give the Lead Contractor a detailed schedule of testing and balancing tasks for incorporation into the project schedule. Reference General Conditions Article 12 for Lead Contractor responsibilities for scheduling.

PRE-BALANCE CONFERENCE

90 days prior to beginning testing, adjusting and balancing, schedule and conduct a conference with the architect/engineer, project representative and the mechanical system and temperature control system installing contractors. Provide AE with a complete copy of the TAB plan for the project. The objective is final coordination and verification of system operation and readiness for testing, adjusting and balancing procedures and scheduling procedures with the above-mentioned parties. Indicate work required to be completed prior to testing, adjusting, and balancing and identify the party responsible for completion of that work.

SUBMITTALS

See also Related Work in this section.

Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB, AABC or TABB Certified Test and Balance Supervisor. The reports certify that the systems have been tested, adjusted and balanced according to the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

SUBMISSION:

Distribute electronic copies of the Report to the contractor and the Project Coordinator

Format: Cover page identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions:

- General Information
- Summary
- Air Systems
- Hydronic Systems
- Special Systems

Contents: Provide the following minimum information, forms and data:

General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.

summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.

The remainder of the report to contain the appropriate standard NEBB, AABC, or TABB forms for each respective item and system. Fill out forms completely. Where information cannot be obtained or is not applicable indicate same.

PART 2 - PRODUCTS

INSTRUMENTATION

Provide all required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements to be according to the requirements of NEBB, AABC, or TABB Standards and instrument manufacturer's specifications.

All instruments used for measurements shall be accurate, and calibration histories for each instrument to be available for examination by DD upon request. Calibration and maintenance of all instruments to be according to the requirements of NEBB, AABC, or TABB Standards.

PART 3 - EXECUTION

PRELIMINARY PROCEDURES

Review preconstruction meeting report, applicable construction bulletins, applicable change orders and approved shop drawings of equipment, outlets/inlets and temperature controls.

Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation and hydronic systems for proper charge and purging of air.

Notify Project Representative on a daily basis during balancing. Identify deficiencies preventing completion of testing, adjusting and balancing procedures. Do not proceed until systems are fully operational with all components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

PERFORMING TESTING, ADJUSTING AND BALANCING

Perform testing, adjusting and balancing procedures on each system identified, according to the detailed procedures outlined in the referenced standards except as may be modified below.

Unless specifically instructed in writing, all work in this specification section is to be performed during the normal workday.

In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete and provide new tile for any tile that are damaged by this procedure. If the ceiling construction is such that access panels are required for the work of this section and the panels have not been provided, inform the owner's project representative.

Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

In air systems employing filters, blank off sufficient filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

Measure and record system measurements at the fan and/or pump to determine total flow. Adjust equipment as required to yield specified total flow at terminals. Proceed taking measurements in mains and branches as required for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

Measure and record static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units.

Adjust outside air, return air and relief air dampers for design conditions at both the minimum and maximum settings and record both sets of data. Balance modulating dampers at extreme conditions and record both sets of data. Balance variable air volume systems at maximum air flow rate, full cooling, and minimum flow rate, full heating; record all data.

Adjust register, grille and diffuser vanes and accessories to achieve proper air distribution patterns and uniform space temperatures free from objectionable noise and drafts within the capabilities of the installed system.

Provide fan and motor drive sheave adjustments necessary to obtain design performance. Provide drive changes specifically noted on drawings, if any. If work of this section indicates that any drive or motor is inadequate for the application, advise the owner's project representative by giving the representative properly sized motor/drive information (according to manufacturer’s original service factor and installed motor horsepower requirements). Confirm any change will keep the duct/piping system within its design limitations with respect to speed of the device and pressure classification of the distribution system. Required motor/drive changes not specifically noted on drawings or in specifications will be considered an extra cost and will require an itemized cost breakdown submitted to owner's project representative. Prior authorization is needed before this work is started.

Areas or rooms designed to maintain positive, negative or balanced air pressures with respect to adjacent spaces, as indicated by the design air quantities, require special attention. Adjust fan drives, distribution dampers, terminals and controls to maintain indicated pressure relationship.

Final air system measurements to be within the following range of specified cfm:

Fans	0% to +10%

Supply grilles, registers, diffusers	0% to +10%
Return/exhaust grilles, registers	0% to -10%
Room pressurization air	-5% to +5%

Final water system measurements must be within the following range of specified gpm:

Heating flow rates	0% to -10%
Cooling flow rates	-5% to +5%

Contact the temperature control contractor for assistance in operation and adjustment of controls during testing, adjusting and balancing procedures. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

Permanently mark equipment settings, including damper and valve positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

Coordinate and assist CxP with all verification activities defined within section (01 91 01, 02) including providing all required sampling date necessary for the commissioning process.

Verify and record, in the T&B Report, “K” factors for all VAV air terminal devices and air flow stations.

Coordinate air handling unit minimum outside air set points with the Temperature Control Contractor.

HYDRONIC SYSTEM DIFFERENTIAL PRESSURE CONTROL SET POINT

For hydronic systems with variable speed pumping, determine the minimum required system differential pressure set point needed to ensure that all terminal devices are operating at their design water flows with the most demanding terminals device control valve wide open. Provide the differential control setting set point to the DDC temperature control contractor and record them in the T&B report for each system.

DEFICIENCIES

Division 23 00 00 contractor to correct any installation deficiencies found by the test and balance agency that were specified and/or shown on the Contract Documents to be performed as part of that division of work. Test and balance agency will notify the Project Representative of these items and instructions will be issued to the Division 23 00 00 contractor for correction of the deficient work. All corrective work to be done at no cost to the State of Wisconsin. Retest mechanical systems, equipment, and devices once corrective work is complete as specified.

END OF SECTION 23 05 93

Section 23 07 00 –HVAC Insulation

PART 1 – GENERAL

SCOPE

This section includes insulation specifications for heating, ventilating and air conditioning piping, ductwork and equipment.

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC

Section 23 21 13 - Hydronic Piping
Section 23 83 16 - Radiant-Heating Hydronic Piping

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

Section 23 31 00 - HVAC Ducts and Casings

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM C165	Test Method for Compressive Properties of Thermal Insulations
ASTM C177	Heat Flux and Thermal Transmission Properties
ASTM C302	Density of Preformed Pipe Insulation
ASTM C355	Test Methods for Test for Water Vapor Transmission of Thick Materials
ASTM C534	Preformed Flexible Elastomeric Thermal Insulation
ASTM C921	Properties of Jacketing Materials for Thermal Insulation
ASTM C1136	Flexible Low Permeance Vapor Retarders for Thermal Insulation
ASTM D1000	Methods for Pressure-Sensitive Adhesive-Coated Tapes Used for Electrical and Electronic Applications
ASTM D2240	Standard Test Method for Rubber Property—Durometer Hardness
ASTM E84	Surface Burning Characteristics of Building Materials
ASTM E814	Standard Test Method for Fire Tests of Penetration Firestop Systems
ASTM E2336	Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems
MICA	National Commercial & Industrial Insulation Standards
NFPA 225	Surface Burning Characteristics of Building Materials
UL 723	Surface Burning Characteristics of Building Materials

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

Label all insulating products delivered to the construction site with the manufacturer's name and description of materials.

Insulation systems shall be applied by experienced contractors. Within the past five years, the contractor shall be able to document the successful completion of a minimum of three projects of at least 50% of the size and similar scope of the work specified in this section.

DESCRIPTION

Furnish and install all insulating materials and accessories as specified or as required for a complete installation. The following types of insulation are specified in this section:

- Pipe Insulation
- Duct Insulation
- Equipment Insulation

Install all insulation according to the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the Project Representative.

DEFINITIONS

Concealed: shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit a schedule of all insulating materials to be used on the project, including adhesives, fastening methods, fitting materials along with material safety data sheets and intended use of each material. Include manufacturer's technical data sheets indicating density, thermal characteristics, jacket type, and manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

ENVIRONMENTAL REQUIREMENTS

Do not store insulation materials on grade or where they are at risk of becoming wet. Do not install insulation products that have been exposed to water.

Protect installed insulation work with plastic sheeting to prevent water damage.

PART 2 - PRODUCTS

MATERIALS

Manufacturers: Armacell, Certainteed, Manson, Childers, Dow, Extol, Fibrex, Halstead, H.B. Fuller, Imcoa, Johns Manville, Knauf, Owens-Corning, Partek, Pittsburgh Corning, Rubatex, VentureTape or approved equal.

Materials or accessories containing asbestos will not be accepted.

Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less, with the following exceptions:

- Pipe insulation which is not located in an air plenum may have a flame spread rating not over 25 and a smoke developed rating no higher than 450 when tested according to UL 723 and ASTM E84.

INSULATION TYPES

Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be suitable to receive jackets, adhesives and coatings as indicated.

FLEXIBLE FIBERGLASS INSULATION:

Minimum nominal density of 0.75 lbs. per cu. ft., and thermal conductivity of not more than 0.3 at 75 degrees F, rated for service to 250 degrees F.

RIGID FIBERGLASS INSULATION:

Minimum nominal density of 3 lbs. per cu. ft., and thermal conductivity of not more than 0.23 at 75 degrees F, minimum compressive strength of 25 PSF at 10% deformation, rated for service to 450 degrees F.

SEMI-RIGID FIBERGLASS INSULATION:

Minimum nominal density of 3 lbs. per cu. ft., thermal conductivity of not more than 0.28 at 75 degrees F, minimum compressive strength of 125 PSF at 10% deformation, rated for service to 450 degrees F. Insulation fibers perpendicular to jacket and scored for wrapping cylindrical surfaces.

ELASTOMERIC INSULATION:

Flexible closed cell, minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75 degrees F, minimum compressive strength of 4.5 psi at 25% deformation, maximum water vapor permeability of 0.17 perm inch, maximum water absorption of 6% by weight, rated for service range of -20 degrees F to 220 degrees F on piping and 180 degrees F. where adhered to equipment.

JACKETS

PVC FITTING COVERS AND JACKETS (PFJ):

White PVC film, gloss finish one side, semi-gloss other side, FS LP-535D, Composition A, Type II, Grade GU. Ultraviolet inhibited indoor/outdoor grade to be used where exposed to high humidity, ultraviolet radiation, in kitchens or food processing areas or installed outdoors. Jacket thickness to be minimum .02” indoors/.03”outdoors for piping 12” and smaller, .03” indoors/.04” outdoors for piping 15” and larger.

ALL SERVICE JACKETS (ASJ):

Heavy duty, fire retardant material with white kraft reinforced foil vapor barrier, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of .02 perms and minimum beach puncture resistance of 50 units.

FOIL SCRIM ALL SERVICE JACKETS (FSJ):

Glass fiber reinforced foil kraft laminate, factory applied to insulation. Maximum permeance of .02 perms and minimum beach puncture resistance of 25 units.

PROTECTIVE METAL JACKETS (PMJ):

.016 inch thick aluminum or .010 inch thick stainless steel with safety edge.

SELF-ADHERING JACKETS (SAJ):

5-ply, self-adhering multiple laminated waterproofing material with reflective aluminum foil, high density polymer films and cold weather acrylic adhesive providing zero (0.0) permeability. Minimum 6 mils material thickness, 35lb puncture resistance when tested according to ASTM D1000 and flame spread/smoke developed rating of 10/20 when tested according to UL 723.

Vapor retarding tape shall be specifically designed and manufactured for use with the self-adhering jacket specified above. Tape shall be provided by the same manufacturer that provides jacketing. Vapor retarding tapes used with self-adhering jackets shall have a maximum permeance of 0.0 perms.

FABRIC REINFORCED MASTIC JACKETS (FMJ):

Glass fiber reinforcing fabric imbedded in weather barrier mastic as per manufacturer’s recommended procedure for two coat application.

VAPOR RETARDING JACKETS (VRJ):

Polyvinylidene chloride (PVDC) vapor retarding jacket material with minimum 6 mils material thickness and maximum permeance of 0.01 perms. Material shall not support the growth of mold or mildew. Dow Saran or equivalent.

Vapor retarding tape shall be specifically designed and manufactured for use with the vapor retarding jacket specified above. Tape shall be provided by the same manufacturer that provides jacketing. Vapor retarding tapes used with vapor retarding jackets shall have a maximum permeance of 0.01 perms.

INSULATION INSERTS AND PIPE SHIELDS

Manufacturers: B-Line, Pipe Shields, Value Engineered Products

Construct inserts with calcium silicate or polyisocyanurate (service temperatures below 300 degrees F. only), minimum 140 psi compressive strength. Piping 12” and larger, supplement with high density 600 psi structural calcium silicate insert. Provide galvanized steel shield. Insert and shield to be minimum 180 degree coverage on bottom supported piping and full 360 degree coverage on clamped piping. On roller mounted piping and piping designed to slide on support, provide additional load distribution steel plate.

Where contractor proposes shop/site fabricated inserts and shields, submit schedule of materials, thicknesses, gauges and lengths for each pipe size to demonstrate equivalency to pre-engineered/premanufactured product described above. On low temperature systems, high density rigid polyisocyanurate may be substituted for calcium silicate provided insert and shield length and shield gauge are increased to compensate for lower insulation compressive strength.

Precompressed 20# density molded fiberglass blocks, Hamfab or equal, of the same thickness as adjacent insulation may be substituted for calcium silicate inserts with one 1”x6” block for piping through 2-1/2” and three 1”x6” blocks for piping through 4”. Submit shield schedule to demonstrate equivalency to pre-engineered/premanufactured product described above.

Wood blocks will not be accepted.

Expansion Joint and Valve Insulation Blankets

Manufacturers: Advance Thermal Corporation, TANI Division B.D. Schiffler or approved equal.

Jacket shall be 7 ounce per square yard Teflon coated Nomex fabric which is designed for wet and dry steam applications to 550ºF. Equal to Advance Thermal Corp. Steamguard-1 cloth. The covers shall be installed to shed water and have a 1-inch rain flap.

All seams shall be sewn twice with double locked stitching. One seam shall be sewn with 3-ply Nomex and the other with 3-ply stainless steel. Hog rings and staples shall not be used.

The insulation shall be a 2-inch thick, 6 lb. density ceramic fiber which is held in place with 12-gauge stainless quilt pins which do not puncture the inner surface of the cover.

Covers shall be designed to allow access to the expansion and ball joints packing cylinder plungers for repacking with removing the covers.

Adjacent pipe insulation must be installed to allow the piping to expand into expansion joints without damaging the insulation or removable covers.

ACCESSORIES

All products shall be compatible with surfaces and materials on which they are applied and be suitable for use at operating temperatures of the systems to which they are applied.

Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

Insulation bands to be 3/4 inch wide, constructed of aluminum or stainless steel. Minimum thickness to be .015 inch for aluminum and .010 inch for stainless steel.

Tack fasteners to be stainless steel ring grooved shank tacks.

Staples to be clinch style.

Insulating cement to be ANSI/ASTM C195, hydraulic setting mineral wool.

Finishing cement to be ASTM C449.

Fibrous glass or canvas fabric reinforcing shall have a minimum untreated weight of 6 oz./sq. yd.

Bedding compounds to be non-shrinking and permanently flexible.

Vapor barrier coatings to have maximum applied water vapor permeance of .05 perms.

Fungicidal water base coating (Foster 40-20 or equal) to be compatible with vapor barrier coating.

PART 3 – EXECUTION

EXAMINATION

Verify that all piping, equipment, and ductwork are tested and approved prior to installing insulation. Do not insulate systems until testing and inspection procedures are completed.

Verify that all surfaces are clean, dry and without foreign material before applying insulation materials.

INSTALLATION

All materials shall be installed by skilled labor regularly engaged in this type of work. All materials shall be installed in strict accordance with manufacturer's recommendations, building codes, and industry standards. Do not install products when the ambient temperature or conditions are not consistent with the manufacturer's recommendations. Surfaces to be insulated must be clean and dry.

Locate insulation and cover seams in the least visible location. All surface finishes shall be extended in such a manner as to protect all raw edges, ends and surfaces of insulation.

Install insulation with smooth and even surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled and coated terminations at all nameplates, uninsulated fittings, or at other locations where insulation terminates.

Install fabric reinforcing without wrinkles. Overlap seams a minimum of 2 inches.

Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation or pieces cut undersize and stretched to fit will not be accepted.

All pipe and duct insulation shall be continuous through walls, ceiling or floor openings and through sleeves except where firestop or firesafing materials are required. Vapor barriers shall be maintained continuous through all penetrations.

Provide a continuous unbroken moisture vapor barrier on insulation applied to systems noted below. Attachments to cold surfaces shall be insulated and vapor sealed to prevent condensation.

Provide a complete vapor barrier for insulation on the following systems:

- Cold Water Make-Up
- Chilled Water
- Refrigerant
- Glycol/Brine
- Insulated Duct
- Equipment, ductwork or piping with a surface temperature below 65 degrees F

PROTECTIVE JACKET INSTALLATION

SELF-ADHERING JACKETS (SAJ):

Install according to manufacturer's recommendations. Cut allowing minimum 4" overlap on ends and 6" on longitudinal joints. Align parallel to surface. Remove release paper and press flat to surface to avoid wrinkles. Rub entire surface for full adhesion and sealing at joint overlaps. On exterior applications, provide a bead of compatible caulk along exposed edges.

Piping with self-adhering (SAJ) jackets shall have elbows, fittings, valves and butt joints wrapped with two layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the self-adhering (SAJ) jacket may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.

VAPOR RETARDING JACKETS (VRJ):

Piping with vapor retarding (VRJ) jackets shall have elbows, fittings, valves and butt joints wrapped with two layers of vapor retarding tape. Piping with a PVC jacket (PFJ) installed over the vapor retarding (VRJ) jackets may be provided with a single, lapped layer of vapor retarding tape for elbows, fittings and valves under the PVC jacket. Vapor retarding tape shall be compatible with the jacket material used.

PVC FITTING COVERS AND JACKETS (PFJ):

Lap seams and joints a minimum of 2 inches and continuously seal PVC with welding solvent recommended by jacket manufacturer. Lap slip joint ends 4" without fasteners where required to absorb expansion and contraction. For sections where vapor barrier is not required and jacket requires routine removal, tack fasteners may be used. Secure PVC fitting covers with tack fasteners. For systems requiring a vapor barrier, apply a 1-1/2" band of mastic over ends, throat, seams and penetrations.

Protective METAL JACKET (PMJ):

Lap seams a minimum of 2 inches. Secure with metal bands for end-to-end joints, and rivets or sheet metal screws for longitudinal joints. Rivets, screws, and bands to be constructed of the same material as the jacket. Locate seams on bottom for exterior applications.

FABRIC REINFORCED MASTIC JACKETS (FMJ):

Glass fiber fabric shall be fitted without wrinkles. Glass fiber fabric shall be sized immediately upon application with lagging adhesive and shall be capable of drying within 6 hrs. Apply adhesive and coating according to manufacturer's recommendations. All seams shall overlap not less than 2".

PIPING, VALVE, AND FITTING INSULATION

General:

Install insulation with butt joints and longitudinal seams closed tightly. Provide minimum 2" lap on jacket seams and 2" tape on butt joints, firmly cemented with lap adhesive unless otherwise noted. Additionally, secure with staples along seams and butt joints. Coat staples, longitudinal and transverse seams with vapor barrier mastic on systems requiring vapor barrier.

Install insulation continuous through pipe hangers and supports with hangers and supports on the exterior of insulation. Where a vapor barrier is not required or where roller hangers are not being used, hangers and supports may be attached directly to piping with insulation completely covering hanger or support and

jacket sealed at support rod penetration. Where riser clamps are required to be attached directly to piping requiring vapor barrier, extend insulation and vapor barrier jacketing/coating around riser clamp.

Where insulated piping is installed on hangers and supports, the insulation shall be installed continuous through the hangers and supports. High density inserts shall be provided as required to prevent the weight of the piping from crushing the insulation. Pipe shields are required at all support locations. The insulation shall not be notched or cut to accommodate the supporting channels.

Fully insulate all reheat coil piping, fittings and valves (with the exception of unions) up to coil connection to prevent condensation when coil is inactive during cooling season. Provide a vapor proof seal between the pipe insulation and the insulated coil casing.

Insulation Inserts and Pipe Shields:

Provide pipe shields at all hanger and support locations. Rigid insulation inserts shall be installed between the pipe and the insulation shields. Quantity and placement of inserts shall be according to the manufacturer's installation instructions; however, the inserts shall be no less than 12" in length. Inserts shall be of equal thickness to the adjacent insulation and shall be vapor sealed as required for system.

Provide insulation inserts and pipe shields at all hanger and support locations. Inserts may be omitted on 3/4" and smaller copper piping provided 12" long 22-gauge pipe shields are used.

Fittings and Valves:

Fittings, valves, unions, flanges, couplings and specialties may be insulated with factory molded or built-up insulation of the same thickness as adjoining insulation. Where the ambient temperature exceeds 150 degrees F, cover insulation with fabric reinforcing and mastic. Where the ambient temperatures do not exceed 150 degrees, furnish and install PVC fitting covers.

Elastomeric:

Where practical, slip insulation on piping during pipe installation when pipe ends are open. Miter cut fittings allowing sufficient length to prevent stretching. Completely seal seams and joints for vapor tight installation. For elastomeric insulation, apply full bed of adhesive to both surfaces. For polyeolefin, seal factory preglued seams with roller and field seams and joints with full bed of hot melt polyolefin glue to both surfaces. Cover elastomeric insulation on systems operating below 40 degrees F with vapor barrier mastic.

PIPING Protective Jackets

In addition to the jackets specified in the pipe insulation schedule below the following protective jackets are required:

Provide a protective PVC (PFJ) or Fabric Reinforced Mastic (FMJ) jacket for the following insulated piping:

All piping within mechanical rooms

Provide a protective metal (PMJ) or self-adhering (SAJ) jacket for the following insulated piping:

Exterior installed refrigeration piping

Pipe Insulation Schedule:

Provide insulation on new and existing remodeled piping as indicated in the following schedule:

Service	Insulation	Jacket	Insulation Thickness by Pipe Size				
			<1"	**1"to <1-1/2"**	1 1/2"to < 4"	**4"to <8"**	8" <
Geothermal Loop (inside building)	Elast./Polyol	None	1.5"	1.5"	2"	2"	2"
Heat Pump Loop	Elast./Polyol	None	1.5"	1.5"	2"	2"	2"
Heating Hot Water	Rigid Fiberglass	ASJ	1.5"	1.5"	2"	2"	2"
Condensate Drain	Elast./Polyol	None	1.5"	1.5"	2"	2"	2"

The following piping and fittings are not to be insulated:

- Hot water piping downstream of radiant manifolds

For systems with fluid temperatures 65° F or less, furnish and install removable elastomeric insulation covers, plugs or caps for all mechanical equipment and devices that require access by balancing contractors or service and maintenance personnel. Examples include but are not limited to: flow sensing devices, circuit setters, manual ball valve air vents, drain valves, blowdown valves, pressure/temperature test plugs, grease fittings, pump bearing caps, equipment labels, etc. Covers shall be tight fitting to ensure a complete vapor barrier.

DUCT INSULATION

General:

Secure flexible duct insulation on sides and bottom of ductwork over 24" wide and all rigid duct insulation with weld pins. Space fasteners 18” on center or less as required to prevent sagging.

Secure rigid board insulation to ductwork with weld pins. Apply insulation with joints firmly butted as close as possible to the equipment surface. Pins shall be located a maximum of 3” from each edge and spaced no greater than 12” on center.

Install weld pins without damage to the interior galvanized surface of the duct. Clip pins back to washer and cover penetrations with tape of same material as jacket. Firmly butt seams and joints and cover with 4” tape of same material as jacket. Seal tape with plastic applicator and secure with staples. All joints, seams, edges and penetrations to be fully vapor sealed.

Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.

External supply duct insulation is not required where ductwork contains continuous 1” acoustical liner. Provide 4” overlap of external insulation over ends of acoustically lined sections.

Where insulated ductwork is supported by trapeze hangers, the insulation shall be installed continuous through the hangers. Drop the supporting channels required to facilitate the installation of the insulation. Where rigid board or flexible insulation is specified, install high density inserts to prevent the weight of the ductwork from crushing the insulation.

Where insulated low temperature (below 45ºF) ductwork is supported by steel metal straps or wire ropes that are secured directly to the duct, the straps or ropes shall be completely covered with insulation and sealed to provide a complete vapor barrier.

Where insulated duct risers are supported by steel channels secured directly to the duct, extend the insulation and vapor barrier jacketing to encapsulate the support channels.

Where ductwork exposed to the weather is insulated with any product other than fluid-applied ductwork insulation, the top surface of the insulation shall be sloped a minimum of ¼” per foot to eliminate ponding and create positive drainage off of insulation. Refer to fluid-applied ductwork insulation section below for slope requirements.

Duct Insulation Schedule:

Provide duct insulation on new and existing remodeled ductwork in the following schedule:

Service	Insulation Type	Jacket	Insulation Thickness
Outside air ducts	Rigid Fiberglass	FSJ	2"
Mixed air ducts	Rigid Fiberglass	FSJ	2"
Exposed supply ducts*	Rigid Fiberglass	FSJ	2"
Concealed supply ducts	Flexible Fiberglass	FSJ	1-1/2"
All Ducts located in unconditioned Attics***	Flexible Fiberglass	FSJ	3”
Exhaust and relief ducts downstream of motorized backdraft dampers	Rigid Fiberglass	FSJ	2"
Louver blank-off panels	Rigid Fiberglass	FSJ	2”

* Exposed supply branch ducts located in the space they are serving do not require insulation. Exposed supply main ducts running through spaces they serve shall be insulated as exposed supply ducts scheduled above.

*** Outside air ductwork between the isolation damper and the outside air intake does not require insulation where it is located in an unheated attic.

EQUIPMENT INSULATION

GENERAL:

Do not insulate over equipment access manholes, fittings, nameplates or ASME stamps. Bevel and seal insulation at these locations.

Semi-Rigid Fiberglass:

Apply insulation to equipment shells using weld pins, bonding adhesive, banded and wired in place. Fill all joints, seams and depressions with insulating cement to a smooth, even surface. Cover with reinforcing fabric and 2 coats of mastic (FMJ). Use vapor barrier mastic on systems requiring a vapor barrier.

Elastomeric/Polyolefin:

Apply full cover coat of adhesive to surface to be insulated, insulation and edge butt joints. Place insulation with edge joints firmly butted pressing to surface for full adhesion. Seal seams and joints vapor tight.

Equipment Insulation Schedule:

Provide equipment insulation as follows:

Equipment	Insulation	Jacket	Thickness
Buffer Tank (BT-1)	Elastomeric/Polyolefin	None	1”
Expansion Tank (TE-1)	Elastomeric/Polyolefin	None	1"
Cold water Pump Bodies	Elastomeric/Polyolefin	None	1"

END OF SECTION 23 07 00

Section 23 09 23 – Direct Digital Control System for HVAC

PART 1 – GENERAL

SCOPE

Work in this section includes Direct Digital Control (DDC) panels, main communication trunk, software programming, and other equipment and accessories necessary to constitute a complete Direct Digital Control (DDC) system.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination

Division 23 - HVAC - Equipment provided to be controlled or monitored

Division 26 - Electrical - Equipment provided to be controlled or monitored

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

FCC Part 15, Subpart J, Class A - Digital Electronic Equipment to Radio Communication Interference

QUALITY ASSURANCE

MANUFACTURER:

A firm regularly engaged in manufacture of DDC control equipment similar to the specified equipment and has been in satisfactory similar service for not less than 8 years.

INSTALLER:

A firm specializing and experienced in DDC control system installation for no less than 3 years. All engineering and commissioning work shall be done by qualified employees of this manufacturer, or qualified employees of an Authorized Representative of that manufacturer that provides engineering and commissioning of the manufacturer's control equipment. Where installing contractor is an authorized representative of the control equipment manufacturer, submit written confirmation of such authorization. Indicate in letter of authorization that the installing contractor has successfully completed all necessary training required for the engineering, installation, and commissioning of equipment and systems to be provided for the project and that such authorization has been in effect for a period of not less than three years. The letter of authorization should also indicate that the installing contractor is authorized to install the manufacturer's DDC equipment at the project location at the time the project is bid. Installation of the equipment shall be done by qualified mechanics and/or electricians in the direct employ or be directly subcontracted and under the supervision of the manufacturer or Authorized Representative. The contractor providing and installing the equipment under this specification section shall be the same contractor providing and installing equipment under the 23 09 14 specification section.

RESPONSE TIME:

During warrantee period, 4 hours or less, 24-hours/day, 7 days/week.

ELECTRICAL STANDARDS:

Provide electrical products, which have been tested, listed and labelled by Underwriters' Laboratories (UL) and comply with NEMA standards.

DDC Standards: DDC manufacturer shall provide written proof with shop drawings that the equipment being provided is in compliance with F.C.C. rules governing the control of interference caused by Digital Electronic Equipment to Radio Communications (Part 15, Subpart J, Class A).

SUBMITTALS

Include the following information: Details of construction, layout, and location of each temperature control panel within the building, including instrument's location in panel and labelling. Indicate which piece of mechanical equipment is associated with each controller and what area within the building is being served by that equipment. For terminal unit control, provide a room schedule that would list mechanical equipment tag, room number of space served, address of DDC controller, and any other pertinent information required for service.

PRODUCT DATA

Submit manufacturer's specifications for each control device furnished, including installation instructions and start-up instructions. General catalog sheets showing a series of the same device is not acceptable unless the specific model is clearly marked. Annotated software program documentation shall be submitted for system sequences, along with descriptive narratives of the sequence of operation of the entire system involved. Submit wiring diagram for each electrical control device along with other details required to demonstrate that the system has been coordinated and will function as a system.

MAINTENANCE DATA

Submit maintenance data and spare parts lists for each control device. Include this data in maintenance manual.

RECORD DRAWINGS

Prior to request for final payment provide complete composite record drawings to incorporate the DDC and Pneumatic/Electric field work. All software addressing for device communication shall be noted for all devices provided under this section and the communication addressing required for devices provided by others that are integrated into the direct digital control system provided under this section. Point to point routing of communication trunks and power wiring between DDC controllers, DDC communication devices, control panels, and Ethernet switches shall be documented. Coordinate with the supplier of the equipment specified to be interfaced through digital communications for communication addressing. Provide circuit number of 120VAC panel power circuit(s) feeding each control panel on record drawings. Label circuit number(s) inside the panel served.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

MATERIAL DELIVERY AND STORAGE

Provide factory shipping cartons for each piece of equipment and control device. This contractor is responsible for storage of equipment and materials inside and protected from the weather.

PART 2 - PRODUCTS

GENERAL

Provide DDC control products in sizes and of capacities as required, conforming to manufacturer's standard materials and components as published in their product information, designed, and constructed as recommended by the manufacturer and as required for application indicate.

System shall be capable of operating with 120 VAC power supply, fully protected with a shutdown-restart circuit, and associated hardware and software.

LOCAL CONTROL PANELS

Use control panels with suitable mounting brackets for each supply fan system. Locate panel adjacent to system served.

Fabricate panels of 14-gauge furniture grade steel or 6063-T5 extruded aluminium alloy, totally enclosed on six sides, hinged door and keyed lock, with manufacturer's standard shop painted finish and color.

Provide UL listed cabinets for use with line voltage devices.

Control panels that have devices or terminations that are fed or switch 50V or higher shall enclose the devices, terminations, and wiring so that Personal Protective Equipment (PPE) is not required to service the under 50V devices and terminations within the control panel. As an alternative, a separate panel for only the 50V and higher devices may be provided and mounted adjacent to the under 50V control panel.

Plastic control enclosures will be approved provided all conduits are bonded and grounded.

Provide control panels for all DDC Controllers, ASC's and associated function modules. All controls to be in panels except for terminal unit controllers mounted within the terminal unit equipment enclosure or VAV box controllers designed to be directly mounted on air terminals. Provide terminal unit equipment enclosures with removable cover for all terminal units located in exposed ceilings that completely enclose the DDC controller and allow for conduit terminations.

Permanently label all controls; tag all control wiring.

DIRECT DIGITAL CONTROLS

System to be capable of integrating multiple building functions, including equipment supervision and control, alarm management, energy management, and trend data collection.

DDC to consist of Supervisory Controllers, Programmable Controllers, stand-alone Application Specific Controllers (ASC's), Operators Terminals, Operator Workstations, DDC system servers, and other operator interface devices.

The system shall be modular in nature and shall permit expansion of both capacity and functionality through the addition of sensors, actuators, ASC's, and operator devices.

The failure of any single component or network connection shall not interrupt the execution of control strategies at other operational devices.

NETWORKING/COMMUNICATIONS

The design of the DDC shall be networked. The highest-level networking shall use Ethernet and the sub-level networking shall use serial communications. Inherent in the system's design shall be the ability to expand or modify the highest network either via a local area network (LAN), wide area network (WAN), or a combination of the two schemes.

The highest-level DDC communications network shall be capable of direct connection to and communication with a high-speed LAN or WAN utilizing an Ethernet connection. Communication protocol used shall be BACnet/IP.

The supervisory controller shall directly oversee a local network such that communications may be executed directly to and between programmable controllers and ASC's. All operator devices, either network resident or connected via dial-up modems, shall have the ability to access all points and application reports on the network.

Provide serial communication ports on all ASC's for operator's terminal communications with the DDC Controller.

Access to system data shall not be restricted by the hardware configuration of the DDC system.

Global data sharing or global point broadcasting shall allow point data to be shared between programmable controllers and ASC's when it would be impractical to locate multiple sensors.

Network design shall include the following provisions:

- Data transfer rates for alarm reporting and quick point status from multiple programmable controllers and ASC's. The minimum baud rate shall be 9600 baud.
- Support of any combination of programmable controllers and ASC's. A minimum of 32 programmable controllers and ASC's shall be supported on a single local network. The buss shall be addressable for up to 32 ASC's.
- Detection of single or multiple failures of ASC's or the network media.
- Error detection, correction, and re-transmission to guarantee data integrity.
- Use commonly available, multiple-sourced, networking components.
- Use of an industry standard communication transport, such as, ARCNET, Ethernet, and IEEE RS-485 communications interface.

Provide a temporary Ethernet network for communications between supervisory controllers and operator workstation until the building IT network is available for use by the DDC system. The temporary Ethernet network and all other communications required for the DDC system shall be installed as required for specified operation of mechanical equipment so check out and commissioning of the equipment can occur in a timely manner.

BACNET REQUIREMENTS

BACnet of highest-level network communications will utilize BACnet/IP over Ethernet and field level communications shall utilize BACnet MSTP. No other communication protocol is acceptable.

All controllers shall provide a Protocol Implementation Conformance Statement (PICS) and BACnet Interoperability Building Blocks (BIBB”S) as required by the American National Standards Institute/American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ANSI/ASHRAE) Standard 135-2001, BACnet protocol.

In general, all devices shall support the following:

Segmentation Capability

Segmentation requests supported

Segmentation responses supported

Standard Object Types Supported

- Analog input
- Analog output
- Analog value
- Binary input
- Binary output
- Binary value
- Calendar
- Device
- Event enrollment
- Group
- Multistate input
- Multistate output
- Multistate value
- Notification class
- Schedule

Character Sets supported

- ANSI X3.4
- ISO 10646 Universal Character Set-2

All highest level networked supervisory devices shall support the following:

Data Link Layer Option

- BACnet Internet Protocol (IP) (Annex J)

Networking Options: BACnet/IP Broadcast Management Device (BBDM)

SUPERVISORY CONTROLLERS

Supervisory controllers shall be microprocessor-based, multi-tasking, multi-user and digital control processors.

Each supervisory controller shall have sufficient memory to support its own operating system and databases including:

- Control processes
- Energy management application
- Alarm management
- Trend data
- Maintenance support applications

- Operator I/O
- Dial-up communications
- Manual override monitoring

The system shall be modular in nature and shall permit easy expansion through the addition of field controllers, sensors, and actuators.

Supervisory controllers shall provide at least two RS-232C or USB serial communication ports or Ethernet ports for simultaneous operation of multiple operator I/O devices, such as laptop computers, personal computers, and video display terminals.

Supervisory controllers shall monitor the status of all overrides and include this information in the logs and summaries to inform the operator that automatic control has been inhibited.

Each supervisory controller shall continuously perform self-diagnostics, communications diagnostics, and diagnostics of all subsidiary equipment. Supervisory controllers shall provide both local and remote annunciation of any detected component failures, or repeated failure to establish communication. Indication of the diagnostic results shall be provided at each supervisory controller.

Isolation shall provide at all network terminations, as well as all field point terminations, to suppress induced voltage transients consistent with IEEE Standard 587-1980. Isolation levels shall be sufficiently high to allow all signal wiring to be run in the same conduit as high voltage wiring acceptable by electrical code.

In the event of the loss of normal power, there shall be an orderly shutdown of the supervisory controller to prevent the loss of data base or operating system software. Non-volatile memory shall be incorporated for all critical controller configuration data, and battery backup shall be provided to support the real-time clock and all volatile memory for a minimum of 72 hours.

Upon restoration of normal power, the supervisory controller shall automatically resume full operation without manual intervention.

Should supervisory controller memory be lost for any reason, the supervisory controller shall have the capability of reloading it’s programming via high-speed local area network from the control system archive workstation or server, the local RS-232C port, or telephone line dial-in.

SYSTEM SOFTWARE FEATURES

All necessary software to form a complete operating system, as described in this specification, shall be provided as an integral part of the supervisory controller, and shall not be dependent upon higher level computer for execution.

Control software shall include a provision for limiting the number of times that each piece of equipment may be cycled within any one-hour period.

The system shall provide protection against excessive demand situations during start-up periods by automatically introducing time delays between successive start commands to heavy electrical loads.

Supervisory controllers shall have the ability to perform any or all of the following energy management routines:

- Time of day scheduling
- Calendar based scheduling
- Holiday scheduling
- Optimal start
- Optimal stop
- Demand limiting
- Load rolling
- Heating/cooling interlock

All programs to be executed automatically without the need for operator intervention and be flexible enough to allow user customization. Programs shall be applied to building equipment described in Section 23 09 93 of this specification.

Supervisory controllers shall be able to execute configured processes defined by the user to automatically perform calculations and control routines.

It

shall be possible to use any of the following in a configured process:

- Any system-measured point data or status
- Any calculated data
- Any results from other processes
- Boolean logic operators (and, or)

Configured processes may be triggered based on any combination of the following:

- Time of day
- Calendar date
- Other processes
- Events (e.g., point alarms)

A single process shall be able to incorporate measured or calculated data from any and all other ASC's.

A single process shall be able to issue commands to points in any and all other programmable controllers and ASC's on the local network.

Alarm management shall be provided to monitor, buffer, and direct alarm reports to operator devices and memory files. Each supervisory controller shall perform distributed; independent alarm analysis and filtering to minimize network traffic and prevent alarms from being lost. At no time shall the ability of supervisory controllers to report alarms be affected by either operator activity at the local I/O device or communications with other ASC's on the network.

All alarm or point change reports shall include the English language description of each point and the time and date of the occurrence.

The user shall be able to define the specific system reaction for each point. Alarms shall be prioritized to minimize nuisance reporting and to speed operator response to critical alarms. A minimum of three priority levels shall be provided. Users shall have the ability to manually inhibit alarm reporting for each point.

The user shall also be able to define conditions under which point changes need to be acknowledged by an operator and/or logged for analysis at a later date.

Alarms reports and messages shall be directed to an operator device.

In addition to the point's descriptor and the time and date, the user shall be able to print, display or store a 60-character alarm message to more fully describe the alarm condition or direct operator response.

Each supervisory controller shall be capable of storing a library of at least 100 messages. Each message may be assignable to any number of points in the panel.

A data collection utility shall be provided to automatically sample, store, and display system data.

Measured and calculated analog and binary data shall be assignable to user definable trends for the purpose of collecting operator specified performance data over extended periods of time. Sample intervals of 1 minute to 24 hours, in one minute or one-hour intervals, shall be provided. Each supervisory controller shall have a dedicated buffer for trend data and shall be capable of storing 16 trend logs. Each trend log shall have up to four points trended at 48 data samples each. Data shall be stored at the supervisory controller and up-loaded to the DDC system server when archiving is desired.

Supervisory controllers shall automatically accumulate and store runtime hours for binary input and output points specified in Section 23 09 14 of this specification.

Supervisory controllers shall automatically sample, calculate and store consumption totals on a daily, weekly, or monthly basis, user defined, for user-selected analog and binary pulse input type points.

Totalization shall provide calculation and storage accumulations of up to 9,999,999 units (e.g., KWH, gallons KBTU, tons, etc.).

The totalization routine shall have a sampling resolution of one minute.

The user shall have the ability to define a warning limit. Unique, user specified messages shall be generated when the limit is reached.

The information available from pulse totalization shall include, but not be limited to, the following:

- Peak demand, with date and time stamp
- 24-hour demand log
- Accumulated KWH for day
- Sunday through Saturday KWH usage
- Demand KW annual history for past 12 periods
- KWH annual history for past periods

Supervisory controllers shall have the ability to count events, such as the number of times a pump or fan system is cycled on and off.

The event totalization feature shall be able to store the records associated with a minimum of 9,999,999 events before reset.

PROGRAMMABLE CONTROLLERS

Programmable controllers shall be provided with a software program that shall allow the user to design flexible software algorithms for the control sequences as described in Sections 23 09 14 and 23 09 93 portions of this specification.

Programmable controllers shall support all necessary point inputs and outputs to perform the specified control sequence in a totally stand-alone fashion.

Each programmable controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.

Each programmable controller shall support the use of a locally mounted status and adjust panel interface to allow for the local adjustment of all setpoints, temporary override of any input or output points and status of all points directly at the controller. The capabilities of the locally mounted status and adjust panel shall include, but not be limited to, the following information for the programmable controllers to which:

- Display temperatures
- Display status
- Display setpoints
- Display control parameters
- Override binary output control
- Override analog output control
- Override analog setpoints
- Modification of gain and offset constants

All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the programmable controller.

Programmable controllers shall support, but not be limited to, the following configurations of systems to address current requirements as described in Sections 23 09 14 and 23 09 93 portions of this specification, and for future expansion of air handling units:

- Mixed air handling units
- 100 percent outside air handling units
- Boiler or chiller plants with pump logic
- Hot water heat exchangers
- Cooling towers

- Zone pressurization of labs
- Smoke control systems
- Generic system interlocking through hardware

APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

Each supervisory controller shall be able to extend its monitoring and control through the use of stand-alone application specific controllers (ASC's).

Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor based, multi-tasking, real-time digital control processor.

Each ASC shall have sufficient memory to support its own operating system and databases including:

- Control Processes
- Energy Management Applications
- Operator I/O (Portable Service Terminal)

The operator interface to any ASC point or program shall be through the supervisory controller connection to any ASC on the network.

ASC's shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following information for the:

- Display temperatures
- Display status
- Display setpoints
- Display control parameters
- Override binary output control
- Override analog output control
- Override analog setpoints
- Modification of gain and offset constants

All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

ASC’s shall support, but not be limited to, the following configurations of systems to address current requirements as described in Sections 23 09 14 and 23 09 93 portions of this specification, and for future expansion of air handling units:

- Variable Air Volume Terminals
- Reheat Terminals
- Fan Coils
- Unit Ventilators
- Packaged Air Handling Units

All application specific controllers shall be fully programmable. Question and answer or template programming are not acceptable. Control sequences for terminal unit control that utilize devices wired directly to the terminal unit application controller shall be programmed in the application specific controller and shall be stand-alone in function, i.e., occupancy sensing, temperature setpoint setback, etc. Supervisory controllers shall not be involved in the control sequence logic unless it involves sharing data between or from individual terminal unit controllers to be utilized in a global sequence, i.e., trim and respond strategies, terminal unit grouping, etc.

OPERATOR INTERFACE REQUIREMENTS

COMMAND ENTRY/MENU SELECTION PROCESS:

Operator interface software shall minimize operator training through the use of English language prompting and English language point identification.

GRAPHIC-BASED DISPLAYS:

The operator interface shall provide graphic based displays of each system. The point data associated with each system shall dynamically update at a minimum of every 30 seconds. Graphic displays shall be linked to each other to provide a “drill down” capability from main graphic displays to more specific system-based displays. Provide a building level graphic display that links to system graphics. For systems that have ASC controlled terminal unit controls, provide a building floor plan with dynamic temperatures shown on the graphic that can be drilled into for more specific terminal information. Points provided in the graphic shall have the override and adjust capability specified under operator commands.

PASSWORD PROTECTION:

Multiple-level password access protection shall be provided to allow the user/manager to limit control, display, and data base manipulation capabilities as he deems appropriate for each user, based upon an assigned password.

Passwords shall be exactly the same for all operator devices.

A minimum of three levels of access shall be supported:

- Level 1: Data access and display
- Level 2 = Level 1 + operator overrides and commands
- Level 3 = Level 2 + database generation and modification

A minimum of 4 passwords shall be supported at each supervisory controller.

Operators will be able to perform only those commands available for their respective passwords. Menu selections displayed at any operator device shall be limited to only those items defined for the access level of the password used to log-on.

Provide user definable, automatic log-off timers of from 1 to 60 minutes to prevent operators from inadvertently leaving devices on-line.

OPERATOR COMMANDS:

The operator interface shall allow the operator to perform commands including, but not limited to, the following:

- Start-up or shutdown selected equipment.
- Adjust setpoints.
- Override analog and binary outputs.
- Add/modify/delete time programming.
- Enable/disable process execution.
- Lock/unlock alarm reporting for each point.
- Enable/disable totalization for each point.
- Enable/disable trending.
- Enter temporary override schedules.
- Define holiday schedules.
- Change time/date.
- Enter/modify analog alarm limits.
- Enable/disable analog alarm limits.
- Enable/disable demand limiting.
- Enable/disable duty cycle.

LOGS AND SUMMARIES:

Reports shall be generated manually and directed to the displays. As a minimum, the system shall allow the user to easily obtain the following general listing of all points in the system that shall include, but not be limited to:

- Points currently in alarm.
- Off-line points.
- Points currently in override status.
- Points in weekly schedules.
- Holiday programming.

Summaries shall be provided for specific points, for a logical point group, for a user-selected group of groups, or for the entire facility without restriction due to the hardware configuration on the facility management system. Under no conditions shall the operator need to specify the address of hardware controller to obtain system information.

SYSTEM CONFIGURATION AND DEFINITION:

All temperature and equipment control strategies and energy management routines shall be definable by the operator. System definition and modification procedures shall not interfere with normal system operation and control.

The system shall be provided complete with all equipment, software, and documentation necessary to allow an operator to independently perform the following functions:

- Add/delete/modify application specific controllers.
- Add/delete/modify points of any type, and all associated point parameters, and tuning constants.
- Add/delete/modify alarm reporting definition for each point.
- Add/delete/modify energy management applications.
- Add/delete/modify time and calendar-based programming.
- Add/delete/modify totalization for every point.
- Add/delete/modify historical data trending for every point.
- Add/delete/modify configured control processes.
- Add/delete/modify dial-up telecommunication definition.
- Add/delete/modify all operator passwords.
- Add/delete/modify alarm messages.

PROGRAMMING DESCRIPTION:

Definition of operator device characteristics, ASC's, individual points, and shall be performed through fill-in-the-blank templates.

NETWORK-WIDE STRATEGY DEVELOPMENT:

Inputs and outputs for any process shall not be restricted to a single ASC but shall be able to include data from any and all other ASC's to allow the development of network-wide control strategies.

SYSTEM DEFINITION/CONTROL SEQUENCE DOCUMENTATION:

All portions of system definition shall be self-documenting and be capable of providing hardcopy printouts of all configuration and application data.

DATA BASE SAVE/RESTORE/BACK-UP:

Backup copies of all programmable controller, ASC and supervisory controller databases shall be stored in at least one personal computer or laptop. Users shall have the ability to manually execute upload and downloading of a programmable controller, ASC and supervisory controller database.

WEB BASED HTML BROWSER INTERFACE

Provide a HTML based browser interface (Web Server) for accessing the DDC system. This shall include all hardware and software to provide an Ethernet twisted pair connection to the owners local or wide area network (LAN or WAN) that can be used to access the DDC system through a standard internet browser.

All information shall be provided to the owner's IT staff to facilitate connection through the owner's LAN/WAN.

At a minimum, this interface shall be capable of all functions described under the Operator Interface section, Password Protection, Operator Commands, and Logs and Summary subsections of this specification.

PORTABLE OPERATOR TERMINAL

Provide a portable interface for accessing the DDC system from a connection to a supervisory controller. This device shall, at a minimum, be capable of all functions described under the Operator Interface section, Password Protection, Operator Commands, and Logs and Summary subsections of this specification.

PART 3 - EXECUTION

GENERAL

All electronic work required as an integral part of the Direct Digital Control system work is the responsibility of this section unless specifically indicated otherwise in this section, Section 23 09 14, or in Division 26.

This contractor shall provide all labor, materials, engineering, software, permits, tools, checkout, and certificates required to install a complete Direct Digital Control system as herein specified.

Any and all points added with this project shall be grouped for display purposes into the system such that all points associated with a new or existing DDC system can appear together on the CRT display or printed log. Assignment of points to a group shall not be restricted by hardware configuration of the points of direct digital control. It shall be possible to assign a point to appear in more than one system. An English descriptor and an alpha/numeric identifier shall identify each system.

This Direct Digital Control system as herein specified shall be fully integrated and completely installed by this section. It shall include all required computer CPU software and hardware. Include the engineering, installation, supervision, calibration, software programming, and checkout necessary for a fully operational system.

INSTALLATION

All work and materials are to conform in every detail to the rules and requirements of the National Electrical Code and present manufacturing standards. All wiring and cable installation shall conform with the wiring installation as specified in the installation section of Section 23 09 14. All material shall be UL approved.

Install system and materials according to manufacturer's instructions, rough-in drawings, and details on drawings.

Line voltage wiring to power the DDC Controllers, not provided by the Division 26 contractor, to be by this contractor.

Control panels serving equipment fed by emergency power shall also be served by emergency power.

Provide uninterruptable power supplies where necessary to provide proper start-up of equipment or to accomplish power restart control sequences specified.

Mount control panels adjacent to associated equipment on vibration-free walls or free-standing angle iron supports. One cabinet may accommodate more than one system in same equipment room. Provide engraved plastic nameplates for instruments and controls inside cabinet and on cabinet face.

Provide as-built control drawings of all systems served by each local panel in a location adjacent to or inside of panel cover. Provide a protective cover or envelope for drawings.

Cable tray routing of the communication trunks is acceptable.

Where a new system is required to be extended to an existing agency Building Automation Network (BAN) (typically connected via the agency Local Area Network (LAN) or Wide Area Network (WAN)), extension of the data-net between DDC Controllers and to the BAN to be by this contractor unless specified to be provided by the division 27 contractor. All wiring and cable installation shall conform to the wiring installation as specified in the installation section of Section 23 09 14 and division 27.

Provide all necessary routers and or repeaters to accomplish connection to the BAN via the panel-mounted port provided.

Provide two data jacks in control panels housing supervisory controllers and allocate 6”x6” for each data jack in the panel. The first jack will be used for connecting the supervisory controller to the BAN. The second jack will be used as a spare for connecting to the BAN by service personnel.

Provide an input for a service shutdown toggle switch for each air handling unit system provided inside the temperature control panel that will initiate a logical shutdown of the air handling unit system.

All tubing, cable and individual wiring is to be permanently tagged, with numbers corresponding with "Record Drawings", spares are to be labelled as "Spare".

Provide technician to work with air balancing contractor and/or provide balancing contractor with necessary hardware to over-ride DDC controllers for air balancing.

Provide documentation to demonstrate that all points, input, and output, have been checked out and verified operational, note any points not operating properly with notation of reason.

END OF SECTION 23 09 23

Section 23 09 93 – Sequence of Operation for HVAC Controls

PART 1 – GENERAL

SCOPE

This section includes control sequences for HVAC equipment as well as equipment furnished by others that may need monitoring or control.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC – Coordination

Division 23 - HVAC - Equipment provided to be controlled or monitored

Division 26 - Electrical - Equipment provided to be controlled or monitored

Division 28 - Electronic Safety and Security

DESCRIPTION OF WORK

Control sequences are hereby defined as the manner and method by which automatic controls function. Requirements for each type of operation are specified in this section.

Operation equipment, devices and system components required for automatic control systems are specified in other Division 23 control sections of these specifications.

SUBMITTALS

Refer to Division 1, General Conditions.

The contractor providing the DDC equipment shall provide a complete narrative of the sequence of operations for equipment that is controlled through the DDC system. The narrative of the sequence of operation shall not be a verbatim copy of the sequences contained herein but shall reflect the actual operation as applied by the contractor.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

PART 2 - PRODUCTS

Not applicable to this Section.

PART 3 - EXECUTION

CONTROL SEQUENCES

Ground Water Loop Temperature Control

The groundwater loop temperature shall be maintained between 40 degrees and 75 degrees as measured within Buffer Tank (BT-1). Provide and install an immersion temperature sensor in this tank.

If the temperature within the tank falls below 40 degrees, or rises above 75 degrees, the Ground Water Pumps (GP-1 through GP-4) shall be started and operated continuously until the temperature returns to setpoint.

On a call for heat or cooling, one pump shall be started and allow to operate continuously. On a continued call for heat or cooling, additional pumps shall be sequenced on and off at 1-degree intervals.

The pumps shall be sequenced in a rotating manner with rotation intervals to not be greater than once per week.

The pumps will operate at constant speed. The variable speed pumps will be used to set design water volume only.

This contractor shall provide and install RIB-style relays to control operation of these pumps.

Monitor the status of these pumps with differential pressure sensors or current sensors and report all alarms to the Energy Management System.

If the temperature falls more than 4 degrees below setpoint in Buffer Tank (BT-1), the gas boiler shall be energized. Prior to energizing the boiler:

Pump (P-4a) shall be started.

Boiler pump (BP-1) shall be started.

Once the pumps are started and flow proven, the boiler shall be started and allowed to operate under its internal controls. Set the outlet temperature to 130 degrees.

Boiler operation shall be controlled by the Energy Management System. Once the tank temperature returns to within 2 degrees of setpoint, the boiler shall be turned off, followed by stopping the pumps after a 3 minute delay.

If the boiler is started, an alarm shall be sent to the Energy Management System.

If the tank temperature falls more than 5 degrees below setpoint, or 5 degrees above setpoint, an alarm shall be sent to the Energy Management System.

The buffer tank water temperature shall be displayed at the Energy Management System and a graphic shall be included to show a daily graph of the tank temperature. Display the tank temperature variation at daily, monthly, and yearly intervals.

Radiant Water Temperature Control

The radiant heating water shall be maintained between 90 degrees and 120 degrees as measured within Boiler Buffer Tank (BBT-1). Provide and install an immersion temperature sensor in this tank.

The water temperature setpoint shall be reset in proportion to outside air temperature, as follows:

Outside Air Temperature	Tank Water Temperature
-20 degrees F	120 degrees F
40 degrees F	90 degrees F

The entire system shall be disabled if the outside air temperature rises above 60 degrees F.

On a call for heat, the water-to-water heat pumps and their associated pumps (two pumps per heat pump) shall be started. The water pumps for each water-to-water heat pump will operate simultaneously at a constant speed.

This contractor shall provide and install RIB-style relays to control operation of all associated pumps.

Monitor the status of these pumps with differential pressure sensors or current sensors and report all alarms to the Energy Management System.

Once water flow is proven, Heat Pump (WP-1) shall be energized. On a continued call for heat, Heat Pump (WP-2) shall be energized. On a continued call for heat, Heat Pump (WP-3) shall be energized, all along with their associated water circulation pumps.

Operation of these water-to-water heat pumps shall be rotated on a uniform basis not to exceed weekly.

Maintain a 2 degree differential between stages of operation.

This contractor shall install and wire all flow switches and safety switches provided by the manufacturer of the heat pump.

If the temperature falls more than 5 degrees below setpoint in Boiler Buffer Tank (BBT-1), the gas boiler shall be energized. Prior to energizing the boiler:

Pump (P-5) shall be started.

Boiler pump (BP-1) shall be started.

Once the pumps are started and flow proven, the boiler shall be started and allowed to operate under its internal controls. Set the outlet temperature to 130 degrees.

Boiler operation shall be controlled by the Energy Management System. Once the tank temperature returns to within 2 degrees of setpoint, the boiler shall be turned off, followed by stopping the pumps after a 3 minute delay.

If the boiler is started, an alarm shall be sent to the Energy Management System.

The boiler buffer tank water temperature shall be displayed at the Energy Management System.

Radiant Hot Water Heat Control

Each radiant zone will be provided with a separate variable speed pump and a room temperature sensor.

At four of the radiant manifolds, zone valves shall be installed on each loop and a separate room temperature sensor shall be provided for each zone valve.

Sensors shall be connected to the Energy Management System to provide a modulating output to the pumps or a 2-position output to the zone valves. Room temperature sensors shall include an occupant-accessible temperature setpoint adjustment, limited by software programming.

All radiant zone temperature sensors in public spaces, or within the Inspection Bay, shall be fitted with clear plastic vandal guards with keyed locks.

On a call for space heat at the room temperature sensor, the zone pump shall be started, and the pump speed shall be modulated in proportion to the deviation from temperature setpoint. Pump shall be at full speed if the room falls more than 3 degrees from setpoint.

At radiant manifolds with zone valves, whenever a single zone valve is called to be opened, the associated radiant pump shall be energized. Pump speed shall be modulated based on the deviation from setpoint.

Pumps shall not be allowed to operate if the outside air temperature rises above 60 degrees.

Temperature sensors shall be single temperature without any night setback cycle.

This contractor shall provide and install RIB-style relays to control operation of these pumps, as well as a modulating signal to the pumps. An “on-off” control will not be required if the modulating signal provides for position pump shut-off.

Unitary Water-to-Air Heat Pumps

This contractor shall provide a room temperature sensor for each unitary heat pump. The sensor shall be connected to the Energy Management System.

All unitary heat pump temperature sensors in public spaces shall be fitted with clear plastic vandal guards with keyed locks.

An occupancy schedule shall be provided for all unitary heat pumps. The owner shall supply an occupancy schedule for initial programming, including holidays. Adjustment of the occupancy schedule shall be accessible to the occupants of the building via the Energy Management System.

During occupied periods, the unitary heat pump fans shall operate continuously. During un-occupied periods, the fans shall remain off unless there is a call for heat or cooling.

On a call for heat or cooling the heat pump compressor and reversing valve (in heating mode) shall be energized and allowed to operate until the call for heat or cooling is satisfied.

When the outside air temperature is below 50 degrees F, the heating capacity in the unitary heat pumps shall be retarded by 2 degrees to allow the in-floor radiant heat to supply the primary heating source.

Each heat pump is paired with a water circulating pump. On a call for heat or cooling, this pump shall be started, and flow shall be proven before the heat pump compressor is allowed to operation. This contractor shall provide a flow switch or a pressure switch to prove flow.

This contractor shall provide and install RIB-style relays to control operation of these pumps.

Monitor the status of these pumps with differential pressure sensors or current sensors and report all alarms to the Energy Management System.

Room temperature sensors shall include an occupant-accessible temperature setpoint adjustment, limited by software programming.

Energy Recovery Unit

The energy recovery unit shall be allowed to operate during occupied periods only and shall operate continuously during the occupied mode.

Each energy recovery unit will be equipped with a motorized damper on the intake and exhaust ductwork. When the system is switched from un-occupied to occupied, these dampers shall be driven open, and their position proven before the energy recovery unit fans are allowed to start.

This contractor shall provide a power source, as necessary, and shall install all control wiring between the dampers and the energy recovery units.

Exhaust Fans EF-1 through EF-4, EF-5 and EF-6, and Make-up Air Unit MU-1

Under normal conditions, exhaust fans EF-1 through EF-4 shall be manually indexed on by the occupants for odor or temperature control. A motorized damper shall be installed at each of these fans and shall be driven open when the fan is energized. The Electrical Contractor will provide manual control switches and will wire the motorized dampers. This contractor shall verify the wiring and the control dampers operate as required.

Exhaust fans EF-5 and EF-6 shall operate based on the following:

These fans shall operate continuously if the Inspection Bay is in an “occupied” mode, as programmed by the owner’s schedule.

These fans shall operate continuously if the main lighting is energized in the Inspection Bay. This contractor shall provide and install relays, as necessary, to energize these fans if the lighting is on. Coordinate with the electrical contractor.

These fans shall operate continuously if carbon monoxide or nitrogen dioxide is detected in the Inspection Bay above acceptable levels.

This contractor shall provide, install, and wire a CO/NO2 detector “system” with multiple point source detectors. Detectors shall be located in each of the depressed inspection pits, and at opposite sides of the Inspection Bay. All sensors shall be low voltage and shall annunciate at the main control panel. This contractor is responsible for all low and line voltage wiring.

If carbon monoxide is detected above a pre-set level, all (6) exhaust fans shall be automatically started, and all associated motorized control dampers shall be opened.

If nitrogen dioxide is detected above a pre-set level, all (6) exhaust fans shall be automatically started, and all associated motorized control dampers shall be opened.

Verify all setpoints with the engineer and the owner.

An alarm shall be sent to the Energy Management System if high concentrations of either gas are detected.

Each motorized damper at all six exhaust fans shall be equipped with an end switch. If any damper is driven open, the make-up air unit (MU-1) shall be energized and allowed to operate.

This contractor shall extend dedicated wiring from each motorized damper to the make-up air unit control panel.

When the make-up air unit is energized, the outside air damper shall first be driven open, and position proven.

The make-up air unit will be supplied with a remote-control panel. This contractor shall install this panel adjacent to gas monitor panel and shall provide and install all wiring per the manufacturer’s directions. The remote-control panel will include a manual summer-winter switch, a remote discharge air temperature control, and a number of status indicator lamps.

Once the make-up air unit is energized, and the outside air damper is proven open, the unit shall operate under its own internal controls to supply a fixed discharge air temperature and to maintain a fixed air pressure in the Inspection Bay as referenced to the Office Spaces.

This contractor shall install the air pressure sensor taps per the manufacturer’s directions.

The make-up air unit includes a mixing box and will mix return air and outside air to maintain a slightly negative pressure as referenced to the Office Spaces.

Gas Infrared Heaters (IR-1 through IR-4)

The gas infrared heater may be supplied with “stand alone”, low voltage, 2-stage room thermostats compatible with the infrared heating units.

Install the thermostats where shown on the drawings and make all low voltage wiring connections per the manufacturer’s directions.

Note that IR-1 and IR-2 share a common room thermostat and must operate simultaneously. This contractor shall provide and install isolation relays, if necessary, to allow a single room thermostat to control both infrared units.

All infrared unit thermostats shall be heavy duty style. No guards will be required, as the intent is to allow the occupants to manually energize the heaters on an “as needed” basis.

Alarms

Provide all alarmed points with adjustable time delays to prevent nuisance tripping under normal operation and on equipment start-up. For all commanded outputs that have status feedback, provide an alarm that will indicate the commanded output is not in its commanded state. Provide alarms on all points as indicated on point charts. For existing campus automations systems, add/delete what is called on the point charts for after consultation with user Agency to provide consistent alarming throughout the automation system.

Equipment Start/Stop Failure States

All start/stop points for equipment shall utilize normally open contacts unless called out specifically in the individual control sequences.

Lead/Lag Sequencing

For sequences that call for lead/lag of equipment connected to building automation systems, the lead device shall be able to be chosen through a selectable day of the week and time of day through the building automation system. Coordinate with the user Agency for scheduling switchover and frequency. Unless otherwise directed, switchover shall occur at 10AM Tuesday and shall rotate the lead device on a weekly cycle rotating through all devices sequentially. For standalone lead/lag sequence controllers (non-DDC), the lead device shall be selected by a switch on the panel face.

Current Switch Setup

When current switches are used for proving fan or pump status, they shall be set up so that they will detect belt or coupling loss by the reduction in current draw on loss of coupled load. The current switch set up shall be redone after the balancer is complete.

Damper Interlocks for Fans

For fan systems with magnetic starters and shutoff dampers specified with end switches, the damper interlock shall be hardwired in such a way that the damper shall open if the fan starter hand / off / auto switch is in the hand or in the auto position and being called to start. After the damper end switch has proven the damper open, a hardwire interlock from the end switch to the starter holding coil for the fan shall cause the fan to start. For fan systems that are ducted in parallel, see specific sequence for fan system on interlock requirements.

Fan Interlocking

Provide interlocks between supply and return or exhaust fan systems as scheduled on the plans or called out in individual control sequences. If DDC controlled, interlocks shall be done through DDC start/stop points unless otherwise specified in individual control sequences. If not DDC controlled, interlocks shall be accomplished via hardwire interlocks between fan starters or VFD’s.

Thermostats and Sensors:

All devices and equipment including terminal units, specified to be controlled in a control sequence by a thermostat or sensor, shall be provided with a thermostat or sensor, whether or not the device is indicated on the plans. Consult the HVAC design engineer for the thermostat or sensor location.

All thermostats and sensors (with occupant-accessible controls) shall be mounted no greater than 48 inches above finished floor and no less than 36 inches above finished floor.

END OF SECTION 23 09 93

Section 23 11 00 – Facility Fuel Piping

PART 1 – GENERAL

SCOPE

This section contains specifications for fuel pipe and fuel pipe fittings for this project.

RELATED WORK

Section 23 05 23 - General-Duty Valves for HVAC Piping
Section 23 05 15 - Piping Specialties
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI B16.3	Malleable Iron Threaded Fittings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.

DELIVERY, STORAGE, AND HANDLING

Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

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.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system according to ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

Non-metallic piping will be acceptable only for the services indicated. It will not be acceptable in occupied spaces and ventilation plenum spaces, including plenum ceilings.

Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at contractor's option. Where the grade or type is not specified, contractor may choose from those commercially available.

WELDER QUALIFICATIONS

Before any metallic welding is performed, contractor to submit his Standard Welding Procedure Specification together with the Procedure Qualification Record as required by Section IX of the ASME Boiler and Pressure Vessel Code and/or the National Certified Pipe Welding Bureau.

Before any polyethylene fusion welding is performed, contractor to submit certification that the welders to be used on this project have successfully demonstrated proper welding procedures according to the Code of Federal Regulations, Title 49, Part 192, Section 192.285.

The A/E reserves the right to test the work of any welder employed on the project, at the contractor's expense. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project.

NATURAL GAS SERVICE

All charges for the gas service as shown on the plans, including the connection from the main in the street or other location to the gas meter, shall be paid by this contractor, including setting of gas meter(s) and all work performed by the gas company.

PART 2 - PRODUCTS

NATURAL GAS

2" and Smaller: ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A197/ANSI B16.3 class 150 black malleable iron threaded fittings or ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

VENTS AND RELIEF VALVES

Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

UNIONS AND FLANGES

2" and Smaller: ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 psi.

PART 3 - EXECUTION

PREPARATION

Remove all foreign material from interior and exterior of pipe and fittings.

ERECTION

Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

"Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half the diameter of the main.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

Install all valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

WELDED PIPE JOINTS

Make all welded joints by fusion welding according to ASME Codes, ANSI B31, and State Codes where applicable.

Electrodes shall be Lincoln, or approved equal, with coating and diameter as recommended by the manufacturer for the type and thickness of work being done.

THREADED PIPE JOINTS

Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

NATURAL GAS

Pitch horizontal piping down 1" in 60 feet in the direction of flow. Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each tee or pipe end which will not be immediately extended. All branch connections to the main shall be from the top or side of the main.

Do not install gas pipe in a ventilation air plenum.

If an above ground vent terminates in an area subject to snow accumulation, terminate the line at least 5 feet above grade.

Install a shut off valve at each appliance. Provide a valved connection at the main for equipment and appliances furnished by others.

Piping through a roof shall be run through an approved roof penetration with flashing and counter flashing.

Each gas pressure reducing valve vent and relief valve vent shall be run separately to a point outside of the building, terminated with a screened vent cap, and located according to gas utility regulations.

Clean all welded piping before all regulators and control valves. Test by placing target cloth over piping and blow with compressed air. Clean piping until target cloth is clean and free of debris.

VENTS AND RELIEF VALVES

Install vent and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line.

UNIONS AND FLANGES

Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

PIPING SYSTEM LEAK TESTS

Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired, and ready for operation. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Verify that hangers can withstand any additional weight load that may be imposed by the test.

Provide all piping, fittings, blind flanges, and equipment to perform the testing.

Conduct pressure test with test medium of air or water unless specifically indicated. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the division's representative. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

Do not insulate pipe until it has been successfully tested.

For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

For air tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. The piping system exclusive of possible localized instances at pump or valve packing shall show no evidence of leaking. After testing is complete, slowly release the pressure in a safe manner.

Measure natural gas system test pressure with a water manometer or an equivalent device calibrated in increments not greater than 0.1 inch water column. System will not be approved until it can be demonstrated that there is no measurable loss of test pressure during the test period.

Conduct fuel oil system test so as not to impose a pressure of more than 10 psig on the tank. Instead of a pressure test, suction lines may be tested under a vacuum of not less than 20 inches of mercury maintained for at least one hour.

System	*Pressure*	*Medium*	*Duration*
Natural gas	100 psig	Air	24 hr

END OF SECTION 23 11 00

PIPING SYSTEM LEAKAGE 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:_____

_____

Section 23 21 13 – Hydronic Piping

PART 1 - GENERAL

SCOPE

This section contains specifications for all HVAC hydronic pipe and pipe fittings for this project.

RELATED WORK

Section 23 05 23 - General-Duty Valves for HVAC Piping
Section 23 05 15 - Piping Specialties
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 07 00 - HVAC Insulation
Section 23 25 00 - HVAC Water Treatment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI B16.3	Malleable Iron Threaded Fittings
ANSI B16.4	Cast Iron Threaded Fittings
ANSI B16.5	Pipe Flanges and Flanged Fittings
ANSI B16.22	Wrought Copper and Wrought Copper Alloy Solder Joint Pressure Fittings
ASTM A53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTM A74	Cast Iron Soil Pipe and Fittings
ASTM A105	Forgings, Carbon Steel, for Piping Components
ASTM A126	Gray Cast Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A181	Forgings, Carbon Steel for General Purpose Piping
ASTM A197	Cupola Malleable Iron
ASTM A380	Practice for Cleaning and Descaling Stainless Steel Parts, Equipment, and Systems
ASTM B75	Seamless Copper Tube
ASTM B88	Seamless Copper Water Tube

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Contractor shall submit schedule indicating the ASTM specification number of the pipe being proposed along with its type and grade and sufficient information to indicate the type and rating of fittings for each service.

COPPER TUBE:

Statement from manufacturer on his letterhead that the pipe furnished meets the ASTM specification contained in this section.

QUALITY ASSURANCE

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the owner.

DELIVERY, STORAGE, AND HANDLING

Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

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. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

DESIGN CRITERIA

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

Construct all piping for the highest pressures and temperatures in the respective system according to ANSI B31, but not less than 125 psig unless specifically indicated otherwise.

Where weld fittings or mechanical grooved fittings are used, use only long radius elbows having a centerline radius of 1.5 pipe diameters.

Where ASTM A53 type F pipe is specified, ASTM A53 grade A type E or S, or ASTM A53 grade B type E or S may be substituted at contractor's option. Where ASTM A53 grade A pipe is specified, ASTM A53 grade B pipe may be substituted at contractor's option. Where the grade or type is not specified, contractor may choose from those commercially available.

Where ASTM B88, type L hard temper copper tubing is specified, ASTM B88, type K hard temper copper tubing may be substituted at contractor's option.

WELDER QUALIFICATIONS

Before any metallic welding is performed, the contractor shall submit his Standard Welding Procedure Specifications, Procedure Qualification Records and Qualification Test Records for each Welder along with associated continuity records to demonstrate compliance with ASME Section IX, paragraph QW-322.

The contractor shall maintain a complete set of welder qualification documents at the jobsite, including Test Records and Continuity Records for each welder.

The A/E reserves the right to test the work of any welder employed on the project, at the contractor's expense. Testing will include a visual examination of the pipe and weld and may include radiography of any suspect welds. If the work of the welder is found to be unsatisfactory, the welder shall be prevented from doing further welding on the project. Any welds deemed unacceptable will be repaired at the contractor’s expense.

PART 2 - PRODUCTS

HEATING HOT WATER AND HEAT PUMP INTERIOR WATER SYSTEMS

2" and Smaller: ASTM A53, type F, standard weight (schedule 40) black steel pipe with ASTM A126/ANSI B16.4, class 125, standard weight cast iron threaded fittings.

2-1/2" and Larger: ASTM A53, standard weight (schedule 40) black steel pipe with ASTM A234 grade WPB/ANSI B16.9 standard weight, seamless, carbon steel weld fittings.

Contractor may use ASTM B88 seamless, type L, hard temper copper tube with ANSI B16.22 wrought copper solder-joint fittings in lieu of steel pipe for all sizes. Mechanically formed tee fittings may be used in lieu of wrought copper solder-joint tee fittings for branch takeoff up to one-half the diameter of the main.

MAKEUP WATER

Extend from where left by the Plumbing Contractor with the same materials.

CHEMICAL TREATMENT

Use pipe and pipe fittings as specified for the system to which the chemical treatment piping is connected. Plastic pipe furnished with the chemical treatment materials may also be used if its pressure/temperature rating is acceptable for the service.

VENTS AND RELIEF VALVES

Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

COOLING COIL CONDENSATE

ASTM B88, type L hard temper copper tubing with ASTM B145/ANSI B16.23 cast red bronze or ASTM B75/ANSI B16.29 wrought solder-type drainage fittings.

PART 3 - EXECUTION

ERECTION

Carefully inspect all pipe, fittings, valves, equipment and accessories before installation. Any items that are unsuitable, cracked or otherwise defective shall be rejected and removed from the job site immediately. Excluding minor surface rust, piping that exhibits significant oxidation or corrosion will be rejected.

Exercise care at every stage of storage, handling, laying and erecting to prevent entry of foreign matter into piping, fittings, valves, equipment and accessories. Do not erect or install any item that is not clean.

Remove all lose dirt, scale, oil, chips, burrs and other foreign material from the internal and external surfaces of all pipe and piping components prior to assembly, including debris associated with cutting, threading and welding.

During fabrication and assembly, remove slag and weld spatter from internal pipe surfaces at all joints by peening, chipping and wire brushing.

During construction, until system is fully operational, keep all openings in piping and equipment closed except when actual work is being performed on that item of the system. Use plugs, caps, blind flanges or other items designed for this purpose.

Furnish and install all flanges, caps, bypasses, drains, valves, etc. required to facilitate flushing and draining all heating and cooling system piping.

Install all piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping as required to clear such interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

Provide anchors, expansion joints, swing joints and/or expansion loops so that piping may expand and contract without damage to itself, equipment, or building.

Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

"Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half the diameter of the main.

Install drains throughout the systems to permit complete drainage.

Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment

Install all valves, control valves, and piping specialties, including items furnished by others, as specified and/or detailed. Make connections to all equipment installed by others where that equipment requires the piping services indicated in this section.

WELDED PIPE JOINTS

Make all welded joints by fusion welding according to ASME Codes, ANSI B31, and State Codes where applicable.

All pipe welding shall be completed by Qualified Welders according to the Contractor’s Procedure Specifications.

Contractor will ensure that these steps are followed where pipe sections will be joined by welding:

- Cleaning – Welding surfaces will be clean and free of defects.
- Alignment – Inside diameter of piping components will be aligned as accurately as possible. Internal misalignment shall not exceed 1/16”.
- Spacing – Pipe sections will be spaced to allow deposition of weld filler material through the entire weld joint thickness.

- Girth Butt Welds:
    a. Girth butt welds shall be complete penetration welds.
    b. Concavity will not exceed 1/32”
    c. Under cuts will not exceed 1/32”
    d. As welded surfaces are permitted however surfaces will be free from coarse ripples, grooves, abrupt ridges and valleys.

Electrodes shall be Lincoln, or approved equal, with coating and diameter as recommended by the manufacturer for the type and thickness of work being done.

THREADED PIPE JOINTS

Use a Teflon based thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

COPPER PIPE JOINTS

Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux, and assemble joint. Use 95-5 solder or brazing to secure joint as specified for the specific piping service.

Where mechanically formed tee fittings are allowed, form mechanically extracted collars in a continuous operation, consisting of drilling a pilot hole and drawing out the tube surface to form a collar having a height of not less than three times the thickness of the tube wall. Use an adjustable collaring device. Notch and dimple the branch tube. Braze the joint, applying heat properly so that pipe and tee do not distort; remove distorted connections.

WATER SYSTEM

Run water mains level or pitch horizontal mains up 1 inch in 40 feet in the direction of flow. Install manual air vents at all high points where air may collect. If vent is not in an accessible location, extend air vent piping to the nearest code acceptable drain location with vent valve located at the drain.

Main branches and runouts to terminal equipment may be made at the top, top 45 degree, side, and/or bottom 45 degree of the main provided that there are drain valves suitably located for complete system drainage and manual air vents are located at all top and top 45 degree connections. Bottom connections are not acceptable unless approved by the DFD Mechanical Inspector.

Use top or top 45 degree connection to main for up feed risers and bottom 45 degree connection to main for down feed risers. Bottom connections are not acceptable unless approved by the DFD Mechanical Inspector.

Use a minimum of two elbows in each pipe line to a piece of terminal equipment to provide flexibility for expansion and contraction of the piping systems. Offset pipe connections at equipment to allow for service, such as removal of the terminal device.

Use eccentric fittings for changes in horizontal pipe sizes with the fittings installed for proper air venting. Concentric fittings may be used for changes in vertical pipe sizes.

MAKEUP WATER

Install where indicated and/or specified, including all valves, piping specialties and dielectric unions required for a functional system.

CHEMICAL TREATMENT

Install chemical treatment piping as indicated on the drawings, as detailed, and as recommended by the supplier of the chemical treatment equipment.

VENTS AND RELIEF VALVES

Install vent and relief valve discharge lines as indicated on the drawings, as detailed, and as specified for each specific valve or piping specialty item. In no event is a termination to occur less than six feet above a roof line.

COOLING COIL CONDENSATE

Trap each cooling coil drain pan connection with a trap seal of sufficient depth to prevent conditioned air from moving through the piping. Extend drain piping to nearest code approved drain location. Construct trap with plugged tee for cleanout purposes as detailed.

UNIONS AND FLANGES

Install a union or flange, as required, at each automatic control valve and at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

PIPING SYSTEM LEAK TESTS

Verify that the piping system being tested is fully connected to all components and that all equipment is properly installed, wired, and ready for operation. If required for the additional pressure load under test, provide temporary restraints at expansion joints or isolate them during the test. Verify that hangers can withstand any additional weight load that may be imposed by the test.

Provide all piping, fittings, blind flanges, and equipment to perform the testing.

Conduct pressure test with test medium of air or water unless specifically indicated. Minimum test time is indicated in the table below; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the Division's representative. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

Do not insulate pipe until it has been successfully tested.

For hydrostatic tests, use clean water and remove all air from the piping being tested by means of air vents or loosening of flanges/unions. Measure and record test pressure at the high point in the system.

For air tests, gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine all joints and connections with a soap bubble solution or equivalent method. The piping system exclusive of possible localized instances at pump or valve packing shall show no evidence of leaking. After testing is complete, slowly release the pressure in a safe manner.

System	*Pressure*	*Medium*	*Duration*
All Water Systems	100 psig	Water	8 hr

On piping that cannot be tested because of connection to an active line, provide temporary blind flanges and hydrostatically test new section of piping. After completion of test, remove temporary flanges and make final connections to piping. Die penetrate test pass weld or x-ray the piping that was not hydrostatically tested up to the active system.

HYDRONIC PIPING SYSTEM FLUSHING

All new chilled water and heating hot water system piping shall be flushed thoroughly before the systems are put in to operation. Subsequent to executing the chemical cleaning processes specified in Section 23 25 00 – HVAC WATER TREATMENT, and prior to adding scale and corrosion inhibitors, flush all piping and components with a clean source of water until the discharge from the system is clean. Discharge shall be from drains provided at all low points in the piping, ends of headers and as otherwise necessary to flush and drain the entire system.

Project specific procedures shall be established prior to flushing. Before beginning flushing operations, submit proposed flushing procedures to the A/E and DFD’s Project Representative for review and approval. Provide sufficient notice to the A/E and/or DFD to allow the flushing operations to be observed.

A clean water source shall be tapped into the system downstream of the main circulation pump(s). Provide minimum 2” connection between water source and hot water/chilled water systems including taps with ball valves (or line size tap and ball valve for piping systems smaller than 2”). Provide minimum 2” taps (or line size if mains are smaller than 2”) at the ends of headers, the low pint of each of the mains on each floor and as otherwise necessary to flush and drain the entire system. Provide minimum 2” bypass with shut off valve (or line size if mains are smaller than 2”) between the supply and return mains on each floor as where directed by the A/E and DFD Project Representative or where shown on the drawings. Contractor shall identify proposed clean water source along with the method/location of drain discharge and review with the A/E and DFD Project Representative prior to installing flushing connections to water source and drain outlets. Provide code required temporary backflow prevention for

the clean water source if needed. Provide all temporary taps, valves, piping, bypasses and hoses as needed to accomplish flushing procedures. The Agency's district chilled water system shall NOT be used as a source of water for flushing any piping.

Flush piping systems using the following procedure:

Flushing sequence for hot water and chilled water systems is as follows:

1. Close isolation valves at all coils and wall fin.
2. Open the temporary bypasses that connect the ends of supply and return mains.
3. Flush mains by turning on flushing water source and sequentially opening drains on mains on each floor until the discharge is clean. This will flush the mains without forcing water/debris into the branches and run out pipes.
4. Close isolation valves located downstream of coils/wall fin.
5. Open isolation valves located upstream of coils/wall fin.
6. Open individual drain valves upstream of coils/wall fin until the discharge is clean. This will flush the supply branch and run out lines between the mains and the coils/wall fin without running water/debris through the TCV or coils/wall fin.
7. Close the individual drain valves upstream of coils/wall fin.
8. Open drain valves at low points in the return piping mains.
9. Open the individual isolation valves located downstream of the coils/wall fin. This will flush the return branch and run out lines located between the coils/wall fin and the mains back into the mains and out the drains on the return mains. The water going through the coil/wall fin should be already be clean since this section was flushed previously.
10. Repeat steps 1-3 to clean debris from the mains.

Isolate all coils while flushing risers and mains. Flush the mains on each floor individually, starting at the top of the building and working down towards the basement level. After risers and mains have been flushed clean, individually open the drain valves in each branch circuit to discharge any debris that may have accumulated in the branch piping.

After flushing operations are complete, drain and/or blow out any residual water, clean and replace all strainers, and add scale and corrosion inhibitors as specified in Section 23 25 00. Leave flushing connections/valves in place and cap.

All flushing procedures shall be documented by completing and submitting the report form included at the end of this Section.

INITIAL FILL AND VENT

Fill hydronic systems with appropriate working fluids as specified. All system fluids shall be chemically treated as specified in Section 23 25 00 – HVAC WATER TREATMENT.

For closed piping systems, all air trapped at high points shall be relieved through the manual air vents prior to notifying A/E that the systems are ready to be tested and balanced.

END OF SECTION 23 21 13

PIPING SYSTEM LEAKAGE TEST REPORT

Date Submitted: _____.

Project Name:_____

Location:_____DOT 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:_____

_____

PIPING SYSTEM FLUSHING REPORT

(revised 10/1/2012)

Date Submitted: _____.

Project Name:_____

Location:_____DOT Project No:_____

Contractor:_____

System Identification (check one):

❒ Chilled Water ❒ Process Chilled Water ❒ Heat Reclaim

❒ Heating Hot Water ❒ Other _____

Describe procedure: _____

_____

_____

_____

_____

_____

Flush Date: _____ Start Time: _____ Stop Time: _____

Pressure of Water Source: _____ PSIG

Describe water source and method of connection to source:_____

_____

PIPING SYSTEM FLUSHING REPORT (page 2)

Flushed By: _____ Witnessed By: _____

Title: _____ Title: _____

Company: _____ Agency: _____

Signed: _____ Signed: _____

Date: _____ Date: _____

Describe results: _____

_____

_____

Section 23 21 23 – Hydronic Pumps

PART 1 – GENERAL

SCOPE

This section includes specifications for water pumps used for HVAC applications.

RELATED WORK

Section 23 05 13 - Common Motor Requirements for HVAC Equipment

REFERENCE

Applicable provisions of Division 1 shall govern work under this section.

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, materials of construction, ratings, weights, pump curves with net positive suction head requirements, manufacturer's installation requirements, manufacturer's performance limitations, and appropriate identification.

Pump curves shall identify design point of operation.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

Pump sizes, capacities, pressures and operating characteristics shall be as scheduled.

Pumps shall meet or exceed operating efficiencies scheduled.

Provide all pumps with motors, impellers, drive assemblies, bearings, coupling guard, and other accessories specified. Statically and dynamically balance all rotating parts. Provide flanged connections on all pumps unless specified otherwise. Service or repair of base mounted pumps shall not require breaking piping connections or removal of motor.

Where a pump is specified for parallel operation, the scheduled conditions are for that pump with both pumps operating, i.e., total system flow rate is twice that scheduled for a single pump. When only one of the parallel pumps is operating, the operating point of that pump must fall within the manufacturer's recommended operating range.

Provide pump with a motor sized for non-overloading over the entire pump curve. Motors to be 1750 rpm unless specified otherwise.

Furnish each pump and motor with a nameplate giving the manufacturer's name, serial number of pump, capacity in GPM and head in feet at design condition, horsepower, voltage, frequency, speed and full load current.

Test all pumps, clean and paint before shipment. The manufacturer shall certify all pump ratings.

All pumps to operate without excessive noise or vibration.

After completion of balancing, provide replacement of impellers, or trim impellers to provide specified flow at actual pumping head, as installed.

Furnish one spare seal and casing gasket for each pump to user agency.

PART 2 - PRODUCTS

IN-LINE CENTRIFUGAL PUMPS

MANUFACTURERS:

Bell and Gossett, Armstrong, Thrush, Taco, Grundfos, Aurora, or approved equal.

TYPE:

Single stage, direct connected, resiliently mounted motor for in-line mounting, oil lubricated, 175 psig maximum working pressure at operating temperature of 225 ° F. continuous, 250 ° F. intermittent.

CASING:

Cast iron or stainless steel; flanged suction and discharge connection; with plugged taps for vent, drain, suction and discharge gauges.

IMPELLER:

Brass or bronze, keyed to the shaft, single suction enclosed type, hydraulically and dynamically balanced.

BEARINGS:

Two, oil lubricated bronze sleeves or ball bearings capable of being greased.

SHAFT:

Stainless steel or carbon steel with stainless steel or bronze sleeve, integral thrust collar.

SEAL:

Mechanical type, carbon rotating against a stationary ceramic seat, 225°F maximum continuous operating temperature.

DRIVE:

Close coupled.

PART 3 - EXECUTION

INSTALLATION

Install all pumps in strict accordance with manufacturer's instructions. Access/service space around pumps shall not be less than minimum space recommended by pump manufacturer.

Support piping adjacent to pump such that no weight is carried on pump casings.

Decrease from line size at pump connections with suction diffusers where specified, long radius reducing elbows or concentric reducers/increasers in the vertical piping, and eccentric reducers/increasers for horizontal piping. Install eccentric reducers/increasers with the top of the pipe level

All valves and piping specialties must be full line size as indicated on the drawings

Install a full line size spring loaded check valve and balancing valve in the pump discharge piping. At contractor’s option, combination shut-off, check, balancing valve may be substituted instead of separate valves. Reference section 23 05 23.

END OF SECTION 23 21 23

Section 23 25 00 – HVAC Water Treatment

PART 1 – GENERAL

SCOPE

This section includes specifications for chemical treatment of all water, steam, and condensate systems.

REFERENCE

Applicable provisions of Division 1 shall govern work under this Section.

RELATED WORK

Section 23 05 15 - Piping Specialties

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Required for all equipment and chemicals specified including data concerning dimensions, capacities, materials of construction, weights, operating sequence, composite wiring diagrams and appropriate identification. Chemical data to include the description of the chemical, its composition, its function, and the associated material safety data sheet.

OPERATION AND MAINTENANCE DATA

Provide for the services of the manufacturer's trained representative to approve the installation and instruct the user agency in the operation of each system.

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.

DESIGN CRITERIA

Recommend a periodic test procedure and chemical treatment program for each system.

Treat the following systems:

* Glycol water

Provide the initial chemical treatment for all systems based on a complete system fluid analysis prior to the equipment installation. The initial chemical treatment supply of chemicals for each system shall be adequate for the start-up and testing period, for the time the systems are being operated by the contractor for temporary heating and cooling, and for one year after start-up of the system.

Provide electrical devices, motors, wiring and conduit according to the applicable sections of the Electrical Specifications.

MAINTENANCE SERVICE

Furnish service and maintenance of treatment systems for one year from date of substantial completion.

Provide 2 technical service visits to perform field inspections and make water analysis on site. Detail findings in writing on proper practices, chemical treating requirements, and corrective actions needed. Submit two copies of field service report after each visit.

Provide laboratory and technical assistance services for the warranty period.

Include 2-hour training course for operating personnel, instructing them on installation, care, maintenance, testing, and operation of the treatment systems. Arrange course at startup of systems.

Provide site inspection of equipment during scheduled shutdown to evaluate success of the treatment program. Make recommendations in writing based on these inspections.

PART 2 - PRODUCTS

MANUFACTURERS

Betz Entac, Dearborn Div. - W. R. Grace & Co., Fremont Industries, Mitco Water Labs, Mogul Corporation, Nalco Chemical Co., Western Water Management, or approved equal.

SYSTEM CLEANER

Blend of organic alkaline penetrants, emulsifiers, surfactants and corrosion inhibitors that remove grease and petroleum products from the interior of piping systems. Cleaners that contain trisodium phosphate are specifically not acceptable.

GLYCOL

Inhibited ethylene glycol-based material specifically designed for use in closed heat transfer systems. Dow Chemical Dowtherm SR-1, Union Carbide UCARTHERM, or approved equal.

TREATMENT EQUIPMENT

BYPASS FEEDER:

5-gallon minimum capacity, 125 psig working pressure, either a screw type cover or a valved funnel opening to feed chemical into the system, prime coat of paint.

Bypass feeder is used for initial cleaning duty only.

AUTOMATIC GLYCOL FEEDER

Based on products by Wessels Company. Equal products will be acceptable.

Automatic glycol feeder shall be a factory assembled unit consisting of glycol reservoir, pump, automatic pressure-based controls, pressure gauge, all required valving, and fully wired.

Reservoir shall have a minimum storage capacity of 18 gallons. Reservoir shall be translucent so fluid quantity is visible and shall have graduations marked on the tank for visual indication of fluid level. Graduations in minimum intervals of one gallon.

Pump shall be self-priming and close-coupled to the motor not requiring coupling, belts, or similar transmission.

The control system shall function from an internal pressure switch which automatically starts the feed pump when the building system pressure falls below the set point. The supplied pressure switch shall have a range adjustable between 0-50 PSI.

The unit shall have a pressure gauge connected to the system side of the assembly to monitor system pressure.

Include an internal check valve so system pressure does not push back against the pump or into the reservoir.

All controls and pump shall be factory wired at 120 VAC 60 HZ. The assembly shall be equipped with a plug and cord for connection to a standard NEMA 5-20R receptacle.

PART 3 - EXECUTION

PREPARATION

Prior to cleaning, verify that systems are operational, filled, started, and vented. Use water meter to record capacity in each system.

Place terminal control valves in the full-open position

CLEANING SEQUENCE

GENERAL:

Systems are to be cleaned before they are used for any purpose except conduct pressure test before cleaning. Add cleaner to closed systems at concentrations as recommended by the manufacturer. Remove water filter elements from the system before starting circulation. For steam systems, fill boilers only, using the water and cleaner solution.

Use neutralizer agents on recommendation of the system cleaner supplier and approval of the architect/engineer.

Flush open systems with clean water for one hour minimum. Drain completely and refill.

Remove, clean, and replace strainer screens.

Inspect, remove sludge, and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

HOT WATER HEATING SYSTEMS:

Add cleaner to the system water until the M alkalinity value is 250 above that of the initial fill water. Verify the M alkalinity level before and after the addition of the cleaner by means of chemical tests that are observed by the owner's construction representative; include results of all tests in the Operating and Maintenance manuals. Apply heat while circulating, slowly raising temperature to 160°F and maintain for 12 hours minimum; vent all high points to assure 100% system circulation. Remove heat and circulate to 100°F or less; drain system as quickly as possible and refill with clean water. Circulate for 6 hours at design temperature, vent air at all high points, then drain. Refill with clean water and repeat until the system cleaner is removed and the M alkalinity level returns to normal. Remove and clean all strainers. Re-vent the system and install clean filter elements in water filters. Treat with scale and corrosion inhibitors before using the system for building heating or cooling.

GLYCOL WATER SYSTEMS:

Clean and flush as indicated above for hot water heating systems. Verify complete drainage by measuring amount of water used for the initial fill versus the amount actually drained to assure complete removal of the cleaning solution. Remove all traces of chloride from the system; test to verify this removal and submit test results.

GLYCOL WATER SYSTEMS

All water systems for this project shall be glycol water systems.

Completely flush all traces of cleaning chemicals before adding the glycol water mixture to the system. Verify this by chemical test.

Premix the glycol water solution in a polyethylene drum to a concentration of 25% by volume. Use domestic water supply on site to make the solution. Use a hand pump to fill system from the mixing tank. Circulate fluid for several hours, vent all high points where air may collect, add more solution to the system if needed, and test the system for proper concentration of glycol; include copy of test report in the Operating and Maintenance manuals.

Once system is initially filled, fill the automatic glycol feeder to full capacity and connect to the system. Open valves and all system pumps to operate under normal control. Monitor fluid level in glycol feeder for 90 days. At the completion of 90 days, re-fill glycol feeder unit to maximum capacity and feed in fully automatic position.

END OF SECTION 23 25 00

Section 23 31 00 – HVAC Ducts and Casings

PART 1 – GENERAL

SCOPE

This section includes specifications for all duct systems used on this project.

RELATED WORK

Section 23 01 30.51 – HVAC Air Duct Cleaning

Section 23 05 93 - Testing, Adjusting, and Balancing for HVAC

Section 23 33 00 – Air Duct Accessories

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

ANSI SS-EN 485-2	Aluminum and Aluminum Alloys-Sheet, Strip and Plate-Part 2: Mechanical Properties
ASTM B209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM A90	Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
ASTM A623	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
ASTM A527	Specification for General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Lock-Forming Quality
ASTM 924	Standard Specification for General Requirements for Sheet Steel, Metallic-coated by the Hot-dip Method
ASTM C 1071	Specification for Fibrous Glass Duct Lining Insulation
ASTM C 411	Test Method for Hot Surface Performance of High Temperature Thermal Insulation
90A	Standard for the Installation of Air Conditioning and Ventilating Systems
UL 181	Standard for Safety for Factory Made Air Ducts and Air Connectors.
NAIMA	Fibrous Glass Duct Liner Standard

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include manufacturer's data and/or contractor data for the following:

* Schedule of duct systems including material of construction, gauge, pressure class, system class, method of reinforcement, joint construction, fitting construction, and support methods, all with details as appropriate.
* Duct sealant and gasket material.
* Duct liner including data on thermal conductivity, air friction correction factor, and limitation on temperature and velocity.

DESIGN CRITERIA

Construct all ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.

Use material, weight, thickness, gauge, construction and installation methods as outlined in the following SMACNA publications, unless noted otherwise:

* HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005
* HVAC Air Duct Leakage Test Manual, 1st Edition, 1985
* HVAC Systems - Duct Design, 4th Edition, 2006

Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

DELIVERY, STORAGE AND HANDLING

Promptly inspect shipments to ensure that Ductwork is undamaged and complies with the specification.

Protect Ductwork against damage.

Protect Ductwork by storing inside or by durable, waterproof, above ground packaging. Do not store material on grade. Protect Ductwork from dirt, dust, construction debris and foreign material. Where end caps/packaging are provided, take precautions so caps/packaging remain in place and free from damage.

Offsite storage agreements do not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

PART 2 - PRODUCTS

GENERAL

All sheet metal used for construction of duct shall be 24 gauge or heavier except for round and spiral ductwork and spiral duct take-offs 12” and below may be 26 gauge where allowed in SMACNA HVAC Duct Construction Standards, Metal and Flexible, 3rd Edition, 2005.

Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner.

DUCTWORK PRESSURE CLASS

Minimum acceptable duct pressure class, for all ductwork except transfer ductwork, is 2-inch W.G. positive or negative, depending on the application. Transfer ductwork minimum acceptable duct pressure class is 1-inch W.G. positive or negative, depending on the application.

MATERIALS

GALVANIZED STEEL SHEET:

Use ASTM A 653 galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 according to ASTM A90. Provide “Paint Grip” finish or galvanneal sheetmetal for ductwork that will be painted.

Seal all joints and seams watertight

DUCT SEALANT

Manufacturer: 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Hardcast Peal & Seal, Lockformer cold sealant, Mon-Eco Industries, United Sheet Metal, or approved equal. Silicone sealants are not allowed in any type of ductwork installation.

Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.

GASKETS

2 INCH PRESSURE CLASS AND LOWER:

Soft neoprene or butyl gaskets in combination with duct sealant for flanged joints.

PART 3 - EXECUTION

INSTALLATION

Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with architect in the event of any interference.

Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts as required, according to SMACNA HVAC Duct Construction Standards, Figure 4-7, except do not reduce duct to less than six inches in any dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as indicated in SMACNA HVAC Duct Construction Standards, Figure 4-8, Fig. E. In all cases, seal to prevent air leakage.

Test openings for test and balance work will be provided under Section 23 05 93.

Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets and screws or nut, bolts and washers.

Install duct to pitch toward outside air intakes and drain to outside of building. Solder or seal seams to form watertight joints.

Where two different metal ducts meet, the joint shall be installed in such a manner that metal ducts do not contact each other by using proper seal or compound.

Install all motor operated dampers and connect to or install all equipment furnished by others. Blank off all unused portions of louvers, as indicated on the drawings, with 1-1/2-inch board insulation with galvanized sheet metal backing on both sides.

Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.

Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

Provide adequate access to ductwork for cleaning purposes.

Provide temporary capping of ductwork openings to prevent entry of dirt, dust and foreign material.

Protect diffusers, registers and grilles with plastic wrap or some other approved form of protection to maintain dirt and dust free and to prevent entry of dirt, dust and foreign material into the Ductwork.

During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

DUCTWORK SUPPORT

Support ductwork according to SMACNA HVAC Duct Construction Standards, Figure 5-5, except supporting ductwork with secure wire method is not allowed.

Support with 3/32-inch, 7 x 7, stainless steel air-craft cable, with matching fastener rated for 50% of actual load, will be allowed on round ductwork under 12 inches if installed as detailed, with cable double looped on duct and at point of support.

LOW PRESSURE DUCT (Maximum 2-inch pressure class)

Seal all duct, with the exception of transfer ducts, according to SMACNA seal class "A"; all seams, joints, and penetrations shall be sealed.

Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers will not be accepted for balancing dampers.

Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheet metal screws or pop rivets. Trapeze hangers may be used at contractor's option.

CLEANING

Remove all dirt and foreign matter from the entire duct system and clean diffusers, registers, grilles and the inside of air-handling units before operating fans.

Clean duct systems with high power vacuum machines where systems have been used for temporary heat, air-conditioning, or ventilation purposes during construction. Protect equipment that may be harmed by excessive dirt with filters, or bypass during cleaning.

END OF SECTION 23 31 00

Section 23 33 00 – Air Duct Accessories

PART 1 – GENERAL

SCOPE

This sections includes accessories used in the installation of duct systems.

RELATED WORK

Section 23 05 29 – Hanger and Supports for HVAC Piping and Equipment
Section 23 31 00 – HVAC Ducts and Casings

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

NFPA 90A	Standard for Installation of Air Conditioning and Ventilating Systems
SMACNA	HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition, 1995
UL 214	
UL 555 (6th edition)	Standard for Fire Dampers and Ceiling Dampers
UL 555S (4th edition)	Leakage Rated Dampers for Use in Smoke Control Systems

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit for all accessories and include dimensions, capacities, ratings, installation instructions, and appropriate identification.

Include certified test data on dynamic insertion loss, self-noise power levels, and aerodynamic performance of sound attenuators.

Submit manufacturer's color charts where finish color is specified to be selected by the architect/engineer.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

PART 2 - PRODUCTS

MANUAL VOLUME DAMPERS

Manufacturers: Ruskin, Vent Products, Air Balance, or approved equal.

Dampers must be constructed according to SMACNA Fig. 2-12, Fig. 2-13, and notes relating to these figures, except as modified below.

Reinforce all blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" w.c. pressure class or above.

TURNING VANES

Manufacturers: Aero Dyne, Anemostat, Barber-Colman, Hart & Cooley, or approved equal.

Construct turning vanes and runners for square elbows according to SMACNA Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one-dimension changes in the turn according to SMACNA Fig. 2-5 and Fig. 2-6.

FIRE DAMPERS

Manufacturers: Air Balance, Advanced Air, American Warming and Ventilating, Greenheck, Phillips-Aire, Prefco, Ruskin, Safe-Air or approved equal.

STATIC FIRE DAMPERS

Static fire damper assemblies must be UL 555 (6th edition) listed and labeled for static applications (where air systems do not operate during a fire) and meet requirements of NFPA 90A. Damper must be type B curtain type with blades out of the air stream; dampers with blades in the air stream will not be accepted. Damper fire rating to be compatible with the rating of the building assembly in which the damper is used.

SMOKE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS

Manufacturers: Ruskin, Johnson Controls, Air Balance, Advanced Air, American Warming and Ventilating, Greenheck, Safe-Air, Phillips-Aire, Prefco, or approved equal.

Smoke damper assemblies to be UL 555S (4th edition) listed and labeled, and leakage rated at no higher than Class II under UL 555S (4th edition). Unless ratings are indicated elsewhere, dampers should be rated for minimum 2,000 fpm air velocity and 4" static pressure.

Combination fire/smoke damper assemblies to be UL 555(6th edition) and UL 555S (4th edition) listed and labeled and have a fire rating compatible with the rating of the building assembly in which the damper is used, and be leakage rated at no higher than Class II under UL 555S.

Provide factory installed electrically operated dampers with linkage arranged so that the damper is closed on loss of power. For electric actuation, provide electric operated dampers with linkage and UL listed operators arranged so that the damper is closed on a loss of power. All electric actuators will be provided with overload protection to prevent motor from damage when stall condition is encountered. Locate all operators out of the air stream unless large damper size will not allow. Provide form "C" end switches to indicate damper position.

Use airfoil shaped damper blades on the following system:

- Control dampers control dampers are specified in section 23 09 14.
- Smoke detectors **S**moke detectors are furnished and installed by the Electrical Contractor.

ACCESS DOORS

Access door to be designed and constructed for the pressure class of the duct in which the door is to be installed. Doors in exposed areas shall be hinged type with cam sash lock. Hinges shall be steel full length continuous piano type. Doors in concealed spaces may be secured in place with cam sash latches. For both hinged and non-hinged doors provide sufficient number of camp sash latches to provide airtight seal when door is closed. Do not use hinged doors in concealed spaces if this will restrict access. Use minimum 1" deep 24-gauge galvanized steel double wall access doors with minimum 24-gauge galvanized steel frames. For non-galvanized ductwork, use minimum 1" deep double wall access door with frame that shall use materials of construction identical to adjacent ductwork. Provide double neoprene gasket that shall provide seals from the frame to the door and frame to the duct. When access doors are installed in insulated ductwork or equipment provide insulated doors with insulation equivalent to what is provided for adjacent ductwork or equipment. Access doors constructed with sheet metal screw fasteners will not be accepted.

Use insulated, 1-1/2-hour UL 1978 listed and labeled access doors in kitchen exhaust ducts.

FLEXIBLE DUCT

Manufacturers: Anco Products, Clevaflex, Thermaflex, Flexmaster or approved equal.

Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke developed rating of 50 or under according to NFPA 90A.

Suitable for pressures and temperatures involved but not less than a 180°F service temperature and ±2-inch pressure class, depending on the application.

Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum construction may also be used.

Where duct is specified to be insulated, provide a minimum 1-inch fiberglass insulation blanket with maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

DUCT LINING

Manufacturer: Manville, Owens-Corning, Knauf, or approved equal.

1 inch thick, flexible, mat faced insulation made from inorganic glass fibers bonded with a thermosetting resin with thermal conductivity of .25 Btu inch / hour sq.ft. deg F.

Meet erosion testing per UL 181 or ASTM C 1071 for 5000 fpm maximum air velocity. ASTM C 411 maximum operating temperature rating of 250 deg F. ASTM E84 flame spread less than 25 and smoke developed less than 50.

Meet requirements of ASTM C 1338 and ASTM G21 for fungi resistance.

Install liner using adhesive conforming to ASTM C 916.

FLASHINGS

Provide flashing to completely weatherproof connection of ductwork to louvers. Flashing to be constructed of material similar to louver material.

Flashing and counterflashing for roof curbs will be provided by others.

Flashing and curbs for duct and pipe penetrations of roof assemblies to be according to details.

DUCT FLEXIBLE CONNECTIONS

Material to be fire retardant, be UL 214 listed, and meet the requirements of NFPA 90A.

Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and airtight. Connections to have adequate flexibility and width to allow for thermal expansion/contraction, vibration of connected equipment, and other movement.

Use coated glass fiber fabric for all applications. Material for inside applications other than corrosive environments, fume exhaust, or kitchen exhaust to be double coated with neoprene, air and watertight, suitable for temperatures between -10°F. and 200°F. and have a nominal weight of 30 ounces per square yard. Material used for outdoor applications other than corrosive environments, fume exhaust, or kitchen exhaust to be double coated with Hypalon, air and watertight, suitable for temperatures between -10°F. and 250°F. and have a nominal wight of 26 ounces per square yard.

HOODS FOR INTAKE AND EXHAUST

Manufacturers: Acme, Ammerman, Carnes, Cook, Greenheck, Louvers and Dampers, Penn, or approved equal.

Use low silhouette type hoods.

Use louvered penthouse type hoods with drainable blade louvers.

Construct hoods of aluminum.

Construct hoods of galvanized steel with a baked enamel finish; color to be selected by the architect during the submittal stage.

Provide bird screen and motor operated damper for each hood.

LOUVERS

Louvers are specified in the architectural section of these specifications.

Manufacturers: Airolite K6776, Industrial Louvers 658, American Warming and Ventilating LE-31, Construction Specialties 6177, Ruskin ELF6375DX or approved equal.

Similar to Airolite Type K6776, extruded aluminum alloy not less than 12 gauge (.081" thick), 6063 series frame and blades, all-welded assembly, 35 degree or 45-degree blades with water baffle, 6 inches thick. Provide with bird screen of ½” x ½” mesh aluminum in 12-gauge aluminum frame and an aluminum sill. [Locate the bird screen on the outside of the louver where indicated on the drawings.] Locate the bird screen inside of the louver unless noted otherwise.

Louver to bear the AMCA certified ratings seal for both air performance and water penetration, having a free area not less than 50% based on a 48" x 48" section, a water penetration less than 0.1 oz/square foot under AMCA test at 1000 feet per minute, and an intake pressure drop less than 0.20 inches of water at 1000 feet per minute.

Finish to be anodized or Kynar 500 in a custom color to be selected by the architect. Furnish sufficient paint in the same color as the louver to paint the outer surface of panels over unused portions of louvers and to paint the interior portion of ductwork visible through the louvers.

PART 3 - EXECUTION

MANUAL VOLUME DAMPERS

Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

TURNING VANES

Install turning vanes in all rectangular, mitered elbows according to SMACNA standards and/or manufacturer's recommendations.

Install double wall, airfoil, 2-inch radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4-1/2-inch radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.

If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheet metal turning vanes according to SMACNA Figure 2-5 and Figure 2-6.

FIRE DAMPERS

Install dampers in strict accordance with manufacturer's installation instructions. Install damper sleeves with retaining angles on both sides of rated partition. Connections of ductwork to fire damper assemblies to be as specified on the installation instructions. Where it is necessary to set dampers out from the rated wall, install a sleeve extension encased in two hour rated fire proofing insulation. Install an access door at each fire damper, located to permit resetting the damper replacing the fusible link.

Manually test each fire damper for proper operation by removing the fusible link. Repair or replace any fire damper that does not close completely. Re-install fusible link after test.

SMOKE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS

Install smoke dampers in locations indicated on the drawings according to the manufacturer's instructions. Install an access door adjacent to each damper for inspection and cleaning. Coordinate damper linkage with operators so the dampers are closed when the air system is not operating.

Install combination fire/smoke dampers as specified above for fire dampers. Coordinate damper linkage with operators so the dampers are closed when the air system is not operating.

CONTROL DAMPERS

Install dampers in locations indicated on the drawings, as detailed, and according to the manufacturer's instructions. Install blank-off plates or transitions where required for proper mixing of airstreams in mixing plenums. Provide adequate operating clearance and access to the operator. Install an access door adjacent to each control damper for inspection and maintenance.

SMOKE DETECTORS

Installation and wiring of detectors will be by the Electrical Contractor. Install an access door at each detector location.

ACCESS DOORS

Install access doors where specified, indicated on the drawings, and in locations where maintenance, service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, and control devices needing periodic maintenance.

Size and numbers of duct access doors to be sufficient to perform the intended service. Minimum access door size shall be 8 x 8-inch size for hand access, 18 x 18-inch size for shoulder access, or other size as indicated. Install access doors on both inlet and outlet sides of reheat coils as well as other duct mounted coils.

Label fire, smoke and combination fire smoke dampers on the exterior surface of ductwork directly adjacent to access doors using a minimum of 0.5-inch height lettering reading, “SMOKE DAMPER” or “FIRE DAMPER”. Smoke and combination fire smoke dampers shall also include a second line listing the individual damper tag. The tags must be coordinated with the mechanical schedules. Utilize stencils or manufactured labels. All other forms of identification are unacceptable. All labels shall be clearly visible from the ceiling access point.

FLEXIBLE DUCT

Flexible duct may only be used for final connections of air inlets and outlets at diffuser, register, and grille locations. Where flexible duct is used, it shall be the minimum length required to make the final connections, but no greater than 5 feet in length, and have no more than one 90-degree bend.

Secure inner jacket of flexible duct in place with stainless steel metal band clamp. Secure insulation vapor barrier jacket in place with steel or nylon draw band. Sheetmetal screws and/or duct tape will not be accepted.

Flexible duct used to compensate for misalignment of main duct or branch duct will not be accepted.

Individual sections of flexible ductwork shall be of one-piece construction. Splicing of short sections will not be accepted.

Flexible ductwork used as transfer duct shall be sized for a maximum velocity of 300 fpm.

Penetration of any partition, wall, or floor with flexible duct will not be accepted.

DUCT LINING

Apply lining to the following ductwork: (As scheduled on the Drawings.)

Do not apply lining to the following ductwork:

- Outside air ductwork.
- Shower exhaust ductwork.

Install liner in compliance with the latest edition of NAIMA’s Fibrous Glass Duct Liner Standard. Locate longitudinal joints at the corners of duct only. Cut and fit to assure lapped, compressed joints. Coat all transverse and longitudinal joints and edges with adhesive. Provide metal nosing on leading edge where lined duct is preceded by unlined duct. Adhere liner to duct with full coverage area of adhesive. Additionally, secure liner to duct using mechanical fasteners spaced as recommended by the liner manufacturer without compressing liner more than 1/8” with the fasteners.

FLASHINGS

Flashing for roof curbs, equipment supports, or rails located on roof, will be installed by others.

DUCT FLEXIBLE CONNECTIONS

Install at all duct connections to rotating or vibrating equipment, including air handling units (unless unit is internally isolated), fans, or other motorized equipment according to SMACNA Figure 2-19. Install thrust restraints to prevent excess strain on duct flexible connections at fan inlets and outlets; see Related Work.

For applications in corrosive environments or fume exhaust systems, use a double layer of the Teflon¿ coated fabric when making the connector.

HOODS FOR INTAKE AND EXHAUST

Install in locations indicated on the drawings, coordinating the roof opening location with the General Contractor. Curbs are covered in Section 23 05 29.

LOUVERS

Louvers are furnished by the Mechanical Contractor and installed by others.

Furnish louvers to the General Contractor for mounting in exterior walls. Connect outside air intake duct to the louver, sealing all connections air and watertight.

Provide bird screen on inside of active louver area where none is provided with louvers. Where louvers are equipped with inside bird screen, remove screen at all locations where duct connections are not made.

Install insulated metal panel on unused portion of louver. Panels must be sealed weathertight to louver assembly with flashing as required for proper drainage to outside of building. Paint outside surface of panel to match louver prior to installation. Where ductwork is visible through louver when viewed from outside the building, paint inside of duct to match louver color.

END OF SECTION 23 33 00

Section 23 34 00 – HVAC Fans

PART 1 – GENERAL

SCOPE

This section includes specifications for fans that are not an integral part of a manufactured device.

RELATED WORK

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment
Section 23 05 13 - Common Motor Requirements for HVAC Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

AMCA 203	AMCA Fan Application Manual - Troubleshooting
AMCA 210	Laboratory Method of Testing Fans for Rating
AMCA 300	Reverberant Room Method for Sound Testing of Fans
NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
NFPA 96	Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations
UL 762	Power Roof Ventilators For Restaurant Exhaust Appliances

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include dimensions, capacities, fan curves, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification and vibration isolation for all equipment. Sound power levels to be based on tests performed according to AMCA Standard 300.

Submit color selection charts for equipment where applicable.

Fan curves shall indicate the relationship of CFM to static or total pressure for various fan speeds. Brake horsepower, recommended selection range, and limits of operation are to also be indicated on the curves. Indicate operating point on the fan curves at design air quantity and indicate the manufacturer's recommended drive loss factor for the specific application. Tabular fan performance data is not acceptable.

For variable air volume application, include data which indicates the effect of capacity control devices, such as inlet vanes, on performance.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

Tested and certify all fans according to the applicable AMCA test code.

Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.

Consider drive efficiency in motor selection according to manufacturer's published recommendation or according to AMCA Publication 203, Appendix L.

Where inlet and outlet ductwork at any fan is changed from that shown on the drawings, provide any motor, drive and/or wiring changes required due to increased static pressure or baffling necessary to prevent uneven airflow or improve mixing.

All internal insulation and other components exposed to the airstream are to meet the flame spread and smoke ratings contained in NFPA 90A.

All roof mounted equipment to be provided with curbs or equipment stands according to specification in Section 23 05 29.

PART 2 - PRODUCTS

GENERAL

Use fan size, class, type, arrangement, and capacity as scheduled.

Furnish complete with motors, wheels, drive assemblies, bearings, vibration isolation devices, and accessories required for specified performance and proper operation. All single phase motors to have inherent thermal overload protection.

Provide variable pitch sheaves for drives 3 hp and smaller, fixed pitch sheaves for drives 5 hp and larger. Design all drives for 150% of motor rating.

Use OSHA approved belt guards that totally enclose the entire drive. Construct guards of expanded metal to allow for ventilation; provide tachometer openings at shaft locations.

Statically and dynamically balance all fans so they operate without objectionable noise or vibration.

IN-LINE FANS

Manufacturers: CFM, Fan-tech, or approved equal.

Construct housing of formed steel with reinforcing to prevent distortion. Furnish with integral inlet and outlet duct connections. Direct drive fans suitable for use with variable speed motor control mounted in the airstream. Permanently lubricated bearings. Standard painted finish.

Design all vertically mounted fans to withstand the vertical thrust loads.

Provide all accessories as Scheduled.

POWER ROOF EXHAUST FANS

Manufacturers: Carnes, Greenheck, Penn, Jenn-Air, Cook, ACME, or approved equal.

Provide upblast or downblast units, as scheduled, with aluminum housing, non-overloading type centrifugal wheel, inlet cone, factory mounted and wired motor and disconnect switch, and bird screen.

Electrical Contractor will provide disconnect switches and thermal overload protection for units with three phase motors.

Upblast units to have motor, bearings, and drives completely enclosed and isolated from the exhaust air stream with ventilation provided by outside air. Units handling grease laden vapors to be U.L. listed for conveying such vapors, operating continuously at 300 degrees F.

PART 3 - EXECUTION

INSTALLATION

Install as shown on the drawings, as detailed, and according to manufacturer's installation instructions. On units provided with a drain connection, reduce drain connection down to ½” fitting and leave open.

Install thrust restraints according to the requirements of Section 23 05 48.

Contractor shall balance blade assembly of destratification fans after installation to assure stable operation.

END OF SECTION 23 34 00

Section 23 34 35 – Large Destratification Fans

PART 1 – GENERAL

SCOPE

RELATED WORK

Division 16

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

UL 507/CSA Electric Fans

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, and material of construction, ratings, weights, manufacturer's installation requirements and performance limitations.

Submit manufacturer's installation instructions including required clearance to structural members.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DELIVERY, STORAGE AND HANDLING

Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.

WARRANTY

Provide a one year parts and labor warranty on the entire unit beginning upon substantial completion of project.

Provide a 15 year parts warranty on the entire fan assembly.

PART 2 - PRODUCTS

LARGE DE-STRATIFICATION FANS

Manufacturers: Big Ass Fans or approved equal product.

Fan shall be a Big Ass Fan Model “Powerfoil X2.0” provided in 14 foot diameter configuration.

Fan shall be equipped with a 1.5 HP motor suitable for variable speed operation.

Provide factory-assembled reduction gearbox so fan has a maximum speed of 95 RPM (plus/minus 15% for equal products).

Provide and install a remote-mounted fan speed controller with single line input, integral disconnecting means, “on-off” manual selector switch, and fully adjustable speed selector switch. Controller shall be suitable for 240 VAC, single phase power supply.

Fans with controllers mounted on the fan assembly and a remote control panel accessible from the floor will be acceptable.

Provide redundant safety features consisting of airfoil retainers, hub clips, safety cables, and minimum Grade 8 bolts and fasteners.

PART 3 - EXECUTION

The Mechanical Contractor is responsible to supply the fan and to physically mount the fan to the structure. Provide and install supplemental structural steel mounted components (angle iron, etc.) to support fan. Construct a mounting base suitable for mounting of the fan per the fan manufacturer’s directions.

Any structural steel support fabricated by the Mechanical Contractor shall be submitted to the architect for review by the structural engineer prior to final fabrication and installation. Include accurate description of materials proposed to be used and method for fabrication.

Mount the fan at the correct elevation to maintain clearances from structural members and mechanical ductwork as recommended by the fan manufacturers. Fans shall be mounted as high as possible but verify all roof pitches as necessary.

Mount fan and secure to mounting base in full compliance with the fan manufacturer’s directions. Install all safety devices supplied by the fan manufacturer. Manually rotate blades to ensure they meet all clearance requirements before connecting power to fan.

Fans shall be balanced by the Mechanical Contractor per the manufacturer’s directions.

Wall-mounted controls shall be turned over to the Electrical Contractor for mounting and wiring. Supply the Electrical Contractor with manufacturer-provided field wiring diagrams and supply any information to the Electrical Contractor.

Provide the services of a factory-authorized start-up technician to perform all pre-start inspection services and to perform initial start-up of the fans.

END OF SECTION 23 34 35

Section 23 37 13 – Diffusers, Registers & Grilles

PART 1 – GENERAL

SCOPE

This section includes specifications for air terminal equipment.

RELATED WORK

Section 23 31 00 - HVAC Ducts and Casings
Section 23 33 00 - Air Duct Accessories
Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

UL 181 - Factory-Made Air Ducts and Connectors.

ARI-ADC Standard 880

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SUBMITTALS

Refer to division 1, General Conditions, Submittals.

Furnish submittal information including, but not limited to, the following:

- Manufacturer's name and model number
- Identification as referenced in the documents
- Capacities/ratings
- Materials of construction
- Sound ratings
- Dimensions
- Finish
- Color selection charts where applicable
- Manufacturer's installation instructions
- All other appropriate data

DESIGN CRITERIA

All performance data shall be based on tests conducted according to Air Diffusion Council (ADC) Test Code 1062 GRD 84.

PART 2 - PRODUCTS

MANUFACTURERS

Manufacturers: Carnes, Krueger, Titus, Metal-Aire, and E.H. Price, and United Sheet Metal.

Acceptable manufacturers for specific products are listed under each item.

LINEAR SLOT DIFFUSERS

Titus Series ML, Carnes Series CH, Metal Aire Series 6000, Price Series SDS

Extruded aluminum with frame type appropriate to installation with diffuser elements being removable from frame. Both air pattern and flow rate adjustment with air pattern having full 180-degree adjustment. Single slot diffuser vanes segmented on 2- or 3-foot centers.

Diffuser lengths and slot sizes as shown on drawings and/or as scheduled.

White, baked enamel finish or powder coat finish, unless otherwise indicated. Flat black diffuser vanes and frame interior.

Provide diffusers with uninsulated galvanized steel plenum. Plenums constructed for specific diffuser frame & border type. Provide round or oval inlet collar designed to fit standard flexible duct sizes.

LINEAR BAR DIFFUSERS AND GRILLES

Titus Series CT, Carnes CC, CT or CW, Metal Aire Series 2000, Price series LBP.

Extruded aluminum with frame type appropriate to side wall, sill or ceiling installation as indicated.

Diffuser and grille lengths, blade spacing and blank off strips as shown on drawings and/or as scheduled.

Where frame and border types allow provide diffusers used for supply air with straightening or equalizing vanes. Fixed blades at 0- or 15-degree deflection as scheduled. Bar support maximum 9" spacing.

White, anodized aluminum finish unless otherwise indicated

Provide alignment strips/wires for end-to-end joining of sections for a continuous appearance when scheduled lengths exceed standard manufacturer lengths.

ROUND CEILING DIFFUSERS

Titus Series TMRA, Carnes Series SSAA, Metal Aire Series 3100, Price Series RCDA

Spun aluminum or steel with uniform 360º discharge pattern.

Adjustable inner cones surrounded by a ceiling plate collar designed to reduce ceiling smudges.

Diffusers as shown on drawings and/or as scheduled.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

SQUARE CEILING DIFFUSERS - Plaque

Titus model OMNI, Carnes series SFPA/SHPA, Price model SMDP, Metal Aire series 5750, and Krueger series PLQ/5PLQ.

Aluminum (Steel) unless otherwise indicated, louvered face furnished with frame type appropriate to installation.

Directional blow pattern as shown on the drawings and/or as scheduled.

One-piece removable square face plaque with one-piece backpan.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

SQUARE CEILING DIFFUSERS

Titus model TDC/TDC-AA, Carnes series SK or SE, Price model SMD/AMD, Metal Aire series 5500 or 5500S, and Krueger series S.

Aluminum (Steel) unless otherwise indicated, louvered face furnished with frame type appropriate to installation.

Directional blow pattern as shown on the drawings and/or as scheduled.

One-piece construction louver cones with no corner joints.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

PLENUM SLOT DIFFUSER

180 degree adjustable

Titus model TBD-30, Carnes model DA, Price model TBD3, Metal Aire series 6600, and Krueger series

PTBA, Raymon-Donco Series SAT/XC.

Steel, furnished with T-bars compatible with ceiling components. Vane air pattern and flow rate adjustment with air pattern having full 180-degree adjustment.

Provide 24 gauge galvanized steel (uninsulated) insulated plenum. Provide round or oval inlet collar designed to fit standard flexible duct sizes.

Double metal thickness slot face.

White, baked enamel finish or powder coat finish, unless otherwise indicated. Flat black diffuser vanes and frame interior.

SIDE-WALL REGISTERS AND GRILLES

Titus series 300 (supply) and series 350 (return/exhaust), Carnes model R series, Price model 520 (Supply) or 530 (return/exhaust), Metal Aire series V4000 or H4000, Krueger series 880.

Aluminum (Steel) unless otherwise indicated, with frame type appropriate to installation.

Double deflection type blade supply registers and supply grilles allow deflection adjustment in all direction.

Opposed blade volume control damper supply registers, operable from face.

Fixed blade (0-degree, 45 degree) core return and exhaust registers and grilles.

Opposed blade volume control damper return registers, operable from face.

Register and grille sizes as shown on drawings and/or as scheduled.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

Screw holes on surface counter sunk to accept recessed type screws.

EGGCRATE GRILLE

Titus model 50, Carnes model RAE or RAT, Price model 80, Metal Aire model CC, Krueger model

EGC.

Aluminum construction with frame type appropriate to installation.

Grille face 1/2" x 1/2" or 1" x 1" grid pattern 1" deep with a minimum of 85% free area.

Grille sizes and finishes as shown on drawings and/or as scheduled.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

Screw holes on surface counter sunk to accept recessed type screws.

HEAVY DUTY SIDE-WALL RETURN/EXHAUST GRILLE

Titus model 30, Carnes Sturdicore, Price 91, Metal Aire series SBG, Krueger series 480, Price model 91.

Grille border 16-gauge steel and grille blades 14-gauge steel suitable for gymnasium applications.

Fixed blade (0-degree, 45 degree).

Grille sizes as shown on drawings and/or as scheduled.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

DOOR GRILLE

Titus Series 700, Carnes Series RF or RG, Metal Aire Series DG, Price ATG/STG

Aluminum (Steel). Sight tight.

Grille sizes, frame types, and finishes as shown on drawings and/or as scheduled.

White, baked enamel finish or powder coat finish, unless otherwise indicated.

PART 3 - EXECUTION

INSTALLATION

Install grilles, registers and diffusers as shown on drawings and according to manufacturer's instructions.

Furnish diffusers with equalizing grids where it is not possible to maintain minimum 2 duct diameter straight duct into diffuser. Equalizing grids shall consist of individually adjustable vanes designed for equalizing airflow into diffuser neck and providing directional control of airflow.

Unless otherwise indicated, size ductwork drops to diffusers or grilles to match unit collar size.

Seal connections between ductwork drops and diffusers/grilles airtight.

Blank off unused portion of linear slot diffusers and linear bar diffusers and grilles.

Where diffusers, registers and grilles cannot be installed to avoid seeing inside duct, paint inside of duct with flat black paint to reduce visibility.

In clean rooms and animal holding rooms, caulk space between diffuser or grille and ceiling or wall to be air and watertight. User clear, non-hardening silicone sealant compatible with ceiling or wall surfaces. Sealant shall be resistant to microbiological growth.

END OF SECTION 23 37 13

Section 23 52 00 – Heating Boilers

PART 1 - GENERAL

SCOPE

This section includes specifications for hot water and steam heating equipment.

RELATED WORK

Section 23 21 13 – Hydronic Piping

Section 23 05 23 – General Duty Valves for HVAC Piping

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASME CSD-1 Control and Safety Devices for Automatically Fired Boilers

ASME Boiler and Pressure Vessel Code IV - Rules for Construction of Heating Boilers

NFPA 70 National Electric Code

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions

Energy Efficiency

All boilers with a capacity of 300,000 btu/hr input must meet the efficiencies specified. Minimum boiler efficiencies are based on Federal Energy Management Program (FEMP) recommendations.

SUBMITTALS

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, and material of construction, ratings, weights, manufacturer's installation requirements and performance limitations.

Submit manufacturer's installation instructions including required clearance to combustible materials.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

Registration

Complete Boiler and Unfired Pressure Vessel (UPV) Installation Registration and forward to the Department of Safety and Professional Services according to the Wisconsin Administrative Code Chapter SPS 341.24.

WARRANTY

Sealed combustion boiler, condensing, hi-efficiency, (modular,) helical heat exchanger/combustion chamber design that will be self-supporting and warranted for a period of 10 years to withstand thermal shock. Heat exchanger shall be warranted against leakage for period of 10 years.

PART 2 - PRODUCTS

HIGH EFFICIENCY CONDENSING BOILER

SEALED COMBUSTION BOILER, STAINLESS STEEL WATER TUBE, CONDENSING, MODULAR (GIANNONI HEAT EXCHANGER)

Manufactures: Camus – Dynamax, HTP, Peerless – Pinnacle, Laars – Neo Therm, NTI – New York Thermal

Provide units with capacity and operating characteristics indicated on schedules.

Boiler ASME stamped. Boiler designed and tested per ANSI Z21.13. Furnish a relief valve in compliance with ASME section IV and set at 30 psig. All internal combustion chamber, and internal burner components, shall be manufactured with stainless steel materials suitable to withstand constant operation

under condensing conditions. Combustion chamber shall be sealed and completely enclosed and shall have a condensate drain to discharge any condensate buildup.

Boiler minimum efficiency of 94%+ per BTS 2000, and operation in the condensing mode with inlet temperatures as low as 90 F.

Pre-mix stainless steel burner design to allow modulation of fuel and air for a minimum of 5:1 turndown.

Combustion air intake capable of accepting either free mechanical room air, or direct outside air through a sealed intake pipe of the length and diameter shown on drawings and of material required by the Boiler manufacturer. Provide inlet/outlet combustion vent temperature fittings with direct outside air application.

Category II, III, or IV flu vent connection as appropriate for installation, for vertical, horizontal and sidewall venting. The vent outlet shall be compatible with installation.

Baked enamel finish Boiler metal jacket with removal panels for maintenance access.

Inlet and outlet temperature gauge to monitor inlet and outlet water temperatures.

Provide a microprocessor controller capable of pre-purge, post purge, burner modulation and boiler operation; adjustable temperature differential set points; LED diagnostic light to indicate normal operation and to assist with troubleshooting; a set of dry pump contacts; and a set of trouble alarm contacts.

PART 3 - EXECUTION

INSTALLATION

Install units as shown on plans, as detailed, and according to manufacturer's installation instructions.

Set units on concrete housekeeping pads.

Install all items shipped loose by equipment manufacturer under supervision of equipment manufacturer's field service personnel.

BOILERS

After piping system has been flushed, boil out boilers using chemical, and procedure as recommended by boiler manufacturer. Perform boil-out under supervision of boiler manufacturer's representative.

Manufacturer shall verify in writing that boilers have been cleaned according to their recommendations and are ready for operation.

Isolate boilers from piping system during boil-out.

Pipe vents from gas train to atmosphere. Size of each vent shall not be less than connection size to device.

Pipe boiler drains to nearest floor drains.

Owner's representative and/or engineer will observe boil-out. Contractor must notify engineer at least 72 hours prior to boil-out.

Install gas pressure gauges at downstream of gas pressure regulators.

END OF SECTION 23 52 00

Section 23 54 00 – Infrared Gas-Fired Heating Units

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC
Section 23 11 00 - Facility Fuel Piping

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI Z223.1 National Fuel Gas Code
NFPA 70 National Electric Code

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit infrared heating unit shop drawings including the following information: specific manufacturer and model numbers, dimensional and weight data, required clearances, materials of construction, capacities and ratings, stages of capacity, component information, size and location of piping connections, electrical connections, wiring diagrams and information for all specialties and accessories.

Submit manufacturer's installation and start-up instructions, maintenance data, troubleshooting guide, parts lists, controls and accessories.

At substantial completion, submit warranty certificate and copy of start-up report.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DELIVERY, STORAGE AND HANDLING

Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.

Ship units to jobsite fully assembled

WARRANTY

Provide a one year parts and labor warranty on the entire unit beginning upon substantial completion of project.

PART 2 - PRODUCTS

INFRARED HEATING UNITS

Manufacturers: Detroit Radiant, Reznor, Superior or approved equal.

General

Radiant Heater Unit System shall be provided that is:

- CGA approved.
- Fitted for Natural Gas and LPG operation.
- Complete with hangers, thermostats, vent terminals, and/or other accessories as noted on the plan.

Heaters shall be provided with a low/high firing rate and a heat exchanger length as scheduled on the Drawings.

Manufacturer’s published warranty covering all components for a period of 36 months and covering the heat exchanger for a period of at least 120 months shall be supplied.

Clearance to combustibles shall be as specified.

Approved stainless steel flexible gas connectors shall be provided.

The Heater Unit shall operate at a minimum inlet gas pressure of 5 in. W.C. for Natural Gas and 11 in. for LPG, and draw no more than 1A @ 120VAC, 60Hz.

Equipment Components

Ignition shall be direct spark with ignition taking place within the burner cup for reliability.

Ignition control shall
- make 3 ignition attempts before lockout
- shall recycle again in one hour with 3 ignition attempts
- shall have a lighted diagnostic display capability
- shall have openly accessible sense current measurement contacts within the housing
- shall have a blower post purge function
- shall accept 24V thermostat wiring

Air blower motor shall be totally enclosed, requiring no oiling and shall be equipped with a thermal overload switch.

Gas and electric controls shall be separated from the combustion air stream.

The burner shall be serviceable from either side while in operation.

Burner shall be equipped with clearly visible power ON and HIGH FIRE lights

Gas valve shall be of the slow opening type.

Air pressure proving switch shall be an integral part of burner safety control system.

Burner housing shall be constructed of 18ga corrosion resistant steel and coated with powder epoxy paint.

Outside air adapters and flue connectors shall be provided as standard equipment.

Combustion air inlet hood and vent terminals shall be provided as standard equipment.

Burner box surface temperature shall not exceed 27 C (80 F) at any point during operation.

All operating components shall be enclosed in sealed burner housing.

Burner shall be equipped with a flame sight port safely usable while the unit is running during service.

Reflectors shall be mill finish aluminum, ASTM 1100, with 10 reflective surfaces.

Reflector material shall be at least 0.024 inches thick (per CGA code).

Reflector end caps shall be supplied as standard and fitted to the end of each reflector run to reduce convective heat loss.

Reflectors shall extend below the bottom surface of the radiant tube.

Directing of radiant pattern shall be accomplished through use of side shields or bottom shields only.

Couplings shall be of aluminized steel, be twelve inches in length with two draw bands of 2 inch wide by 0.0625 (16ga) aluminized steel.

Radiant heat exchanger tubing shall be seamless welded 16ga thick either heat treated aluminised steel or stainless steel.

Two stage gas valve

Burner box is sealed with silicone in the corners and joints

Rubber gaskets are used instead of fiber

Weather resistant electrical components are used for exterior connections

PART 3 - EXECUTION

Installation must comply with manufacturer supplied Instruction Manual, all applicable local codes and/or gas utility requirements. In the absence of any of the former, reference should be made to CAN 1-B149.1 and B149.2 Installation Codes in Canada and ANSI Z223.1 in the US.

Heater units must be wired according to the National Electric Code, ANSI/NFPA 70 in the US, as well as local ordinances.

Heater Units shall be suspended according to manufacturer's instruction with chair and turnbuckles exceeding 150lb pull test. (3/8 - 4inch turnbuckles and 2/0 chair).

The Mechanical Contractor is responsible for all hanging support of the heaters. Provide supplemental angles, channels, and similar structural steel items.

All low voltage wiring is the responsibility of the Mechanical Contractor. All low voltage wiring shall be routed in EMT conduit.

Provide and install digital room thermostats for the heaters. A single thermostat may control both heaters. When commonly vented, the infrared heaters may be "master-slave" configured and operated simultaneously.

END OF SECTION 23 54 00

Section 23 57 33 – Vertical Ground Loop Heat Exchanger, Pipe and Accessories

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 23 05 23 - General-Duty Valves for HVAC Piping

Section 23 05 15 - Piping Specialties

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

Section 23 07 00 - HVAC Insulation

Section 23 25 00 - HVAC Water Treatment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM D1693	Standard Test for Environmental Stress Cracking of Ethylene Plastics.
ASTM D2239-03	Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter
ASTM D2683-04	Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled PE Pipe and Tubing
ASTM D3350	Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.
ASTM D 3261-03	Standard Specification for Butt Heat Fusion PE Plastic Fittings for PE Pipe and Tubing

International Ground Source Heat Pump Association (IGSHPA)

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit manufacturer’s catalog sheets, specifications, and installation instructions for each item specified.

QUALITY ASSURANCE

Geothermal System Installer’s Qualifications Data:

Name of each person who will be performing the geothermal work and their employer’s name, business address and telephone.

Names and addresses of 3 similar projects that each person has worked on.

Copy of installer’s personal experience demonstrating the use of thermal fusion techniques for polyethylene piping.

The persons performing geothermal work shall be personally trained in polyethylene pipe fusion techniques by IGSHPA or piping manufacturer, personally experienced in geothermal work and shall have been regularly employed by a Company performing geothermal work for a minimum of 2 years.

Geothermal System Supervisor’s Qualifications Data:

Name of person overseeing the geothermal work and their name, business address and telephone number.

Names and addresses of three similar projects that the supervisor has overseen during the past 5 years.

Copy of installer’s personal experience demonstrating the use of thermal fusion techniques for polyethylene piping.

The supervisor overseeing the geothermal work shall be personally trained in polyethylene pipe fusing techniques by IGSHPA or piping manufacturing, personally experienced in geothermal work, and shall have been regularly employed by a Company performing geothermal work for a minimum of 2 years.

Geothermal System Contractor’s Qualifications Data:

Names and addresses of three geothermal projects that the contractor has completed during the past 5 years.

The contractor shall have completed geothermal work on at least three projects with vertical boreholes within the last 5 years.

IGSHPA Installation Manuals: Maintain one copy on site for review. CSA C448-02: Maintain one copy on site for review.

REGULATORY REQUIREMENTS

Perform field testing of piping systems in complete accordance with the local utilities and other agencies having jurisdiction and as specified.

Fully comply with Wisconsin Department of Natural Resources regulations for Heat Exchange Drilling and Well Construction.

PRODUCT CONDITION

Protection: During test work, protect adjacent buildings, equipment, vehicles, etc., against damage from testing activities.

SEQUENCING AND SCHEDULING

Transmit written notification of proposed date and time of tests to the engineer at least two days in advance of such tests.

Perform cleaning and testing work in the presence of owner's representative.

WARRANTY

Manufacturer's Warranty: Minimum 50 years warranty for polyethylene piping.

Special Warranty: 25 years for butt fusion welds in polyethylene piping against leakage.

WATER, SILT AND SOIL CONTAINMENT AND REMOVAL

The contractor shall submit a detailed proposal outlining his proposed methodology for containing, removing and runoffs created by the well drilling and piping installation.

Dewater each borehole during drilling utilizing an interceptor and water sump tank arrangement. Remove water from site in a manner according to all authorities having jurisdiction.

PART 2 - PRODUCTS

HIGH DENSITY POLYETHYLENE (P.E.) PIPE AND FITTINGS

Pipe and fittings shall be manufactured based on polymers made with ethylene as the sole monomer, which meet the requirements of PE Type III for water distribution.

PE Type III pipe shall have a 23.2 kPa design stress at 23°C which is listed by the plastics pipe institute (PPI).

Use SDR-11 tubing for vertical bore holes

Use SDR-15.5 for horizontal transfer piping.

The piping shall be PE3408 (high density polyethylene) with minimum cell classification 345434C per ASTM D 3350. Resistance to environmental stress cracking is critical to long life expectancy. Therefore, as a more stringent requirement, the piping shall experience zero failures (Fo) after 5,000 hours under condition "C" (100% reagent @ 100°C) when tested according to ASTM D1693. A 50 year limited warranty (in writing) must be issued by the pipe manufacturer. U-type fittings shall be shop fabricated under quality controlled conditions of the same material designation and shall be ASTM D-3261 certified.

Pipe shall conform to ASTM D3035 and ASTM D3261 for butt fusion fittings. U-bend joints shall be butt heat fused or socket welded.

Pipe must be designed and fabricated by manufacturer specifically for geothermal heat pump applications.

The complete assembly of piping within the borehole must be continuous without any joints except at the bottom U-BEND located where only a thermally fused joint or socket welded joint will be acceptable.

All piping shall be sealed at the factory and contain a compressed air charge. The presence of the air charge must be witnessed at the site prior to hydrostatic testing. Piping without an air charge will not be accepted.

ANTI-FREEZE

Provide a 25% by volume solution of polypropylene glycol charge and water for all the entire ground source heat pump closed loop piping.

The performance characteristics shall be as follows:

Viscosity shall be no moiré than 5.00 centipoise at –1.1°C with blend for – 9.4°C freeze protection.

Specific heat shall be 1.05 at 21°C with blend for –9.4°C freeze protection.

Specific gravity shall be 0.982 at 10°C with blend for –9.4°C freeze.

Pressure drop and Reynolds Number for a 11.3 l/m flow in NPS ¾ SDR-11 PE pipe of a –1.1°C mixture for a –9.4°C freeze protected blend shall be no more than 0.86 m of HD per 30.0 m of pipe and no less than Re = 2028 respectively.

The fluid shall mix easily and readily with water and shall not damage or corrode common tools.

The fluid shall have a good or excellent material compatibility with iron, copper, red and yellow brass, polyethylene, PVC, Viton, Buna “n” neoprene and nylon and shall include an oxygen scavenger blend to reduce any corrosion capability. The fluid shall not have a low surface tension to prevent leakage.

The fluid shall have a NFPA 704 Health rating of 0 (least risk).

The contractor shall provide a certified test report from a recognized lab stating glycol concentration.

The product shall be available in plastic 19 liter pails, plastic 208 liter drums, or bulk tanker.

BOREHOLE GROUT

Provide grout for each of the boreholes as indicated on the drawings.

Grout shall be a thermally-enhanced product as follows:

- Thermal conductivity of approximately 1.00 BTU/hr.-ft.-degree F.
- Density of approximately 10.5 bags per gallon.
- Approximately 32.41% solids.
- Approximately 26.65% active solids.
- Permeability of <1x10(-7) cm/s.

Grout based on a “Powertec” combined with “TG Lite” as manufactured by GeoPro, Inc. Similar products will be acceptable.

PART 3 - EXECUTION

GEOTHERMAL BOREHOLE PIPING INSTALLATION

The contractor shall obtain all necessary permits associated with the described work.

The borehole drilling contractor shall be experienced in deep bore hole drilling and shall have a minimum of 10 years drilling experience within the geographic vicinity of the project or shall subcontract to an approved drilling contractor with equivalent experience.

The vertical holes shall be drilled no closer than 20 feet apart and shall be held open by a “mud” casing so that the piping can be inserted. The piping shall be tested according to other sections of this specification prior to insertion. Loops must be installed from or by a mechanical device so that the pipe is not rolled out on the ground before installation.

Install polyethylene piping according to standard industry practice.

The piping shall be capped and protected for future connection.

Approved borehole seals should be tightened to manufacturer’s specifications.

The entire piping system shall be pressure tested according to other sections of this specification before any backfilling of trench is permitted.

The owner’s representative shall be notified 24 hours prior to the test and shall, at his discretion, witness the test.

The contractor shall maintain an accurate record of all borehole locations and at the completion of the work, deliver to the owner a set of “as-built” site plans.

GROUTING BOREHOLE

Bore holes in vertical heat exchangers shall be tremi-grouted. Grouting of vertical heat exchangers shall be done according to jurisdictional requirements of IGSHPA standards. Grouting shall immediately follow the completion of drilling and installation of each borehole piping. A large capacity grout mixer/separate holding tank are required, and a minimum of 25 mm diameter polyethylene tubing shall be used as the tremi-grout pipe. The tremi-grout pipe shall be attached to the u-bend heat exchanger before it is lowered into the ground.

Grouting procedures to be as follows:

Monitor the grouting operation to ensure grout is being adequately mixed in correct proportions and that the viscosity is adequate for pumping down the borehole.

The grout contractor should have spare grout pipes, hoses, fittings, readily available on site.

A screw-type pump or a piston pump shall be used to pump grouts down the boreholes.

A 75 to 100 mm inside diameter suction line and a 25 to 50 mm discharge line shall be used.

Bentonite based grout shall be used mixed with water in proportions recommended by manufacturer. For Volclay Grout II (25% solids) utilize a mixture of 68 L per 22.7 kg of grout. Cement based grout will not be used.

PIPING SYSTEMS TEST

The contractor shall provide all necessary equipment and shall perform all work required in connection with all piping system tests.

At the water working pressure of the pipe installed, all water piping systems shall be tested. Each section tested shall be slowly filled with water. Care shall be taken to expel all air from pipes. If necessary, the pressure, as measured at the point of lowest elevation, shall be applied for not less than ½ hour. When the test pressure has fallen over 5%, the point of leakage shall be found, repaired and tested repeated. This procedure shall be followed until the piping systems have been proved absolutely tight. The use of any chemicals, any “Stop-Leak” compounds, any mastic or any other temporary means shall not be used for repairing leaks during or subsequent to these tests.

Polyethylene pipe testing:

Prior to insertion of the vertical pipe, the contractor shall assembly the “U Bend” and piping, cap both ends, and air pressure test the piping to a pressure of 862 kPa. The test must be maintained for 8 hours minimum without the pressure falling more than 20 kPa.

Loops shall pass the test at the following milestones:

Before insertion into hole.

After insertion into hole.

Contractor is responsible to provide evidence of and certification of pressure testing, and acceptance of all work performed by signature of the owner’s representative.

CONNECTIONS

Drawings indicate general arrangement of piping, fittings, and specialties.

FIELD QUALITY CONTROL

Piping Tests: Fill piping 24 hours before testing and apply test pressure to stabilize piping. Use potable water only.

Hydrostatic Tests: Test at not less than 1-1/2 times the pipe working-pressure rating allowing for static pressure of borehole depth.

Increase pressure in 50-psig (345-kPa) increments and inspect each joint between increments. Hold at test pressure for 30 minutes. Slowly increase to next test pressure increment and hold for 30 minutes. After testing at maximum test pressure, reduce pressure to 30 psig (207 kPa). Hold for 90 minutes, and measure pressure at 30-minute intervals. Repair leaks and retest until no leaks exist.

Prepare reports of testing activity and submit to the owner’s representative.

FLUSHING, PURGING, PRESSURE AND FLOW TESTING

All fusion joints and loop lengths shall be checked to verify that no leaks have occurred due to fusion joining or shipping damage.

Each supply and return circuit shall be flushed and purged in the forward and reverse directions with water at a minimum velocity of 2 ft/sec (0.6096 m/sec) through each piping section. Flow must be maintained for a minimum of 15 minutes in each direction to remove all debris and air. To verify that all air is removed from the system, the return water valve to the tank shall be closed. A change in the level of fluid in the purge pump tank during pressurization indicates air still trapped in the system. The heat exchanger system purging shall be completed separately from the building system.

Flow rates and pressure drops will be compared to calculated values to assure that there is no blockage or kinking of any pipe. If actual flow rate or pressure drop values differ from calculated design values by more than 10 percent, the problem shall be identified and corrected.

Pressure tests for both polyethylene and cross-linked polyethylene pipe shall be conducted according to ASTM F2164, which provides information on apparatus, safety, pre-test preparation, and procedures for conducting field test of PE and PEX pressure piping systems by filling them with liquid and applying pressure to determine if leaks exist in the system.

- The maximum test pressure shall be 1.5 times the design static pressure less the elevation hydrostatic head.
    a. Where the design static pressure is not known, a default value of 100 psi (690 kPa) may be used.
    b. At no time shall the maximum test pressure exceed the pressure rating of the lowest pressure-rated component of the system.

System components of devices with lower pressure ratings than the pipe shall be protected from excessive pressure during testing by removing or isolation them from the system.

Pressure testing of the ground loop to determine if there are any leaks shall be conducted at the following points as a minimum:

- After each circuit has been assembled, including connection to the boreholes or horizontal loops, and before backfilling.
- After the complete ground heat exchanger system has been installed, flushed and purged of air and debris, and before the entire ground heat exchanger system is connected to the building system.
- Site conditions may dictate backfilling prior to testing with water. A minimum air pressure of 45 psi shall be maintained on the ground heat exchanger during backfilling and until the final pressure test with water can be conducted.

The duration of the pressure test shall be no less than one hour after the stabilization of pressure. If no visual leakage is observed and pressure test phase remains steady (within 5% of the test phase pressure), a passing test is indicated.

After the conclusion of the ground heat exchanger pressure test, the ground heat exchanger shall be left filled with clean water and maintained under pressure until final connection to the building system.

END OF SECTION 23 57 33

Section 23 72 00 – Air-to-Air Energy Recovery Equipment

PART 1 – GENERAL

SCOPE

This section includes specifications for energy recovery equipment that is used to recover heating and/or cooling energy.

REFERENCE

Applicable provisions of Division 1 govern work under this Section.

RELATED WORK

Section 23 07 00 - HVAC Insulation

Section 23 33 00 - Air Duct Accessories

QUALITY ASSURANCE

Refer to division 1, General Conditions, Equals and Substitutions.

SUBMITTALS

Refer to division 1, General Conditions, Submittals.

Include unit dimensions, weights, materials of construction, thermal characteristics, ratings, fabrication methods, manufacturer's installation requirements, and appropriate identification.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DESIGN CRITERIA

Capacity, efficiency, and operating characteristics as indicated on the drawings and/or as scheduled.

PART 2 - PRODUCTS

AIR-TO-AIR HEAT EXCHANGERS (Fixed plate type) Manufacturers:

Renewaire or approved equal. (Fixed media must be total energy transfer type.)

GENERAL

Product Specification: Energy Recovery Ventilator (ERV) shall be a packaged unit and shall transfer both heat and humidity using static plate core technology.

QUALITY ASSURANCE:

The energy recovery ventilator shall be Certified by the Home Ventilating Institute (HVI) under CSA 439. Both a heating and a cooling test must be run to demonstrate year-round energy recovery.

Manufacturer shall be able to provide evidence of independent testing of the core by Underwriters Laboratory (UL), verifying a maximum flame spread index (FSI) of 25 and a maximum smoke developed index (SDI) of 50 thereby meeting NFPA 90A and NFPA 90B requirements for materials in a compartment handling air intended for circulation through a duct system. The method of test shall be UL Standard 723.

Unit shall be Listed under UL 1812 Standard for Ducted Air to Air Heat Exchangers. The unit must pass commercial flammability requirements and shall not be labeled “For Residential Use Only”.

The ERV core shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of ten years from the date of purchase. The balance-of-unit shall be warranted to be free of manufacturing defects and to retain its functional characteristics, under circumstances of normal use, for a period of five years from the date of purchase.

PERFORMANCE

Energy Transfer:

The ERV shall be capable of transferring both sensible and latent energy between airstreams. Latent energy transfer shall be accomplished by direct water vapor transfer from one airstream to the other, without exposing transfer media in succeeding cycles directly to the exhaust air and then to the fresh air.

Passive Frost Control:

The ERV core shall perform without condensing or frosting under normal operating conditions (defined as outside temperatures above -10°F and inside relative humidity below 40%). Occasional more extreme conditions shall not affect the usual function, performance or durability of the core. No condensate drains will be allowed.

Continuous Ventilation:

Unit shall have the capacity to operate continuously without the need for bypass, recirculation, pre-heaters, or defrost cycles under normal operating conditions.

Positive Airstream Separation:

Water vapor transfer shall be through molecular transport by hydroscopic resin and shall not be accomplished by “porous plate” mechanisms. Exhaust and fresh airstreams shall travel at all times in separate passages, and airstreams shall not mix.

Laminar Flow:

Airflow through the ERV core shall be laminar over the products entire operating airflow range, avoiding deposition of particulates on the interior of the energy exchange plate material.

CONSTRUCTION

The energy recovery component shall be of fixed-plate cross-flow construction, with no moving parts.

No condensate drain pans or drains shall be allowed and unit shall be capable of operating in both winter and summer conditions without generating condensate.

The unit case shall be constructed of 24-gauge steel, with lapped corners and zinc plated screw fasteners. The case shall be finished with textured, powder coat paint (GR90 case shall be constructed of G90 galvanized steel.)

Access doors shall provide easy access to blowers, ERV cores, and filters. Doors shall have an airtight compression seal using closed cell foam gaskets.

Case walls and doors shall be fully insulated with 1 inch, expanded polystyrene foam insulation faced with a cleanable foil face on all exposed surfaces.

The ERV cores shall be protected by a MERV-8 rated, spun polyester, disposable filter in both airstreams.

The unit shall have a line-cord power connection and be supplied with an internal 24 VAC transformer and relay (G90 shall have hardwired line voltage connection and be controlled by line voltage controls provided by others.)

Standby power draw shall not exceed 1 Watt for the unit along with an optional automatic control.

PART 3 - EXECUTION

UNIT LOCATION

Locate and orient unit to provide the shortest and most straight duct connections. Provide service clearances as indicated on the plans. Locate units distant from sound critical occupancies.

Use integral mounting flange and hanging bar system to mount the unit to a structurally suitable surface. The units may be mounted in any orientation.

VIBRATION ISOLATION

Utilize factory supplied vibration isolation kit following instructions.

Provide flexible duct connections at unit duct flanges.

DUCT DESIGN

All ductwork shall be designed, constructed, supported and sealed according to SMACNA HVAC Duct Construction Standards and pressure classifications.

At a minimum all duct runs to the outdoors shall be thermally insulated at levels appropriate to the local climate. A continuous vapor barrier shall also be provided on warm surface of the insulation.

SOUND CONTROL

To control sound radiated from the unit: Provide acoustic treatment in mechanical room walls and ceilings.

To control sound associated with the two blower outlets:

Utilize insulated, flexible duct.

In sound critical applications provide increased duct sizing and consider the use of sound attenuators.

TEST AND BALANCING

Test and Balancing may not begin until 100% of the installation is complete and fully functional.

Follow National Comfort Institute (NCI) air test and balance procedures specific to Heat Recovery Ventilator Balancing Procedure including standard reports to the owner’s representative.

END OF SECTION 23 72 00

Section 23 73 33 – Make-Up Aire Units (Gas-Fired) and related Accessories

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 23 05 00 - Common Work Results for HVAC
Section 23 11 00 - Facility Fuel Piping

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ANSI Z223.1 National Fuel Gas Code

NFPA 70 National Electric Code

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Submit make-up air heating unit shop drawings including the following information:

- Complete fan performance curves for Supply Air, with system operating conditions indicated, as tested on an AMCA Certified Chamber.
- Sound performance data for Supply Air, as tested on an AMCA Certified chamber.
- Motor ratings, electrical characteristics and motor and fan accessories.
- Dimensioned drawings for each type of installation, showing isometric and plan views, to include location of attached ductwork and service clearance requirements.
- Estimated gross weight of each installed unit.
- Installation, Operating and Maintenance manual (IOM) for each model.
- Microprocessor Controller (DDC) specifications to include available options and operating protocols. Include complete data on all factory-supplied input devices.
- Remote Panel description to include all functions.
- Color chart including a palette of available standard paint finishes.

Submit manufacturer's installation and start-up instructions, maintenance data, troubleshooting guide, parts lists, controls and accessories.

At substantial completion, submit warranty certificate and copy of start-up report.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS supply the following additional documentation:

DELIVERY, STORAGE AND HANDLING

Comply with manufacturer's instructions for storing, rigging, unloading, and transporting units. Protect units from physical damage. Leave factory-shipping covers in place until installation.

Ship units to jobsite fully assembled

WARRANTY

Provide a one year parts and labor warranty on the entire unit beginning upon substantial completion of project.

COORDINATION

Coordinate size and location of all building penetrations required for installation of each MAU and associated ducting, plumbing and electrical systems.

Coordinate sequencing of construction of associated plumbing, HVAC and electrical supply [roofing contractor].

EXTRA MATERIALS

Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Filters: Two sets of MERV 13 disposable filters for each unit.

One set of fan belts.

PART 2 - PRODUCTS

MAKE-UP AIR HEATING UNITS

Manufacturers: Captive-Aire, Greenheck, Rapid, Thermotek, Rupp or approved equal.

MANUFACTURED UNITS

Unit with Integral Heating shall be fully assembled at the factory and consist of an insulated metal cabinet, motorized intake dampers, sensors, freeze protection, filter assembly for intake air, supply air blower assembly and an electrical control center. All specified components and internal accessories factory installed and tested and prepared for single-point high voltage connection.

CABINET

Materials: Formed, double wall insulated metal cabinet fabricated to permit access to internal components for maintenance. Underside of unit shall have formed metal panels covering base panel insulation

Outside casing: 18 gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish. [Pre-painted components as supplied by the factory shall have polyester urethane paint on 18 gauge G60 galvaneal steel]. Base rail is 12 gauge, galvazined (G90) steel

Internal assemblies: 24 gauge, galvanized (G90) steel except for motor supports which shall be minimum14 gauge galvanized (G90) steel.

Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.

Materials: Fiberglass insulation. If insulation other than fiberglass is used, it must also meet the Fire Hazard Classification shown below.

- Thickness: 1 inch (25 mm)
- Fire Hazard Classification: Maximum flame spread of 25 and smoke developed of 50, when tested according to ASTM C 411.
- Location and application: Floor of each unit shall be insulated with 1 inch thick rigid fiberglass insulation, covered on one surface with integral aluminum foil. [Full interior coverage of entire cabinet to include walls and roof of unit shall be semi-rigid type and installed between inner and outer shells of all cabinet exterior components when double walls are specified]. [Full interior coverage from “Heating on”] [Full interior coverage from “Cooling on”] [entire unit]

Access panels: Unit shall be equipped with insulated hinged access panels to provide easy access to all major components. Access panels shall be fabricated of 18 gauge galvanized G90 steel. Removable access panels shall incorporate a formed drip edge.

Supply Air blower assembly: Blower assembly consists of an electric motor and a belt driven, double width, and double inlet forward curve blower. Assembly shall be mounted on heavy gauge galvanized rails and further mounted on minimum 1.125 inch thick neoprene vibration isolators.

Control center / connections: unit shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections.

Direct Gas-Fired Furnace:

- Shall be factory assembled, piped and wired direct gas-fired system of 92% efficiency with a draw through design and field adjustable burner baffles with a direct spark ignition system.
- Shall have a cast aluminum burner manifold and stainless steel mixing plates. No air from the inside space shall be allowed to pass across the burner at any time. Flame rectification shall be provided by an ultra-violet scanner. A flame safeguard display shall be included. Burner control shall have a digital coded fault indicator capable of storing the last five faults.
- Shall be equipped for operation on natural gas with a maximum rated inlet gas pressure of 2 psi. Gas pressure regulator shall be provided.
- Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
- Shall have temperature control provided by an electronic 25:1 turndown-ratio modulating discharge air sensor. Amplifier to include a low fire time delay potentiometer, sensitivity potentiometer, minimum discharge air temperature potentiometer and maximum discharge temperature potentiometer.
- Shall include the following safety controls:
    a. Manual Reset, High Limit Switch: Main gas valve closes if high-limit temperature is exceeded.
    b. Dual safety shutoff valves shall be provided that do not exceed 120 VAC control signals.
    c. High and low Gas Pressure Switch: Main gas valve closes if high or low pressure switch faults.
    d. FM global requirements: Include high and low gas pressure switches and visual indication gas valves.
    e. Two hydraulic proof of close valves(s) shall be included.
    f. A gas vent line shall be included that vents gas from between the safety shutoff valves.
    g. Visual indication: Clear visual signal demonstrating the position of the main gas safety shutoff valves.

Motorized dampers / Intake Air: Motorized damper of insulated low leakage type shall be factory installed.

BLOWER

Blower section construction, Supply Air: Belt drive motor and blower shall be assembled onto a minimum 14 gauge galvanized steel platform and must have neoprene vibration isolation devices, minimum of 1 – 1/8 inches thick.

Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

Centrifugal blower housing: Formed and reinforced steel panels to make curved scroll housing with shaped cutoff.

Forward curved blower (fan) wheels: Galvanized or aluminum construction with inlet flange and shallow blades curved forward in direction of airflow. Mechanically attached to shaft with set screws.

Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established according to AMCA 210, “Laboratory Methods of Testing Fans for Rating.”

MOTORS

General: Blower motors greater than ¾ horsepower shall be “NEMA Premium™” unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure. Drives shall be sized for a minimum of 150% of driven horsepower and pulleys shall be fully machined cast-type, keyed and fully secured to the fan wheel and motor shafts. Electric motors of ten horsepower or less shall be supplied with an adjustable drive pulley. Comply with requirements in Division 23 05 13, matched with fan load.

Motors shall be 60 cycle, 1 phase 230 volts.

UNIT CONTROLS

The unit shall be constructed so that it can function as a stand-alone heating and make-up air system controlled by factory-supplied controllers, thermostats and sensors. This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

FILTERS

Unit shall have 2" thick MERV 13 disposable pleated filters] located in the outdoor air intake and shall be accessible from the exterior of the unit.

PART 3 - EXECUTION

EXAMINATION

Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

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

INSTALLATION

Installation shall be accomplished according to these written specifications, project drawings, manufacturer's installation instructions as documented in manufacturer's IOM, Best Practices and all applicable building codes.

CONNECTIONS

In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.

- Piping installation requirements are specified in Division 22 (Plumbing). Drawings indicate general arrangement of piping, fittings and specialties.
- Duct installation and connection requirements are specified in Division 23 of this document.
- Electrical installation requirements are specified in Division 26 of this document.

FIELD QUALITY CONTROL

Manufacturer's Field Service: Engage a factory authorized service representative to inspect field assembled components and equipment installation, to include electrical and piping connections. Report results to A/E in writing. Inspection must include a complete startup checklist to include (as a minimum) the following: Completed Start-Up Checklists as found in manufacturer's IOM.

START-UP SERVICE

Engage a factory authorized service representative to perform startup service. Clean entire unit, comb coil fins as necessary, and install clean filters. Verify water source for compliance with manufacturer's requirements for flow and temperature. Measure and record electrical values for voltage and amperage. Refer to Division 23 "Testing, Adjusting and Balancing" and comply with provisions therein.

DEMONSTRATION AND TRAINING

Engage a factory authorized service representative to train owner's maintenance personnel to adjust, operate and maintain the entire unit. Refer to Division 01 Section Closeout Procedures and Demonstration and Training.

END OF SECTION 23 73 33

Section 23 81 46 – Unitary Water – Source Heat Pumps

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 23 05 23 - General-Duty Valves for HVAC Piping

Section 23 05 15 - Piping Specialties

Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Include data concerning dimensions, capacities, and material of construction, ratings, weights, manufacturer's installation requirements and performance limitations.

Submit manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

GENERAL:

Furnish and install Water Source Heat Pumps, as indicated on the plans. Equipment shall be completely assembled, piped, and internally wired. Capacities and characteristics as listed in the schedule and the specifications that follow.

Units shall be supplied completely factory built capable of operating over an entering water temperature range from 20° to 120°F (-6.7° to 48.9°C) as standard. Equivalent units from other manufacturers may be proposed provided approval to bid is given 10 days prior to bid closing. All equipment listed in this section must be rated and certified according to Air-Conditioning, Heating and Refrigeration Institute/International Standards Organization (AHRI/ISO 13256-1). All equipment must be tested, investigated, and determined to comply with the requirements of the standards for Heating and Cooling Equipment UL-1995 for the United States and CAN/CSA-C22.2 NO.236 for Canada, by Intertek Testing Laboratories (ETL). The units shall have AHRI/ISO and ETL-US-C labels.

All units shall be fully quality tested by factory run testing under normal operating conditions as described herein. Quality control system shall automatically perform via computer: triple leak check, pressure tests, evacuation and accurately charge system, perform detailed heating and cooling mode tests, and quality cross check all operational and test conditions to pass/fail criteria. Detailed report card will ship with each unit displaying status for critical tests and components. ***Note: If unit fails on any cross check, it shall not be allowed to ship. Serial numbers will be recorded by factory and furnished to contractor on report card for ease of unit warranty status. Units tested without water flow are not acceptable.***

BASIC CONSTRUCTION:

Horizontal units shall have one of the following air flow arrangements: Left Inlet/Straight (Right) Discharge; Right Inlet/Straight (Left) Discharge; Left Inlet/Back Discharge; or Right Inlet/Back Discharge as shown on the plans. Units must have the ability to be field convertible from straight to back or back to straight discharge with no additional parts or unit structure modification. Horizontal units will have factory installed hanger brackets with rubber isolation grommets packaged separately.

Vertical Units shall have one of the following air flow arrangements: Left Return/Top Discharge, Right Return/Top Discharge, Left Return/Bottom Discharge, Right Return/Bottom Discharge as shown on the plans.

If units with these arrangements are not used, the contractor is responsible for any extra costs incurred by other trades***.*** All units (horizontal and vertical) must have a minimum of three access panels for serviceability of compressor compartment. ***Units having only one access panel to compressor/heat exchangers/expansion device/refrigerant piping shall not be acceptable.***

Compressor section interior surfaces shall be lined with 1/2 inch (12.7mm) thick, 1-1/2 lb/ft3 (24 kg/m3) acoustic type glass fiber insulation. Air handling section interior surfaces shall be lined with 1/2 in (12.7mm) thick, 1-1/2 lb/ft3 (24 kg/m3) ***foil-faced*** fiber insulation for ease of cleaning. Insulation placement shall be designed in a manner that will eliminate any exposed edges to prevent the introduction of glass fibers into the air stream. ***Units without foil-faced insulation in the air handling section will not be accepted.*** The heat pumps shall be fabricated from heavy gauge galvanized steel with powder coat paint finish. Both sides of the steel shall be painted for added protection.

Standard cabinet panel insulation must meet NFPA 90A requirements, air erosion and mold growth limits of UL-181, stringent fungal resistance test per ASTM-C1071 and ASTM G21, and shall meet zero level bacteria growth per ASTM G22. ***Unit insulation must meet these stringent requirements or unit(s) will not be accepted.***

All horizontal units to have factory installed 1” (25.4mm) discharge air duct collars, 1” (25.4mm) filter rails with 1”(25.4mm) filters factory installed, and factory installed unit-mounting brackets. Vertical units to have field installed discharge air duct collar, shipped loose and 1” (25.4mm) filter rails with 1” (25.4mm) filters factory installed. ***If units with these factory-installed provisions are not used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.***

All units must have an insulated panel separating the fan compartment from the compressor compartment. Units with the compressor in the air stream are not acceptable. Units shall have a factory installed 1 inch (25.4mm) wide filter bracket for filter removal from either side. Units shall have a 1 inch (25.4mm) thick throwaway type glass fiber filter. The contractor shall purchase one spare set of filters and replace factory shipped filters on completion of start-up. Filters shall be standard sizes. If units utilize non-standard filter sizes then the contractor shall provide 12 spare filters for each unit.

Cabinets shall have separate holes and knockouts for entrance of line voltage and low voltage control wiring. All factory-installed wiring passing through factory knockouts and openings shall be protected from sheet metal edges at openings by plastic ferrules. Supply and return water connections shall be copper FPT fittings and shall be securely mounted flush to the cabinet corner post allowing for connection to a flexible hose without the use of a back-up wrench. Water connections that protrude through the cabinet or require the use of a backup wrench shall not be allowed. All water connections and electrical knockouts must be in the compressor compartment corner post as to not interfere with the serviceability of unit. Contractor shall be responsible for any extra costs involved in the installation of units that do not have this feature. Contractor must ensure that units can be easily removed for servicing and coordinate locations of electrical conduit and lights with the electrical contractor.

Contractor shall install 2-inch (50.8mm) filter racks with removable access door and 2 inch (50.8mm) MERV11 pleated throwaway filters on all units.

The unit will be supplied with internally mounted secondary pump for primary/secondary applications, including one-pipe systems.

FAN AND MOTOR ASSEMBLY:

Blower shall have inlet rings to allow removal of wheel and motor from one side without removing housing. Units shall have a direct-drive centrifugal fan. The fan motor shall be an ECM variable speed ball bearing type motor. The ECM fan motor shall provide soft starting, maintain constant CFM over its static operating range and provide airflow adjustment on its control board. The fan motor shall be isolated from the housing by rubber grommets. The motor shall be permanently lubricated and have thermal overload protection. A special dehumidification mode shall be provided to allow lower airflows in cooling for better dehumidification. The dehumidification mode shall be selectable via a jumper on the control board or may be controlled externally from a humidistat. Airflow/Static pressure rating of the unit shall be based on a wet coil and a clean filter in place. ***Ratings based on a dry coil, and/or no air filter, shall NOT be acceptable.***

REFRIGERANT CIRCUIT:

All units shall contain an EarthPure®(HFC-410A) sealed refrigerant circuit including a high efficiency two-stage scroll compressor designed for heat pump operation, a thermostatic expansion valve for refrigerant metering, fin and tube or micro channel refrigerant to air heat exchanger, reversing valve, coaxial (tube in tube) refrigerant to water heat exchanger, and safety controls including a high pressure switch, low pressure switch (loss of charge), water coil low temperature sensor, and air coil low temperature sensor. Access fittings shall be factory installed on high and low pressure refrigerant lines to facilitate field service. Activation of any safety device shall prevent compressor operation via a microprocessor lockout circuit. The lockout circuit shall be reset at the thermostat or at the contractor supplied disconnect switch. ***Units that cannot be reset at the thermostat shall not be acceptable.***

Hermetic compressors shall be internally sprung. The compressor shall have a dual level vibration isolation system. The compressor will be mounted on specially engineered sound-tested EPDM vibration isolation grommets to a large heavy gauge compressor mounting plate, which is then isolated from the cabinet base with rubber grommets for maximized vibration attenuation. All units shall include a discharge muffler to further enhance sound attenuation. Compressor shall have thermal overload protection. Compressor shall be located in an insulated compartment away from air stream to minimize sound transmission.

Refrigerant to air heat exchangers shall utilize aluminium fin with copper tube or all aluminium micro channel construction and be rated to withstand 625 PSIG (4309 kPa) refrigerant working pressure. Refrigerant to water heat exchangers shall be of copper inner water tube and steel refrigerant outer tube design, rated to withstand 625 PSIG (4309 kPa) working refrigerant pressure and 500 PSIG (3445 kPa) working water pressure. The refrigerant to water heat exchanger shall be “electro-coated” with a low cure cathodic epoxy material a minimum of 0.4 mils thick (0.4 – 1.5 mils range) on all surfaces. The black colored coating shall provide a minimum of 1000 hours salt spray protection per ASTM B117-97 on all external steel and copper tubing. The material shall be formulated without the inclusion of any heavy metals and shall exhibit a pencil hardness of 2H (ASTM D3363-92A), crosshatch adhesion of 4B-5B (ASTM D3359-95), and impact resistance of 160 in-lbs (184 kg-cm) direct (ASTM D2794-93).

Refrigerant metering shall be accomplished by thermostatic expansion valve only. Expansion valves shall be dual port balanced types with external equalizer for optimum refrigerant metering. Units shall be designed and tested for operating ranges of entering water temperatures from 20° to 120°F (-6.7° to 48.9°C). Reversing valve shall be four-way solenoid activated refrigerant valve, which shall default to heating mode should the solenoid fail to function. If the reversing valve solenoid defaults to cooling mode, an additional low temperature thermostat must be provided to prevent over-cooling an already cold room.

DRAIN PAN:

The drain pan shall be constructed of 304 Stainless Steel to inhibit corrosion. This corrosion protection system shall meet the stringent 1000 hour salt spray test per ASTM B117. If plastic type material is used, it must be HDPE (High Density Polyethylene) to avoid thermal cycling shock stress failure over the lifetime of the unit. Drain pan shall be fully insulated. Drain outlet shall be located at pan as to allow complete and unobstructed drainage of condensate. Drain outlet for horizontal units shall be connected from pan directly to FPT fitting. ***No hidden internal tubing extensions from pan outlet extending to unit casing (that can create drainage problems) will be accepted.*** The unit as standard will be supplied with solid-state electronic condensate overflow protection. ***Mechanical float switches will NOT be accepted.***

Vertical units shall be furnished with a PVC FPT condensate drain connection and an internal factory installed condensate trap. If units without an internal trap are used, the contractor is responsible for any extra costs to field install these provisions, and/or the extra costs for his sub-contractor to install these provisions.

ELECTRICAL:

A control box shall be located within the unit compressor compartment and shall contain a 50VA transformer, 24 volt activated, 2 or 3 pole compressor contactor, terminal block for thermostat wiring and solid-state controller for complete unit operation. Reversing valve and fan motor wiring shall be routed through this electronic controller. Units shall be name-plated for use with time delay fuses or HACR circuit breakers. Unit controls shall be 24 Volt and provide heating or cooling as required by the remote thermostat/sensor.

SOLID STATE CONTROL SYSTEM (CXM):

Units shall have a solid-state control system. ***Units utilizing electro-mechanical control shall not be acceptable.*** The control system microprocessor board shall be specifically designed to protect against building electrical system noise contamination, EMI, and RFI interference. The control system shall interface with a heat pump type thermostat. The control system shall have the following features:

- Anti-short cycle time delay on compressor operation.
- Random start on power up mode.
- Low voltage protection.
- High voltage protection.
- Unit shutdown on high or low refrigerant pressures.
- Unit shutdown on low water temperature.
- Condensate overflow electronic protection.
- Option to reset unit at thermostat or disconnect.
- Automatic intelligent reset. Unit shall automatically reset the unit 5 minutes after trip if the fault has cleared. If a fault occurs 3 times sequentially without thermostat meeting temperature, then lockout requiring manual reset will occur.
- Ability to defeat time delays for servicing.
- Light emitting diode (LED) on circuit board to indicate high pressure, low pressure, low voltage, high voltage, low water/air temperature cut-out, condensate overflow, and control voltage status.
- The low-pressure switch shall not be monitored for the first 120 seconds after a compressor start command to prevent nuisance safety trips.
- 24V output to cycle a motorized water valve or other device with compressor contactor.
- Unit Performance Sentinel (UPS). The UPS warns when the heat pump is running inefficiently.
- Water coil low temperature sensing (selectable for water or anti-freeze).
- Air coil low temperature sensing.

SOLID STATE ECM FAN CONTROL BOARD:

Airflow selection shall be accomplished via jumper or dip switch settings on the ECM control board. Actual airflow shall be indicated by the CFM LED with each 100 CFM being represented by one flash of the LED. Airflow shall be automatically maintained (±5%) by the ECM motor regardless of external static pressure up to its maximum output capacity. A jumper shall allow selection of a special dehumidification mode, which reduces airflow in cooling by 25% to increase the latent capacity of the unit. A terminal shall be provided on the control board to allow an external humidistat to activate dehumidification mode.

WARRANTY:

Manufacturer shall warranty equipment for a period of 12 months from start up or 18 months from shipping (whichever occurs first).

Provide optional extended 4-year refrigeration circuit warranty covers coils, reversing valve, expansion valve and compressor for a total of 5 years.

PROVIDE THE FOLLOWING FIELD INSTALLED OPTIONS

Hose Kit Assemblies:

The following assemblies ship with the valves already assembled to the hose described:

- Supply and return hoses having ball valve with PT port.
- Supply hose having ball valve with PT port; return hose having automatic flow regulator valve with PT ports, and ball valve.

- Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having automatic flow regulator with PT ports, and ball valve.
- Supply hose having “Y” strainer with blowdown valve, and ball valve with PT port; return hose having ball valve with PT port.

THERMOSTATS:

The thermostat shall be an electronic type thermostat as selected below with the described features:

Single Stage Digital Automatic or Manual Changeover with Two-Speed Fan Control

Thermostat shall be a single-stage, digital, auto or manual changeover with HEAT-OFF-COOL-AUTO system switch, fan ON-AUTO switch, and fan LO-HI switch. Thermostat shall have an LCD display with temperature and set-point(s) in ºF or ºC. A fault LED shall be provided to display specific fault condition. Thermostat shall allow use of an accessory remote temperature sensor (AST009) but may be operated with internal sensor via orientation of a jumper.

PART 3 – EXECUTION

INSTALLATION

Install units as shown on plans, as detailed, and according to manufacturer's installation instructions.

Set units on concrete housekeeping pads where floor-mounted. Suspended units shall be suspended with neoprene or spring vibration isolators.

Install all items shipped loose by equipment manufacturer under supervision of equipment manufacturer's field service personnel.

Make all piping connections as shown and in full compliance with the manufacturer’s directions.

Flush water-side of heat pumps and clean as recommended by the manufacturer.

END OF SECTION 23 81 46

Section 23 83 34 – In-Floor Hot Water Radiant Systems and Equipment

PART 1 – GENERAL

SCOPE

RELATED WORK

Section 23 05 15 - Piping Specialties
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment

REFERENCE

Applicable provisions of Division 1 govern work under this section.

REFERENCE STANDARDS

ASTM F876 Standard Specification for Crosslinked Polyethylene Tubing (PEX)
ASTM B75 Seamless Copper Tube

SHOP DRAWINGS

Refer to division 1, General Conditions, Submittals.

Provide manufacturer's literature for tubing, manifolds, valves, and all accessories provided for the project.

Provide a "job-specific" parts list of all parts proposed for this project.

RECORD DRAWINGS

Provide as-built drawings show precisely document location and spacing of all tubing concealed from future view.

PART 2 - PRODUCTS

PLASTIC PIPE AND FITTINGS

PEX-a (Engle-method Crosslinked Polyethylene) Piping: ASTM 876 with oxygen-diffusion barrier that meets DIN 4726.

Basis-of-Design Product: Subject to compliance with requirements, provide **Uponor Wirsbo hePEX** or a comparable product.

PEX-a Fittings, Elbows and Tees (½ inch through 2 inch nominal pipe size): ASTM F1960 cold-expansion fitting manufactured from the following material types:

- UNS No. C69300 Lead-free (LF) Brass.
- 20% glass-filled polysulfone as specified in ASTM D6394.
- Unreinforced polysulfone (group 01, class 1, grade 2) as specified in ASTM D6394.
- Polyphenylsulfone (group 03, class 1, grade 2) as specified in ASTM D6394.
- Blend of polyphenylsulfone (55-80%) and unreinforced polysulfone (rem.) as specified in ASTM D6394.
- Reinforcing cold-expansion rings shall be manufactured from the same source as PEX-a piping manufacturer and marked "F1960".

PEX-a Fittings (2½ inch through 4 inch nominal pipe size): SDR9 compression type fitting consisting of a double O-ring insert with a compression sleeve tightened around the pipe and insert.

TRANSITION FITTINGS

Plastic-to-Metal Transition Fittings:

- Manufacturers: Provide fittings from the same manufacturer of the piping.
- Threaded Brass to PEX-a Transition: one-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
- Brass Sweat to PEX-a Transition: one-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

TRANSITION UNIONS

Plastic-to-Metal Transition Unions:
Manufacturers: Provide fittings from the same manufacturer of the piping.

- Threaded Brass to PEX-a Union: one-piece brass fitting with male or female threaded adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.
- Brass Sweat to PEX-a Union: one-piece brass fitting with sweat adapter and F1960 cold-expansion end, with PEX-a reinforcing cold-expansion ring.

PART 3 - EXECUTION

PIPING APPLICATIONS

Hot-water heating piping, aboveground (2 inch and below) shall be the following:

- PEX-a piping, with F1960 cold-expansion fittings.

Hot-water heating piping installed below ground and within slabs shall be any of the following:

- 2 inch and below –PEX-a piping with engineered polymer (EP) polyphenylsulfone F1960 cold-expansion fittings. Use the fewest possible joints and install per manufacturer's recommendations.

PIPING INSTALLATIONS

Install PEX-a tubing according to manufacturer's recommendations.

PIPE JOINT CONSTRUCTION

PEX-a Connections: Install per manufacturer's recommendations. Use manufacturer-recommended cold-expansion tool for F1960 connections.

CHEMICAL TREATMENT

(Refer to Specification Section 23 25 00.)

FIELD QUALITY CONTROL

Do not expose PEX piping to direct sunlight for more than 30 days. If construction delays are encountered, provide cover to portions of piping exposed to direct sunlight.

WARRANTY

PEX-a manufacturer system warranty shall cover tubing for a duration of 30 years from the date of installation.

END OF SECTION 23 83 34

END OF DIVISION 23 – HVAC

56. SWEF Building, Electrical, Item SPV.0060.103.

A Description

This item consists of the Electrical work for the SWEF building. The work shall be according to the applicable plans and the following specifications.

B (Vacant)

C (Vacant)

D Measurement

The department will measure SWEF Building, Electrical, completed according to the contract and accepted, as a single complete unit of work.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.103	SWEF 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.

DIVISION 26 – ELECTRICAL

Section 26 00 00 – Electrical Table of Contents

ELECTRICAL WORK

END SECTION 26 00 00

Section 26 01 26 – Maintenance Testing of Electrical Systems

PART 1 – GENERAL

SCOPE

Complete testing of equipment and systems shall be provided throughout according to the Contract Documents.

PART 2 - PRODUCTS

GENERAL

Provide all labor and materials required for shop and field testing as specified in the Contract Documents and as required by the authorities having jurisdiction.

SYSTEMS

The following systems are to be tested, inspected and certified:

- Wire and Cable (600 Volts and Below):
    a. Inspect all splices and terminations and make mechanically and electrically tight during a 15 day period immediately prior to final acceptance of the work.
- Motors:
    a. Test all motors under load and verify that motor rotation is correct.
- Lighting Controls
    a. Test each lighting control system for proper operation.
    b. Test each relay for proper switching.
    c. Test each occupancy sensor.
- Communication Cable and Equipment
    a. Test and certify CAT6 cable, jacks, patch panels, and fiber optic cable as specified.
- Public Address System
- Emergency Generator System.
- Closed Circuit Television (CCTV) System.

PART 3 - EXECUTION

Notify the engineer seven days prior to the testing dates.

Conduct tests at a time agreeable to the engineer. Provide premium labor as necessary.

Products which are found defective or do not pass such tests shall be removed and replaced at the contractor's expense. Tests shall be repeated.

Conduct all tests required by the authorities having jurisdiction.

END SECTION 26 01 26

Section 26 05 00 – Common Work Results for Electrical

PART 1 – GENERAL

EXECUTION OF THE WORK

The requirements of Division 1 shall apply to all Sections of Division 26.

These specifications call out certain duties of the Electrical Contractor and his Subcontractors. They are not intended as a material list of items required by the Contract.

Provide all items and work indicated on the Drawings and all items and work called for in this Division of the Specifications according to the Conditions of the Contract and Division 1. This includes all incidentals, equipment, appliances, services, hoistings, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide complete systems. Perform start-up and checkout on each item and system to provide fully operable systems.

Examine and compare the Electrical Drawings and Specifications with the Drawings and Specifications of other trades and report any discrepancies between them to the architect and obtain from him written instructions for changes necessary in the work. At time of bid the most stringent requirements must be included in said bid. Install and coordinate the electrical work in cooperation with other trades installing inter-related work. Before installation, make proper provisions to avoid interferences in a manner approved by the architect. All changes required in the work of the contractor, caused by his neglect to do so, shall be made by him at his own expense.

It is the intent of the Drawings and Specifications to provide a complete workable system ready for the owner's operation. Any item not specifically shown on the Drawings or called for in the Specifications, but normally required to conform with the intent, are to be considered a part of the Contract.

All materials furnished by the contractor shall be new and unused (temporary lighting and power products are excluded) and free from defects. All materials used shall bear the Underwriters' Laboratory, Inc. label provided a standard has

Except for conduit, conduit fittings, outlet boxes, wire and cable, all items of equipment or material shall be the product of one manufacturer throughout. Multiple manufacturers will not be permitted, except for lighting fixtures.

COORDINATION OF THE WORK

Certain materials will be provided by other trades. Examine the Contract Documents to ascertain these requirements.

Carefully check space requirements with other trades and the physical confines of the area to ensure that all material can be installed in the spaces allotted thereto, including finished suspended ceilings. Make modifications thereto as required and approved.

Due to the type of the installation, a fixed sequence of operation is required to properly install the complete systems. Coordinate project and schedule work with other trades according to the construction sequence.

The locations of lighting fixtures, outlets, panels and other equipment indicated on the Drawings are approximately correct. Locations are understood to be subject to revision as may be found necessary or desirable at the time the work is installed in consequence of increase or reduction of the number of outlets, or in order to meet field conditions or to coordinate with modular requirements of ceilings, or to simplify the work.

Exercise particular caution with reference to the location of panels, outlets, switches, etc., and have precise and definite locations approved by the architect before proceeding with the installation.

Circuit "tags" in the form of arrows are used where shown to indicate the home runs of raceways to electrical distribution points. These tags show the circuits in each home run and the panel designation. Show the actual circuit numbers on the panel directory card.

PROGRESS OF WORK

The contractor shall order the progress of his work so as to conform to the progress of the work of other trades and shall complete the entire installation as soon as the conditions of the building will permit. Any cost resulting from the defective or ill-timed work performed under this section shall be borne by the contractor.

EQUIPMENT ACCESSORIES

Provide supports, hangers and auxiliary structural members required for support of the work.

Furnish and set all sleeves for passage of raceways through structural, masonry and concrete walls and floors and elsewhere as will be required for the proper.

Wall mounted equipment may be directly secured to wall by means of steel bolts. Maintain at least 1" air space between equipment and supporting wall.

EXCAVATION AND TRENCHING

Provide trenches of widths necessary for the proper execution of the work. Grade bottom of the trenches accurately to provide uniform bearing and support the work on undisturbed soil at every point along its entire length.

CUTTING, PATCHING, ETC.

The work shall be carefully laid out in advance. Where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of raceway, outlets or other equipment, the work shall be carefully done. Any damage to the building, piping, equipment or defaced finish plaster, woodwork, metalwork, etc. shall be repaired by skilled mechanics of the trades involved at no additional cost to the owner.

The contractor shall do no cutting, channeling, chasing or drilling of unfinished masonry, tile, etc., unless he first obtains permission from the architect. If permission is granted, the contractor shall perform this work in a manner approved by the architect.

Slots, chases, openings and recesses through floors, walls, ceilings, and roofs will be provided by the various trades in their respective materials. The trade requiring them shall properly locate such openings and be responsible for any cutting and patching caused by the neglect to do so.

MOUNTING HEIGHTS

Unless otherwise noted or required because of special conditions, locate outlets as follows:

- Heights listed are from finished floor to center of device.
- Verify exact locations with the architect before installation.
- Convenience receptacles: 18 inches unless otherwise noted.
    - Lighting switches: 46 inches.
    - Disconnect switches and motor controllers: 5 feet.
    - "Normal height" telephone outlets: 18 inches.
    - Wall telephone outlets: 46 inches.
    - Exit lights: 2 inches above top of door to bottom of fixture.
    - Data receptacles: 18 inches.
    - Wall-mounted fixtures: 7 feet, 6 inches or over mirrors (as applicable) or 1 foot below ceilings lower than 8 feet.

CLEANING UP

Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean, subject to the architect/Engineer's instructions, which shall be promptly carried out.

Contractor shall clean all fixtures and equipment at the completion of the project.

All panelboards, wireways, trench ducts, cabinets, enclosures, etc. shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the architect as required.

WATERPROOFING

Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the architect and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.

If contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface at his own expense and as directed by the architect.

SEALING AND FIRESTOPPING

Sealing and fire-stopping of sleeves/openings between conduits, wireways, etc. and the structural or partition opening shall be the responsibility of the contractor whose work penetrates the opening. The contractor responsible shall hire individuals skilled in such work to do the sealing and fireproofing occupation.

PART 2 - PRODUCTS

If products and materials are specified or indicated on the Drawings for a specific item or system, use those products or materials. If products and materials are not listed in either of the above, use first class products and materials, subject to approval of Shop Drawings where Shop Drawings are required or as approved in writing where Shop Drawings are not required.

PART 3 - EXECUTION

Follow manufacturer's instructions for installing, connecting, and adjusting all equipment. Provide one copy of such instructions to the architect before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Provide all special supports, connections, wiring, accessories, etc.

Use mechanics skilled in their trade for all work.

Keep all items protected before and after installation. Clean up all debris.

Perform all tests required by local authorities in addition to tests specified herein, such as life safety systems.

Applicable equipment and materials to be listed by Underwriters' Laboratories and manufactured according to ASME, NEMA, ANSI, or IEEE standards and as approved by local authorities having jurisdiction.

Before commencing work, examine all adjoining, underlying, etc., work on which this work is in any way dependent for perfect workmanship and report any condition which prevents performance of first-class work. Become thoroughly familiar with actual existing conditions to which connections must be made or which must be changed or altered.

END SECTION 26 05 00

Section 26 05 04 – Cleaning, Inspection, and Testing of Electrical Equipment

PART 1 – GENERAL

SCOPE

The work under this section includes the required cleaning, repair, adjustment, calibration, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this contractor for this project. Included are the following topics:

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

PART 2 – PRODUCTS

NOT USED

PART 3 – EXECUTION

GENERAL INSPECTION AND CLEANING OF ALL ELECTRICAL EQUIPMENT

Inspect for physical damage and abnormal mechanical and electrical conditions.

Any item found to be out of tolerance, or in any other way defective as a result of the required testing, shall be reported. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.

Check tightness of accessible bolted electrical joints. Use torque wrench method.

Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.

Make a close examination of equipment and remove any dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.

Clean All Equipment:

- Vacuum inside of panelboards.
- Loosen attached particles and vacuum them away.

Inspect equipment anchorage.

Lubricate nonelectrical equipment per manufacturer's recommendations.

GROUNDING SYSTEMS

Inspect the ground system for adequate termination at all devices.

CABLES

Visual and Mechanical Inspections:

- Inspect exposed sections for physical damage.
- Inspect for shield grounding, cable support and termination.
- Inspect for visual jacket and insulation condition.
- Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radii -- 12 times the diameter for tape shielded cables.
- Inspect for proper fireproofing in common cable areas.

Electrical Tests -- Below 600 Volts:

- Visually inspect cables, lugs, connectors and all other components for physical damage and proper connections.
- Check all cable connectors for tightness (with a torque wrench) and clearances. Torque test conductor and bus terminations to manufacturer's recommendations.

LIGHT FIXTURES

Check the bonding and proper lamping. Verify that recessed fixtures are installed with hold down clips. Confirm operation of the fixture with the proper switch or sensor.

OCCUPANCY SENSORS

Confirm operation of the sensor per the manufacturers spec.

END OF SECTION 26 05 04

Section 26 05 19 – Wire and Cable (600 Volts and Below)

PART 1 – GENERAL

SCOPE

Provide 600-volt wire and cable according to the Contract Documents.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

- Conductors:
  a. ASTM
  b. IPECA

SUBMITTALS

- Not required.

PART 2 - PRODUCTS

APPROVED MANUFACTURERS

Wire and Cable: American Insulated Wire, General Electric, Phelps Dodge, Triangle, Anaconda, General Cable, National Electric Products, Rome.

Connectors: Hand applied: “Wing Nut" (Ideal Industries), "Piggy" (Thomas & Betts) or "Scotchlok" (3M Company).

Electrical Tape: Minnesota Mining 33+.

WIRE AND CABLE

General: Provide wire with a minimum insulating rating of 600 volts, except for wire used in 50 volts or below applications for control of signal systems use 300 volt minimum or 600 volt where permitted to be incorporated with other wiring systems.

Conductors: Electrical grade, annealed copper, tinned if rubber insulated, and fabricated according to ASTM standards, minimum size number 12 for branch circuits; number 18 for control wiring.

The conductors illustrated on the drawings are copper, except as otherwise noted.

Stranding and Number of Conductors:

- Number 14, 12 and 10 solid.
- Cables larger than number 10, stranded according to ASTM Class B stranding designations.
- Control wires stranded according to ASTM Class B stranding designations.
- Cables, multi conductor unless otherwise noted for low tension systems.

Insulation:

- Type THW, THHN-2 or THWN-2 Thermoplastic insulation suitable for use in wet locations up to 75 degrees Centigrade: use for lighting, receptacle and motor circuits and for panel and equipment feeders.
- Type THHN-2 Frame retardant: heat resistant thermoplastic insulation, nylon jacket rated for 90 degrees Centigrade operation. Use for interior lighting branch circuit wiring installed and passing through the driver channels of LED fixtures, wiring in metal roof decks in or near roof insulation, in attic or joist spaces.
- Type XHHW-2: For exterior use.

Color Coding: Provide consistent phase color, Neutral conductor shall be White.

CONNECTORS

Make connections, splices, taps and joints with solderless devices, mechanically and electrically secure. Protect exposed wires and connecting devices with electrical tape or insulation to provide not less than that of the conductor.

Branch Circuit wires (Number 10 and smaller): Use any of the following types of terminals and connecting devices:

- Hand Applied:
    a. Coiled tapered, spring wound devices with a conducting corrosion resistant coating over the spring steel and a plastic cover and skirt providing full insulation for splice and wired ends. Screw connector on by hand.

PART 3 - EXECUTION

WIRE AND CABLE

Provide a complete system of conductors in raceway system. Mount wiring through a specified raceway, regardless of voltage application.

Drawings do not indicate size of branch circuit wiring. For branch circuits whose length from panel to furthest outlet exceeds 100 feet for 120-volt circuits or 200 feet for 277-volt circuits, use number 10 or larger.

Do not install wire in incomplete conduit runs nor until after the concrete work and plastering is completed and moisture is swabbed from conduits. Eliminate splices wherever possible. Where necessary, splice in readily accessible pull, junction, or outlet box.

Use terminating fittings, connectors, etc., of a type suitable for the specified cable furnished. Make bends in cable at termination prior to installing compression device. Make fittings tight.

Extend wire sizing for the entire length of a circuit, feeder, etc. unless specifically noted otherwise.

END SECTION 26 05 19

Section 26 05 26 – Grounding and Bonding for Electrical Systems

PART 1 – GENERAL

SCOPE

Provide a low impedance grounding system according to the Contract Documents.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

- Underwriters Laboratory Standard No. U.L. 467.
- ANSI C 1 1978.
- IEEE Standard No. 142 1982.
- National Electrical Safety Code.

PART 2 - PRODUCTS

GENERAL

Furnish and install an electrical grounding system as indicated on the construction documents and as specified herein.

Grounding systems shall be installed according to the requirements of the local authorities, NEC Section 250, and subject to the approval of the architect.

All ground wires and bonding jumpers shall be stranded copper installed in conduit. All ground wires shall be without joints and splices over its entire length.

GROUNDING SYSTEMS

The system neutral shall be grounded at the service entrance only and kept isolated from grounding systems throughout the building.

Each system of continuous metallic piping and ductwork shall be grounded according to the requirements of the NEC Section 250.

PVC conduits and portions of metallic piping and duct systems which are isolated by flexible connections, insulated couplings, etc., shall be bonded to the equipment ground with a flexible bonding jumper, or separate grounding conductor.

Mechanical equipment shall be bonded to the building equipment grounding system. This shall include, but is not limited to, fans, pumps, chillers, etc.

Receptacles shall be grounded to the outlet box by means of a bonding jumper between the outlet box and the receptacle grounding terminal.

Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings and other metal noncurrent carrying parts that are to serve as grounding conductors shall be effectively bonded where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them. Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces or be connected by means of fittings so designed as to make such removal unnecessary.

PART 3 - EXECUTION

Grounding connections and splices shall be brazed molded exothermic welded, bolted clamp terminal or pressure connector type. Bolted connections and pressure connectors shall be used for connections to removable equipment.

Provide a complete test according to Section 26 01 26 of these specifications.

END SECTION 26 05 26

Section 26 05 29 – Hangers and Supports for Electrical Systems

PART 1 – GENERAL

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

SUBMITTALS

Product Data: Provide data for support channel.

QUALITY ASSURANCE

Support systems shall be adequate for weight of equipment and conduit, including wiring, which they carry.

PART 2 – PRODUCTS

MATERIAL

Support Channel: Steel, Galvanized, Enameled or other corrosion resistant.

Hardware: Corrosion resistant.

Minimum sized threaded rod for supports shall be 3/8” for trapezes and single conduits 1-1/4” and larger, and ¼” for single conduits 1” and smaller.

Conduit clamps, straps, supports, etc., shall be steel or malleable iron. One-hole straps shall be heavy duty type. All straps shall have steel or malleable backing plates when rigid steel conduit is installed on the interior or exterior surface of any exterior building wall.

PART 3 – EXECUTION

INSTALLATION

Fasten hanger rods, conduit clamps, outlet, junction and pull boxes to building structure using pre-cast insert system, preset inserts, beam clamps, expansion anchors, or spring steel clips (interior metal stud walls only).

Use toggle bolts or hollow wall fasteners in hollow masonry, plaster, or gypsum board partitions and walls; expansion anchors or preset inserts in solid masonry walls; self-drilling anchors or expansion anchors on concrete surfaces; sheet metal screws in sheet metal studs and wood screws in wood construction. If nail-in anchors are used, they must be removable type anchors.

Powder-actuated fasteners and plastic wall anchors are not permitted. Compressed-air power-actuated fasteners may ONLY be used for the installation of separate ceiling wires required for support of conduits and aircraft cable hung light fixtures.

File and de-bur cut ends of support channel and spray paint with cold galvanized paint to prevent rusting.

Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit. Do not fasten to suspended ceiling grid system.

Do not drill structural steel members unless approved by Structural Engineer.

Fabricate supports from galvanized structural steel or steel channel, rigidly welded or bolted to present a neat appearance. Use hexagon head bolts with spring lock washers under all nuts.

In mechanical rooms and electrical rooms install free-standing electrical equipment on 3.5-inch (89 mm) concrete pads (minimum).

Install surface-mounted cabinets and panelboards with a minimum of four anchors. At all cabinet and panelboard locations on concrete or concrete block walls, and at ALL locations below grade, provide steel channel supports to stand cabinet 1 inch (25 mm) off wall (7/8” Uni-strut or ¾” painted, fire-retardant plywood is acceptable). In above-grade equipment rooms that have drywall walls, the cabinets and panelboards may be mounted to the drywall if backing is provided in the stud walls behind the equipment.

Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

Furnish and install all supports as required to fasten all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.

END OF SECTION 26 05 29

Section 26 05 33 – Raceways and Boxes for Electrical Systems

PART 1 – GENERAL

SCOPE

Provide all materials, labor, services and incidentals necessary for the completion of this Section of the Work.

SHOP DRAWINGS

Not required.

PART 2 - PRODUCTS

Rigid, heavy wall, hot dipped galvanized steel (GRC), produced to ANSI Specification C80.1.

- Manufacturer: Republic Steel, GALVITE, or equal.

Rigid, standard wall, Poly Vinyl Chloride:

- UL listed, Type 40/80.
- Manufacturer: Carlon, or equal.

Thinwall, galvanized electric metallic tubing (EMT):

- Manufacturers: Republic Steel ELECTRUNITE, or equal.

Liquidtight Flexible Metal Conduit:

- Flexible steel core with gray Poly Vinyl Chloride covering.
- Manufacturer: Anaconda Metal Hose, or equal.

CONDUIT FITTINGS

All fittings shall be designed for the application.

For rigid metallic conduits:

- Threaded couplings and connections. Connections shall comprise a double locknut and nonmetallic bushing or locknut and steel or malleable iron bushing.
- Manufacturer: Raco, or equal.

For rigid PVC conduits:

- Cemented socket type couplings and socket/threaded adaptors.
- Manufacturer: Carlon Products, or equal.

For electric metallic tubing:

- Steel gland compression type.
- Manufacturer: Raco, or equal.

For liquidtight flexible metal conduit:

- Specifically designed for use with liquidtight conduit.
- Manufacturers: Appleton, or equal.

PART 3 - EXECUTION

CONDUITS

General:

All line voltage wiring shall be installed in conduit.

All life safety wiring shall be installed in conduit.

All exterior wiring above grade shall be run in conduit.

Conduit Sizing:

- GRC, PVC, IMC, EMT, ENT: 1/2" minimum.
- Flexible: 1/2" minimum.
- Conduit sizes shall be based on THW insulated conductors, regardless of the type of insulation on conductors installed.
- Unless noted otherwise, conduit sizes indicated on the Drawings are based upon using copper conductors.

Conduit runs shall be installed perpendicular and parallel to structure, walls and ceilings. Group conduits where possible.

All conduit fittings and boxes shall be concealed where building construction permits. Obtain permission for surface mounting from the engineer prior to commencing any installation.

Exposed conduits shall be run parallel to and at right angles to building lines and neatly grouped with approved conduit hangers or channel supports.

Conduits shall be capped upon installation to keep same free from dirt and water during construction.

Conduits shall be installed a minimum of 12" away from any hot water piping and from any heated surface.

PVC and flexible metal conduit shall carry a separate grounding conductor. Refer to Section 16450.

All other low voltage wiring shall be run as follows:

- In solid concrete wall: Provide PVC conduit and outlet boxes for entire run where concealed in concrete. Convert to EMT immediately upon emerging from concrete.
- In hollow masonry partitions: Provide continuous EMT and metal outlet boxes. Terminate in accessible plenum cavities with 90-degree sweep to horizontal. Provide Arlington (or equal) press-on insulating bushings to protect end of metallic conduit.
- In hollow wood or metal stud partitions: (Same as for hollow masonry partitions.)

Rigid Steel Conduits:

- Shall be used through walls and floors entering the building, as an extension of underground PVC conduits.

Rigid PVC Conduits:

- May be used for direct burial below grade; however, PVC raceways must be converted to rigid steel where entering the building.
- Protect from injury during construction. Conduit or couplings that are cracked, broken, crushed, etc., shall be replaced.
- Cutting, joining and bending conduit shall be as per manufacturer's recommendations.
- PVC conduits shall carry a grounding conductor.

Thinwall Steel Conduits

- 1/2 through 4" trade size may be used throughout, except:
    a. Laid in contact with the earth.
    b. Cast into concrete slabs on grade.
    c. Exposed to the weather.
    d. Areas having excessive moisture.

Liquidtight Flexible Metal Conduit:

- In lengths not to exceed 24 inches shall be used for final raceway connections to all motorized equipment.
- Install liquidtight conduit and fittings in such a manner as to assure a liquidtight assembly throughout.

CONDUIT FITTINGS

Provide all fittings necessary for a complete installation, providing ground continuity from the service equipment to each extreme remote outlet box, wiring enclosure and motor/equipment connection.

Provide proper fittings for the application.

Install fittings as per manufacturer's recommendations.

Install fittings with integral ground lug where required.

SPECIAL REQUIREMENTS

All metallic conduit buried in earth shall be specially protected against corrosion by the following methods:

- Coat entire conduit and fitting with Bitumastic #50 in field after couplings have been assembled. The junction points of all couplings shall be made watertight.

Conduits passing through roof:

- Proper flashing and sealing shall be installed to prevent moisture leakage.

Fire Alarm System Raceway:

Metallic raceway shall be pre-painted “red” by manufacturer.

END SECTION 26 05 33

Section 26 05 36 – Cable Trays

PART 1 – GENERAL

SCOPE

Provide cable trays where shown or indicated on the Drawings, including all accessories and suspension members as required.

Cable Tray is designated for all low voltage and communications cabling. Conduit and power wiring shall not be installed on Cable Tray.

SUBMITTALS

Required.

Provide manufacturer's literature showing dimensions of each part.

Provide installation instructions.

PART 2 - PRODUCTS

CABLE TRAY

Cable Tray shall be B-LINE "WB200 Series" wire mesh basket system.

- Equal products by Cabofil, Chalfant, or G.S. Metals will be acceptable.

Provide Tray with single tier - bottom hung.

Tray to be 12” width with 2” loading depth.

Support tray with heavy duty center hung supports. Install supports at a maximum of 6-foot intervals or as required to support a minimum of 60 lbs/linear foot.

Tray material shall be ASTM A510 steel with a yellow zinc dichromate finish applied after fabrication.

Tray shall be supported from building structure. Verify mounting accessories required on site.

Provide all splices, mounting accessories, and any other accessories required for a continuous installation.

LADDER-TYPE CABLE TRAY (INSTALL IN TELECOM RM. #115)

Description: NEMA VE 1, Class 8C ladder type tray.

Material: Steel

Finish (steel tray only): ASTM A 525, mill-galvanized before fabrication

Inside Width: 12 inches.

Inside Depth: 4 inches. Inside depth shall be measured from the top of rail to the top of rung.

Straight Section Rung Spacing: 9 inches on center.

Inside Radius of Fittings: 12 inches.

Provide manufacturer's standard clamps, hangers, brackets, splice plates, reducer plates, blind ends, barrier strips, connectors, and grounding straps.

PART 3 - EXECUTION

CABLE TRAY

Provide necessary fittings, splices and joints, hanging devices, and accessories as required for the installation. Cable tray shall be installed continuous where shown on Drawings as best possible. Cable tray may be interrupted up to 36” in length at any location to allow for ductwork or structural interferences.

Support cable tray from structure. Do not support from electrical conduit, ductwork, piping or other mechanical equipment.

Supports shall be installed at maximum 6’ intervals to yield 60 lb./ft. loading capacity.

Maintain continuous grounding path for all lengths of cable tray. Where cable tray is interrupted, bond adjacent sections with #6 copper ground conductor and grounding clamps.

At Data Cabinets or Racks, provide continuous drop-out supports. Maintain smooth radius as best possible. Secure tray above cabinet or rack for rigid support of drop-out fitting.

Field cutting and notching will be allowed. Provide additional supports at all cuts and notches that may affect load carrying capacity of tray.

Cable tray to be shared with all trades for low voltage cable. Coordinate with mechanical contractors as required.

END SECTION 26 05 36

Section 26 05 53 – Identification for Electrical Systems

PART 1 – GENERAL

SCOPE

Provide fixed identification on all Panelboards.

Provide fixed identification of all motor disconnects and control devices.

Provide identification of all power, low voltage and communication wire and conductors.

PART 2 - PRODUCTS

NAMEPLATES

Unless otherwise noted, nameplates shall be black bakelite plates with white engraved upper-case letters enclosed by white border on beveled edge.

All nameplates must be engraved and must be secured with rivets or brass screws.

Lettering heights unless otherwise noted must be as follows:

Item	Lettering Height
Panelboards	1/2"
Combination Disconnect/Starters	1/2"
Disconnect Switches	1/2"
Transfer Switches	1/2”
Lighting Control Panels	1/2"
Equipment	1/2”

Nameplate inscriptions must bear the name and number of equipment to which they are attached as indicated on the Drawings. The engineer reserves the right to make modifications in the inscriptions as necessary.

EMBOSSED PLASTIC LABELS

1/4" plastic tape with high gloss black finish and white letters.

Pressure sensitive adhesive bond.

Dymo or equal.

COLOR CODING TAPE

5 mil pressure sensitive tape.

Scotch "35" or equal.

WIRE MARKERS

Waterproof tape with factory printed numerals.

Pressure sensitive adhesive bond.

Thomas & Betts or equal.

PART 3 - EXECUTION

NAMEPLATES

Provide and install nameplates for the following:

- All new panelboards.
- All new combination disconnect switches/motor starters.
- All new disconnect switches, fused or un-fused, rated at 60 amp or greater.

Confirm background color and exact text on labels with owner prior to ordering, fabricating or installing nameplates.

PANELBOARDS

After installations are complete, provide and mount under sturdy transparent shield in the directory frame of each panel door, a neat, accurate and carefully typed directory properly identifying the lighting, receptacles, outlets and equipment each overcurrent device controls.

Include on directory the panel identification, the cable and raceway size of panel feeder, and the feeder origination points.

EMBOSSED PLASTIC LABELS

Install an embossed plastic label on each of the following:

- Disconnects of 30-amp capacity and 3-poles or less.
- Single pole and small motor disconnects.
- Power and lighting contactors.
- Relays.
- Pull and junction boxes.
- Blank outlet covers (install on back of plate).
- Terminal cabinets.
- Time controls.

CONDUCTOR COLOR CODING

#8 wire and smaller shall be color coded insulation per ANSI standards.

#6 wire and larger shall be black color with 3/4" minimum color band of colored plastic tape at each connection, splice or junction/pull box.

Conductor color coding or taping shall comply with current NEC regulations, regardless of existing color coding on site.

COMMUNICATION CABLE

Identify each cable with a wire marker indicating Room Number or origin and intended use.

Install wire markers at all termination points.

EMPTY CONDUIT

Identify each empty conduit above suspended ceiling to indicate origin of conduit and intended use.

END SECTION 26 05 53

Section 26 05 73 – Short Circuit/Coordination Study & Arc Flash Hazard Study

PART 1 – GENERAL

SCOPE

The electrical contractor shall retain the services of an independent third party firm to perform a short circuit/coordination study and arc flash hazard study as described herein.

The studies shall be submitted to the Design Engineer prior to receiving final approval of the distribution equipment shop drawings and/or prior to release of equipment for manufacture. If formal completion of the studies may cause delay in equipment manufacture, approval from the engineer may be obtained for a preliminary submittal of sufficient study data to ensure that the selection of device ratings and characteristics will be satisfactory.

The studies shall include all portions of the electrical distribution system from the normal power source or sources, and emergency / standby sources, down to and including the smallest circuit breaker in the distribution system (for short circuit calculations). Normal system connections and those which result in maximum fault conditions shall be adequately covered in the study.

The firm should be currently involved in low-voltage power system evaluation. The study shall be performed, stamped and signed by a registered professional engineer in the State of Wisconsin. Credentials of the individual(s) performing the study and background of the firm shall be submitted to the Design Engineer for approval prior to start of the work. A minimum of five years' experience in power system analysis is required for the individual in charge of the project.

The firm performing the study should demonstrate capability and experience to provide assistance during start up as required.

The study and assessment shall be performed based on SKM's Dapper, Captor and PowerTool software.

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 26 2416 - Panelboards

Section 26 2728 - Disconnect Switches

Section 26 2813 - Fuses

Section 26 2816 - Enclosed Switches and Circuit Breakers

Section 26 3623 – Automatic Transfer Switches

QUALITY ASSURANCE

Reference standards listed in the IEEE "Buff Book", latest edition.

DATA COLLECTION FOR THE STUDY

The contractor shall provide the required data for preparation of the studies. The engineer performing the system studies shall furnish the contractor with a listing of the required data immediately after award of the contract.

The contractor shall expedite collection of the data to assure completion of the studies as required for final approval of the distribution equipment shop drawings and/or prior to release of the equipment for manufacture.

SUBMITTALS

DRAFT REPORT: Submit a draft of the study to Design Engineer for review prior to delivery of the study to the owner. Make all additions or changes as required by the reviewer.

FINAL STUDY REPORT: Provide studies in conjunction with equipment submittals to verify equipment ratings required.

The results of the power system study shall be summarized in a final report. Six bound copies of the final report shall be submitted. Provide two copies in PDF format of the study, so that it can be more easily stored and shared. Also, provide two copies of the one-line diagram in CAD format.

The report shall include the following sections:

I. Overview

II. Short Circuit Study

- SC-1 Purpose
- SC-2 Explanation of Data
- SC-3 Assumptions
- SC-4 Analysis of Results
- SC-5 Recommendations
- SC-6 DAPPER Fault Analysis Input Report

III. Protective Device Coordination Study

- PDC-1 Purpose
- PDC-2 Explanation of Data
- PDC-3 Assumptions
- PDC-4 Analysis of Results
- PDC-5 Recommendations (Including NEC 700-27 Requirement)
- PDC-6 CAPTOR Results
- PDC-7 Example Drawings

IV. Arc Flash Study

- ARC-1 Purpose
- ARC-2 Explanation of Data
- ARC-3 Assumptions
- ARC-4 Analysis of Results
- ARC-5 Recommendations
- ARC-6 SKM Arc Flash Evaluation Report

V. Prioritized Recommendations and Conclusions

VI. Appendices

- APP-1 DAPPER One-line Diagrams
- APP-2 AutoCAD One-line Diagrams
- APP-3 SKM Protective Device Summaries
- APP-4 Reference Data
- APP-5 Sample Work Permit Form
- APP-6 Copy of Warning Labels, including study date

The above sections shall include the following items in detail:

- Obtain available fault current from the local utility company.
- Short circuit studies shall evaluate the available fault current at each bus (each change of impedance).
- Coordination study recommendations for relay settings, breaker settings, and motor protection settings.
- Recommendations for improving the coordination and/or load distribution, as well as ground fault requirements.
- Arc flash values for two normal cases to define the highest values (low short circuit and high short circuit).

- Arc flash values for two maintenance cases, which define the arc flash values available at the equipment that would be available if the instantaneous trip of the upstream circuit breaker is set at a minimum value. This is recommended if someone has to work on live equipment.
- IEEE standard one-line diagram with equipment evaluation and circuit breaker setting forms that clearly define the system data and are easy to interpret.
- Recommendations to reduce the arc flash incident energy in all areas that require class 2 and higher PPE.
- Prioritized report summarizing all recommendations from this study. This shall include observed NEC code violations and their corrective action.
- The contractor shall provide a one-line diagram that meets IEEE/ANSI standard 141, mounted on 24” x 36” (minimum) Styrofoam backboard. This one-line diagram shall be mounted in each electrical room.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

SHORT CIRCUIT AND COORDINATION STUDY

The short circuit, coordination, and arc flash hazard studies shall be performed using SKM Dapper, Captor and PowerTool for Windows software packages. In the short circuit study, provide calculation methods and assumptions, the base per unit quantities selected, one-line diagrams, source impedance data including power company system characteristics, typical calculations, and recommendations. Calculate short circuit interrupting and momentary (when applicable) duties for an assumed 3-phase bolted fault at each supply switchgear lineup, low voltage switchgear lineup, distribution panelboards, pertinent branch circuit panelboard, transfer switches, control panels for motors, disconnect switches and other significant locations throughout the system. Provide a ground fault current study for the same system areas, including the associated zero sequence impedance data. Include in tabulations fault impedance, X to R ratios, asymmetry factors, motor contribution, short circuit KVA, and symmetrical and asymmetrical fault currents.

In the protective device coordination study, provide time-current curves graphically indicating the coordination proposed for the system, centered on conventional, full-size, log-log forms. Include with each curve sheet a complete title and one-line diagram with legend identifying the specific portion of the system covered by that particular curve sheet. Include a detailed description of each protective device identifying its type, function, manufacturer, and time-current characteristics. Tabulate recommended device tap, time dial, pickup, instantaneous, and time delay settings.

Include on the curve sheets power company relay and fuse characteristics, low-voltage equipment circuit breaker trip device characteristics, pertinent transformer characteristics, pertinent transformer characteristics, pertinent motor characteristics, and characteristics of other system load protective devices. Include at least all devices down to largest branch circuit and largest feeder circuit breaker in each main breaker in branch panelboards.

Include all adjustable settings for ground fault protective devices. Include manufacturing tolerance and damage bands in plotted fuse characteristics. Show transformer full load and 150, 400, or 600 percent currents, transformer magnetizing inrush, ANSI transformer withstand parameters, and significant symmetrical and asymmetrical fault currents. Terminate device characteristic curves at a point reflecting the maximum symmetrical or asymmetrical fault current to which the device is exposed.

Select each primary protective device required for a delta-wye connected transformer so that its characteristic or operating band is within the transformer characteristics, including a point equal to 58 percent of the ANSI withstand point to provide secondary line-to-ground fault protection. Where the primary device characteristic is not within the transformer characteristics, show a transformer damage curve. Separate transformer primary protective device characteristic curves from associated secondary device characteristics by a 16 percent current margin to provide proper coordination and protection in the event of secondary line-to-line faults.

Include complete fault calculations as specified herein for each proposed and ultimate source combination. Note that source combinations may include present and future supply circuits, large motors, or generators as noted on drawing one-lines.

Utilize equipment load data for the study obtained by the contractor from contract documents, including contract addendums issued prior to bid openings.

Include fault contribution of all motors in the study. Notify the engineer in writing of circuit protective devices not property rated for fault conditions.

FIELD SETTINGS

The contractor shall perform field adjustments of the protective devices as required to place the equipment in final operating condition. The settings shall be according to the approved short circuit study, protective device coordination study and arc flash hazard study.

Necessary field settings of devices and adjustments and minor modifications to equipment to accomplish conformance with the approved short circuit and protective device coordination study shall be carried out by the contractor at no additional cost to the owner.

ARC FLASH HAZARD STUDY

As part of the short circuit and coordination study, arc flash hazard study shall be included. The study shall include the following:

- Determine and document all possible utility sources that are capable of being connected to each piece of electrical gear. Calculations shall be based on highest possible source connection.
- Calculations to conform to National Fire Protection Association (NFPA) 70E – 2003 calculation standards. All incident energy units shall be calculated in calories per square centimeter.
- Provide recommended boundary zones and personal protective equipment (PPE) based on the calculated incident energy and requirements of NFPA 70E-2003 for each piece of electrical gear.

Electrical Contractor shall provide labeling as required by OSHA based upon the results of the arc flash hazard study. At a minimum, the labeling shall contain the following information: PPE level, Flash Hazard Boundaries, Flash Protection Boundary, and Shock Hazard Boundaries such as Limited Approach Boundary, Restricted Approach Boundary, Prohibited Approach Boundary, and study date."

END SECTION 26 05 73

Section 26 09 23 – Lighting Control Devices

PART 1 – GENERAL

SCOPE

Provide and install all automatic lighting controls as shown on the Drawings and as specified within.

Model numbers on the Drawings take precedence over model numbers listed in this specification.

SHOP DRAWINGS

Required.

Provide manufacturer's standard literature for each project proposed for the project.

SPECIAL PROJECT CONDITIONS

All wall-mounted occupancy sensors for this project shall match color of electrical devices.

PART 2 - PRODUCTS

WALL-MOUNTED OCCUPANCY/VACANCY SENSORS – SINGLE RELAY

Wattstopper Model PW-100.

- Equal products by Mytech, Novitas, Leviton or Uenco are acceptable.

Switch mounts in standard single gang electrical box or may be gang-mounted with additional decorator-type electrical devices.

Switch works on infrared sensing only.

800 watts load rating for LED Lighting.

Adjustable time delay form 15 sec. up to 30 minutes.

Field–adjustable sensitivity and light level.

180-degree coverage up to 10 feet in radius.

WALL-MOUNTED OCCUPANCY SENSORS – DUAL RELAY

Wattstopper model PW-200

- Equal products by Mytech, Leviton, Novitas or Uneco are acceptable.

Switch mounts in a standard single-gang electrical box or may be gang-mounted with additional decorator-type electrical devices.

Passive infrared dual relay (Dual-switching) wall switch

120/277 VAC, 800 watts load rating

Time delays: Fixed (5, 10, 15, 20, 25, or 30) walk-through test mode.

CEILING-MOUNTED ULTRASONIC OCCUPANCY SENSORS

Based on products by Wattstopper.

- Equal products by Mytech or Novitas are acceptable.

Sensor shall be Wattstopper Model WT-605.

Power pack shall be Wattstopper Model BZ-100.

Sensor mounts over a standard octagon box or may be supported independently on a suspended ceiling system.

Power pack mounts to a standard electrical box using knockout to separate low voltage from high voltage.

Include low voltage senor wiring. 3-conductor, #18 AWG minimum, with overall non-shielded jacket, plenum-rated where located in air-return plenums.

CEILING-MOUNTED DAYLIGHT SENSOR

Based on products by Leviton, model #PCC1D-W.

Equal products by Wattstopper and Hubbell are acceptable.

120/277VAC Line Voltage

1% Accuracy

1FC – 1,600FC Range

1 Zone, 1 Relay

PART 3 - EXECUTION

GENERAL INSTALLATION

Mount automatic controls where shown on the Drawings. Ceiling-mounted sensors shall be coordinated with lighting, HVAC diffusers/grilles, etc.

Make all wiring connections per manufacturer direction.

At completion of installation, adjust light level and sensitivity as needed for proper operation.

90 DAY RE-ADJUSTMENT

After 90 days of “normal” use by the owner, this contractor shall re-adjust the sensitivity, lighting levels and devices locations as necessary for proper and acceptable operation.

END SECTION 26 09 23

Section 26 24 16 – Panelboards

PART 1 – GENERAL

SCOPE

General: Provide Panelboards according to the Contract Documents.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and recommendations of the following.

- Panelboards:
  a. U.L. Standards #50 and #67.
  b. Federal Standard W P 115A Type II, Class 1.
  c. N.E.M.A. Standard PB 1 1971.
- Circuit Breakers:
  a. U.L. Standard #489.
  b. Federal Standard W C 375a Amendment No. 4 and W C 375b.
  c. N.E.M.A. Standard AB 1 1969.

SUBMITTALS

With each panelboard center drawing, the following is required.

- Show main devices and lug sizes; branch circuit device sizes and arrangement; circuit breaker terminal degree ratings; bus ampacities; with stand ability and short circuit rating; dimensions and construction; gutter and back-box dimensions; nameplate and legends; protective coating; and all pertinent details of panel, enclosure, cover and method of securing cover and lock.

QUALITY ASSURANCE

- Each panelboard as a complete and finished product, shall receive a single integrated equipment rating by the manufacturer. The integrated equipment short circuit rating shall certify that all equipment is capable of withstanding the thermal and magnetic stress of a fault equal to the value specified on the Drawings. Such rating shall be established by actual tests by the manufacturer on similar equipment. This certification shall be permanently affixed to each panelboard and motor control center. Test data shall be submitted to the engineer at time of submission of Acceptance Drawings.

PART 2 - PRODUCTS

APPROVED MANUFACTURERS

Square D, Cutler Hammer, Siemens & General Electric

PANELBOARDS IN GENERAL

Provide panelboards and motor control centers consisting of an assembly of branch circuit switching and protective devices (circuit breakers) mounted inside a dead front enclosure. Provide the number and size of these branch circuit devices as indicated by the circuiting, on the drawings, and in the schedules.

Provide the following modifications and additional equipment as shown on the Drawings.

- Main circuit breakers.
- Double lugs for multiple cables or for future provisions.
- Ground fault interrupting circuit breakers.

Interiors:

- Rigid assembly of copper bus bars and plug on branch circuit devices.
- Bus bars fabricated to permit branch circuit devices of all sizes and number of poles to be interchangeable and installed in any spare space of sufficient size, without disturbing adjacent units; without removing main bus or branch circuit connectors and without machining, drilling, or tapping in the field.

- Arrange bus in sequence or distributed phasing so that multipole circuit breaker can replace any group of single circuit breakers of the same size.
- Provide split neutral bus in each panelboard.

Enclosure:

- Code gauge steel box.
- Provide a bolt on ground connector to inside of enclosure.
- Flush mounted in finished areas and where indicated. Surface mount elsewhere.

Front:

- Doors must be provided on all lighting and power panels.
- Hold front closed with trim clamps or screws.
- Factory finished in medium gray enamel or two coats of air-drying lacquer over a rust inhibitor.
- Provide directory for total number of poles.
- Provide approved lock. All panels keyed alike. Furnish 4 sets matching keys to the owner.
- Doors over 48" in height shall have auxiliary fasteners at top and bottom of door in addition to lock and catch.

Terminal Lugs:

- Bolted type, labeled for either copper or aluminum conductors.
- Locate main lugs properly at top or bottom, depending where main feeder enters.

Electrical Ratings:

- Panelboards are to be rated with voltage as listed in the Scheduled on the Drawings, 3 phase, 4 wire, full neutral with ampacities as indicated on the Drawings (unless otherwise noted).
- Short circuit withstand ratings shall be as indicated on the Drawings or as indicated in the Short Current coordination study and Arc Flash Hazard study whichever is greater.
- Where indicated, provide panelboards having a "service entrance" Type UL label with neutrals factory bonded to frame or enclosure.

Circuit Breaker Devices:

- Plastic molded case. Completely sealed enclosure. Toggle type operating handle. Trip ampere rating and ON/OFF indication clearly visible.
- Thermal magnetic trip free, trip indicating, quick make, quick break, with inverse time delay characteristics.
- Silver alloy contacts with auxiliary arc quenching devices.
- Panelboard must be of the type which will accept the field installation of shunt trip devices of 60 amperes or less on the branch devices.
- Interrupting capacities shall be as indicated on the Drawings. In general, 120/208-volt devices shall be not less than (10,000 AIC) or as indicated in the Short Current coordination study and Arc Flash Hazard study whichever is greater.
- For lighting circuits that are controlled at panel, provide devices labeled "SWD" for switching purposes.
- Bolted type terminals U.L. listed for either aluminum or copper 75 degrees C. cables.
- Locate next to each breaker or space unit an individual number.
- All circuit breakers in 277/480 VAC panelboards shall be “bolted” type.
- All circuit breakers in all panelboards shall be “bolted” type.

Ground Fault Interrupters:

- Ground fault interrupter branch circuit breakers shall be as indicated in panel schedules. Circuit breakers shall be circuit interrupting which will operate manually for normal switching functions and automatically under overload, short circuit, and 0.005-amp line to ground fault conditions. The operating mechanism shall be entirely trip free so that contact cannot be held close against an abnormal overcurrent, short circuit, or ground fault condition.

PART 3 - EXECUTION

GENERAL

Mount panel 4 feet to panel center but with maximum height of 6 feet, 6 inches to handle of topmost switching device.

Mount surface type panels a minimum 1 inch off wall on channels.

Where flush mounted, the fire integrity of the wall in which it is installed must be maintained.

Neatly arrange branch circuit wires and tie together in each gutter with Thomas & Betts nylon "Ty Raps" or approved equal at minimum 4-inch intervals.

Plug all knockouts removed and not utilized.

TOUCH UP AND CLEANING

Vacuum all backboxes clean of debris after installation and prior to final payment.

Touch up scratch marks, etc. with matching paint.

END SECTION 26 24 16

Section 26 27 02 – Equipment Wiring Systems

PART 1 – GENERAL

SCOPE

The work under this section includes electrical connections to equipment specified under other Divisions and/or Sections, or furnished by owner, including, but not limited to:

- -HVAC motors, VFDs, and panels
- -Plumbing motors, VFDs, and panels
- All disconnects and motor starters provided as noted in Motor/Equipment Schedule.
- VFD's shall be provided by HVAC contractor and/or Plumbing Contractor.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Section 26 05 33 – Raceway and Boxes for Electrical Systems.

Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.

SUBMITTALS

Product Data: Provide data for cord and wiring devices.

COORDINATION

Coordinate all equipment requirements with the various contractors and the owner. Review the complete set of drawings and specifications to determine the extent of wiring, starters, devices, etc., required.

PART 2 - PRODUCTS

CORDS AND CAPS

Straight-blade Attachment Plug: NEMA WD 1.

Locking-blade Attachment Plug: NEMA WD 5.

Attachment Plug Configuration: Match receptacle configuration at outlet provided for equipment.

Cord Construction: Oil-resistant thermoset insulated multiconductor flexible cord with identified equipment grounding conductor, suitable for hard usage in damp locations.

Cord Size: Suitable for connected load of equipment and rating of branch circuit overcurrent protection.

OTHER PRODUCTS

Refer to related sections for other product requirements.

PART 3 - EXECUTION

INSPECTION

Verify that equipment is ready for electrical connection, wiring, and energization.

PREPARATION

Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

INSTALLATION

Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

Make conduit connections to equipment using flexible PVC-coated metal conduit.

Install pre-finished cord set where connection with attachment plug is indicated or specified, or use attachment plug with suitable strain-relief clamps.

Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

Make wiring connections in control panel or in wiring compartment of pre-wired equipment according to manufacturer's instructions. Provide interconnecting wiring where indicated.

Install disconnect switches, controllers, control stations, and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

HVAC AND PLUMBING CONNECTIONS

Provide all power wiring including all circuitry carrying electrical energy from panelboard or other source through starters, variable frequency drives (VFDs), and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide all wiring between packaged control panels and motors.

VFD Installations: Install VFD input wiring and output wiring in separate conduit systems. Do not mix VFD input power and output power, or control wiring in a common raceway.

Provide 120 volts to each temperature control panel. Coordinate requirements with HVAC/DDC contractors.

Unless otherwise specified, all electrical motors and control devices such as aquastats, float and pressure switches, fan powered VAV boxes, switches, electro-pneumatic switches, solenoid valves and damper motors requiring mechanical connections shall be furnished and installed and wired by the contractor supplying the devices.

Each motor terminal box shall be connected with a minimum 12", maximum 36" piece of flexible PVC-coated metal conduit to a fixed junction box. Conduit must be installed perpendicular to direction of equipment vibration to allow conduit to freely flex.

Check for proper rotation of each motor.

EQUIPMENT CONNECTION SCHEDULE

See the schedule as indicated on the drawings for the conduit size, the wire size and quantity and the final connection.

END OF SECTION 26 27 02

Section 26 27 26 – Wiring Devices

PART 1 – GENERAL

SCOPE

Provide all wiring devices as shown on the Project Drawings and as required to complete the work.

SHOP DRAWINGS

Required.

Provide manufacturer literature showing exact component proposed for this project with dimensions, optional finishes, etc.

Provide manufacturer's installation instructions.

PART 2 - PRODUCTS

WIRING DEVICES

Convenience and Equipment Receptacles:

- Single:
    a. 15 AMP Equipment Receptacle: "Specification Grade", NEMA 5 15R, 15 amp., 125-volt, 3 wire grounding, color choice by architect, Pass & Seymour #26261-X or equal.
    b. 20 AMP Equipment Receptacle: "Specification Grade", NEMA 5 20R, 20 amp., 125-volt, 3 wire grounding, color choice by architect, Pass & Seymour #26361-X or equal.
- Duplex:
    a. Normal Use: "Specification Grade", NEMA 5 20R, 20 amp., 125-volt, 3 wire grounding, color choice by architect, Pass & Seymour #26852-X or equal.
    b. Ground fault interrupting (GFI): "Specification Grade", 20 amp., 120-volt, 3 wire grounding, color choice by architect, with built in ground fault circuit interrupter. Pass & Seymour #2091 S-X or equal.
    c. Provide weather-resistant receptacles for exterior use.
    d. Manufacturers: Eagle, G.E., Hubbell, Leviton, Pass and Seymour or Equal.

Manual Light Switches:

- SPST 1 way: "Specification Grade", 20 amp., 120/277-volt, color choice by architect, Pass & Seymour #2621-X or equal.
- SPST 3 way: "Specification Grade", 20 amp., 120/277-volt, color choice by architect, Pass & Seymour #2623-X or equal.
- SPST 4 way: "Specification Grade", 20 amp., 120/277-volt, color choice by architect, Pass & Seymour #2624-X or equal.
- Manufacturers: Eagle, G.E., Hubbell, Leviton, Pass and Seymour or Slater.
- Single-Pole/3-way dimming switch: 500 VA, 120/277-volt, 20 amp., LED, Lithonia, Lutron or equal.

Miscellaneous Devices:

- DPST switch for small motor disconnects: "Manual Controller", 20-amp, 120-volt, 1 HP max., Pass & Seymour #20AC2 HP, or equal.
- Manufacturers: Eagle, G.E., Hubbell, Leviton, Pass and Seymour or Slater.

Plug-in Strip with surge protection (100 Required for this project):

- Minimum of six outlets
- Computer grade plug-in strip
- 15 amp., 125-volt AC.
- EMI/RFI noise attenuation for micro-processor driven electronic equipment application.
- Manufacturer: Leviton, Model #4900-P or equal.

Device cover plates:

- Interior: stainless steel
- Exterior: Thermoplastic, rainproof, While-In-Use.
- Manufacturers: Eagle, G.E., Hubbell, Leviton, Pass and Seymour or Equal.

PART 3 - EXECUTION

RECEPTACLES

Unless noted otherwise, mount receptacle vertically with U shaped ground position at bottom.

Mount all exterior receptacles horizontally.

Prior to final payment, replace all receptacles/faceplates which have broken features.

SWITCHES

Mount switches vertically with the "on" position on top, unless noted or specified otherwise.

Where switches are indicated to be installed near doors, corner walls, etc. mount same not less than 4 inches and not more than 12 inches from trim. Verify exact location with the architect.

Carefully coordinate the location of switches to ensure locations at the strike side of doors.

Three-way switches shall be installed so all toggles are down when all lighting is “off”.

END SECTION 26 27 26

Section 26 27 28 – Disconnect Switches

PART 1 – GENERAL

SCOPE

Provide disconnect switches according to the Contract Drawings. The work under this section includes disconnect switches, fuses and enclosures.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest provisions and latest recommendations of the following:

- U.L. Standards #98 (File #4776) and #508.
- NEMA Standard KS1 1975.

SUBMITTALS

Submit manufacturers' data for all disconnect switches. Include outline drawings with dimensions, and equipment ratings for voltage, ampacity, horsepower, and short circuit.

PART 2 - PRODUCTS

SAFETY SWITCHES

Heavy duty, 600 VAC Class, single throw knife switch, quick-make, quick-break, load interrupter, enclosed knife switch with externally operable handle interlocked to prevent opening front cover with the switch in the ON position. Shall be capable of full load operations.

Provide self-aligning switchblades with copper contact areas and designed so that arcing upon making and breaking does not occur on the final contact surfaces. Mount switch parts on high grade insulating base.

Enclosure: NEMA 1 or 3R (as noted) with hinged door and can be positively padlocked in "On" and "Off" positions.

Size, fusing and number of poles as shown or as required. Where fused, the devices must be provided with UL listed rejection feature to reject all but Class R cartridge type fuses.

Provide either fused or non-fused as noted on the drawings or as required.

Enclosure: NEMA 1, NEMA 3R as indicated on the drawings.

Provide manufacturer’s equipment ground kit in all disconnect switches.

FUSES

Fuses 600 Amperes and Less: Dual element, time delay, 250, 600-volt, UL Class RK

Interrupting Rating: 200,000 rms amperes.

Fuses 601 Amperes and Larger: Time delay, 600-volt, UL Class L. Interrupting Rating: 200,000 rms amperes.

PART 3 - EXECUTION

MOUNTING

Provide connections and wiring to and from each disconnect switch. Support conduit feeder from ceiling or floor.

Disconnect switches shall be mounted on wall or from the floor with independent supports.

Provide identification as specified in Section 26 05 53.

END SECTION 26 27 28

Section 26 28 13 – Fuses

PART 1 – GENERAL

SCOPE

Provide fuses according to the Contract Documents.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

- UL Standard #198.
- UL Standard #977.

SUBMITTALS

Not required.

PART 2 - PRODUCTS

MANUFACTURERS

Bussman, Cefco, Chase Shawmut

MATERIALS

Branch Circuits and Equipment:

- All fuses shall be labeled as UL Class R, current limiting and rated for up to 200,000 amperes. Time delay Class R fuses shall be so labeled.
- Feeding motor circuits shall be UL Class RK5 labeled as Time delay.
- All fuses shall be so selected as to provide a selectively coordinated system.
- All fuses shall be of the same manufacturer.
- All fuses to be of the Class R type.

Spares: Upon completion of the building, the contractor shall provide the owner with spare fuses as indicated below:

- 100 percent of each type and rating of installed fuses shall be supplied as spares.

PART 3 - EXECUTION

GENERAL

Fuses shall not be installed until equipment is ready to be energized.

All fuses shall be provided by the Electrical Contractor.

END SECTION 26 28 13

Section 26 28 16 – Enclosed Switches and Circuit Breakers

PART 1 – GENERAL

SCOPE

Provide disconnect switches according to the Contract Drawings.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest provisions and latest recommendations of the following:

- U.L. Standards #98 (File #4776) and #508.
- NEMA Standard KS1 1975.

SUBMITTALS

Submit manufacturers' data for all disconnect switches.

PART 2 - PRODUCTS

SAFETY SWITCHES

Heavy duty, 600 VAC Class, single throw knife switch, capable of full load operations.

Provide self-aligning switchblades with copper contact areas and designed so that arcing upon making and breaking does not occur on the final contact surfaces. Mount switch parts on high grade insulating base.

Enclosure: NEMA 1 or 3R (as noted) with hinged door and can be positively padlocked in "On" and "Off" positions.

Size, fusing and number of poles as shown or as required. Where fused, the devices must be provided with UL listed rejection feature to reject all but Class R fuses.

PART 3 - EXECUTION

MOUNTING

Provide connections and wiring to and from each disconnect switch. Support conduit feeder from ceiling or floor.

Disconnect switches shall be mounted on wall or from the floor with independent supports.

END SECTION 26 28 16

Section 26 32 00 – Packaged Generator Assemblies

PART 1 – GENERAL

SCOPE

The work under this section includes providing a complete factory assembled packaged engine generator system with controls and startup testing. Included are the following topics:

RELATED WORK

Applicable provisions of Division 01 govern work under this section.

Section 26 36 23- Transfer Switches.

REFERENCES

NFPA110 – Emergency and Standby Power Systems. Level 1

ANSI/NEMA MG 1 - Motors and Generators.

PERMITS

The contractor shall be responsible for obtaining all necessary permits for the complete installation of the generator fuel system and related equipment.

SUBMITTALS

Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical ratings and diagrams including schematic and interconnection diagrams.

Submit manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

QUALITY ASSURANCE

Manufacturer: Company specializing in packaged engine generator systems with minimum ten years documented experience.

Supplier: Authorized distributor of engine generator manufacturer with service facilities within 100 miles of project site.

EXTRA MATERIAL

Provide two additional sets of each fuel, oil, and air filter elements required for the engine generator system and one additional set of all required belts.

PART 2-PRODUCTS

SYSTEM RATINGS

Generator Set Rating:100 KW, 125 KVA, .8pf, 120/208 VAC, 3 phase, 4 wire, 12 wire re-connectable, 60 Hz at 1,800 rpm. Standby power rated.

Motor starting KVA shall be KVA based on a sustained RMS voltage drop of no more than 10% of no-load voltage with the specified KVA load at near zero power factor applied to the engine-generator set.

The generator set manufacturer shall verify the engine as capable of driving the generator with all accessories in place and operating at the nameplate rating after de-rating for the range of temperature expected in service and the altitude of the installation.

The engine-generator set shall be capable of picking up 100% of nameplate kW, less applicable derating factors, in one step with the engine-generator set at operating temperature.

Voltage regulation shall be ±1.0% of rated voltage for any constant load between no load and rated load. Random voltage variation with any steady state load from no load to full load shall not exceed ±1.0% of rated voltage.

Frequency regulation shall be ±0.5% from steady state no load to steady state rated load.

Harmonic distortion shall not exceed 5% total harmonic distortion at full linear load and no single harmonic shall exceed 3% of rated voltage.

ENGINE AND ENGINE EQUIPMENT

Engine Type: Water-cooled, turbo-charged, four cycle, internal combustion engine.

Fuel Type: Natural gas.

Engine Speed: 1,800 rpm.

Governor: Isochronous electronic type to maintain engine speed within 0.5 percent, steady state, and 1 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.

Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine over crank. Limits as selected by manufacturer.

Include remote starting control circuit, with RUN-OFF-AUTO selector switch on engine generator control panel.

Engine Accessories: Include intake air filter, fuel filter, fuel priming pump, automatic electric fuel shutoff, fuel/water separator, gear-driven water pump, positive displacement mechanical full pressure lubrication oil pump, full flow lubrication oil filters with replaceable elements, dipstick oil level indicator, and oil drain valve with hose extension. Include engine mounted battery charging alternator with solid state voltage regulator. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.

Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F (32 degrees C). Heater voltage shall be 120 VAC.

Mounting: Provide unit with suitable spring-type vibration isolators and mount on concrete base. Consult manufacturer for recommended mounting.

Cooling System: Unit mounted radiator using glycol coolant, with blower type fan, coolant pump and thermostat temperature control sized to maintain safe engine temperature in ambient temperature of 110 degrees F. The equipment supplier shall provide 50% ethylene glycol antifreeze solution to fill engine cooling system.

Exhaust System:

- Provide critical grade silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized according to engine manufacturer's instructions. Contractor shall mount muffler, so its weight is not supported by the engine.
- Flexible exhaust connections shall be provided as required for connection between engine exhaust manifold and exhaust line, in compliance with applicable codes and regulations.
- Provide an exhaust condensation trap with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from entering the engine. Provide drain line to drip pan.
- Provide a suitable rain cap at the stack outlet. Provide all necessary flanges and special fittings for proper installation.
- Contractor shall mount and install all exhaust components as required to comply with applicable codes and regulations. All components shall be properly sized to assure proper operation without excessive back pressure when installed as shown on the drawings. Make provisions as required for pipe expansion and contraction.

Fuel System:

- The generator shall be capable of accepting natural gas fuel. Natural gas fuel will be the primary source of fuel.
- Provide flexible supply and return line fittings and all connections for connecting fuel system to the engine in compliance with applicable codes and regulations. All fuel piping shall be pressure tested for minimum 2 hours.

Batteries:

- Heavy duty, Natural Gas starting type, lead-acid storage batteries. Provide a DC volt system with number of batteries and battery capacity as sized by the manufacturer adequate for four 30 second cranking periods (total of 2 minutes) along with all additional loads being run on the DC system.

GENERATOR

Insulation: ANSI/NEMA MG 1, Class H.

The generator shall be single bearing, self-aligning 4-pole, brushless, synchronous type, revolving field with amortisseur windings, and with direct driven centrifugal blower for proper cooling and minimum noise. No brushes will be allowed. Generator shall be directly connected to engine fly wheel housing and driven through a flexible coupling to ensure permanent alignment. Generator design shall prevent potentially damaging shaft currents.

The generator shall be 3-phase, broad-range, re-connectable and shall have 12 leads brought out to allow connection by user to obtain any of the available voltages for the unit.

The regulator design shall include torque-matching characteristics to allow the engine to use its fullest power producing capacity (without exceeding it or overcompensating) at speeds lower than rated, to optimize motor starting capability and provide the fastest possible recovery from transient speed dips. Regulators which use a fixed volts per hertz characteristic are not acceptable.

Provide an exciter field automatic circuit breaker, mounted on the control panel, of the manual reset only type (cannot be used as a manual disconnect) for protection of exciter field and regulator.

The generator, exciter, and voltage regulator shall be designed and manufactured by the engine generator set manufacturer. The exciter shall be 3-phase, full wave, rectified with heavy duty silicone diodes mounted on the common rotor shaft and sized for maximum motor starting loads. Systems utilizing 3-wire, solid state control elements rotating in the rotor, will not be acceptable. The generator design shall be of the self-protecting type as demonstrated by the prototype short circuit test.

Provide Two mainline circuit breakers as noted on drawings and as recommended by manufacturer, on generator output with integral thermal and instantaneous magnetic trip in each pole; number and rating as indicated. Include battery-voltage operated shunt trip, connection to open circuit breaker on engine failure. Mount unit in enclosure to meet ANSI/NEMA 250, Level 1 requirements. Provide Electronic type circuit breakers as required to meet coordination requirements for the Emergency Branch per the Fault Current and Arc Flash Study requirements.

ACCESSORIES

Provide the following accessories with the engine generator set.

Enclosure: Standard Weather protective housing with the following features:

- Galvanized steel body.
- Lifting points on base frame.
- Stainless steel flush fitting latches and hinges.
- Zinc plated or stainless-steel fasteners.
- Sheet steel components pre-treated with zinc phosphate prior to polyester powder coating.
- Lockable wide door on each side installed to allow 180 degree opening rotation.
- Radiator fill access door with lockable cover.
- Lube oil and coolant drains piped to the exterior of the enclosure skid base.
- Lockable fuel fill cap.
- Battery can only be reached through lockable doors.
- UL listed base tank sized as indicated elsewhere in these specifications.

Battery Heater: Thermostatically controlled battery blanket heater, 120VAC.

Battery Tray: Plastic coated metal tray treated for electrolyte resistance, constructed to contain spillage of electrolyte.

Battery Charger: A 10-ampere voltage regulated battery charger shall be provided for the engine-generator set. Charger shall be equipped with float, taper and equalize charge settings. Charger shall include overload protection, voltage surge suppressor, DC voltmeter and fused AC input. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of:

- Loss of AC power-red light (no relay contact).
- Low battery voltage-red light.
- High battery voltage-red light (no relay contact).
- Chargers fail-red light.

Engine-Generator Digital Control Panel: Top of control panel shall not be more than six (6) feet above finished floor. NFPA – 110, Level 1, generator mounted control panel enclosure with engine and generator controls and indicators. Include the following features:

- Power source with circuit protection: 12or 24 VDC.
- Operating temperature range: –40degree C to +70-degree C.
- Humidity range: 5% to 95% non-condensing.
- Alarm horn.
- Indicators: not on auto, program, systems, warning.
- Alphanumeric digital display.
- Keypad with multi-function soft membrane environmentally sealed cover.
- Frequency Meter.
- True RMS AC Voltage.
- AC Output Amperage.
- Front mounted output voltage adjustment, locking screwdriver type, to adjust voltage ±5% from rated value.
- Push-to-test indicator lamps, one each for low oil pressure, high water temperature, overspeed, and over crank.
- Push-to-test indicator lamps, one each for high engine temperature and low engine oil pressure pre-alarm and one run light.
- A flashing red light to indicate the generator set is not in automatic start mode.
- Engine run/off/auto selector switch.
- Emergency stop “mushroom” switch.
- Engine running time meter.
- Oil pressure gauge.
- Water temperature gauge.
- Battery voltmeter.
- Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.
- Remote Alarm Contacts: Pre-wire form C contacts to terminal strip for remote alarm functions required by ANSI/NFPA 110.
- Indicator lamps to include over crank, low oil pressure, high engine temperature, overspeed, not-in-auto, system ready, low battery volts, battery charger fault, low fuel, pre-alarm high engine temp, pre-alarm low oil pressure, low water temp, auxiliary alarm, auxiliary pre-alarm.
- Remote Annunciator Panel and Emergency Shut-Off Switch.

The NEMA 3R enclosed control panel shall be mounted on the generator set with vibration isolators. The control shall include surge suppression for protection of solid-state components. A front control panel illumination lamp with On/Off switch shall be provided. The engine-generator set starting batteries shall power the monitor.

PART 3 - EXECUTION

EXAMINATION

Verify that required utilities are available in proper location and ready for use.

INSTALLATION

Install according to manufacturer's instructions.

Generator set shall be anchored to the concrete pad.

FIELD QUALITY CONTROL

Provide full load testing utilizing a portable test bank for four hours continuous, minimum. During the first two hours, step increase the load from 0% to 100% in at least six equal steps. At the end of two hours, continue running test at 100% load. Record the following in 20-minute intervals throughout the four-hour test: kilowatts, amperes, voltage, coolant temperature, room temperature, generator frequency (Hz), oil pressure, fuel consumption.

After the generator has cooled down from the four-hour test, shut it down and then simulate a power failure including operation of the transfer switch, automatic cycle, and automatic shutdown and return to normal.

AGENCY TRAINING

Provide factory training to Wisconsin Department of Transportation (D.O.T.) maintenance department (minimum of 2 hours).

END OF SECTION 26 32 00

Section 26 36 23 – Automatic Transfer Switches

PART 1 – GENERAL

SCOPE

The work under this section includes transfer switches (less than 600V) for standby generator systems.

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 26 32 00- Packaged Generator Assemblies.

QUALITY ASSURANCE

Manufacturer: Company specializing in automatic transfer equipment with five years documented experience.

SUBMITTALS

Submit product data showing overall dimensions, electrical connections, electrical ratings, all specified accessories, interlock methods, and environmental requirements.

Submit manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

AUTOMATIC TRANSFER SWITCH

Description: NEMA ICS 2; automatic transfer switch. In applications where the switch serves as the service entrance disconnect, the switch shall be rated as suitable for use as a service disconnecting means.

Configuration: The transfer switch shall be electrically operated and mechanically held. The electrical operation shall be by a solenoid mechanism operating from the same source to which the load is being transferred.

The switch shall be rated for continuous duty and be mechanically interlocked to be in either the normal or the emergency position.

The switch shall be controlled by electronic solid-state components with printed circuit control boards, and industrial grade plug in control relays.

The switch shall be designed and built so that it can be manually operated under no-load conditions from behind a barrier partition or with the door closed. The enclosure shall allow for inspection of the internal operation of the switch through a full sequence of the transfer cycle with the door open and the switch de-energized.

RATINGS (Two required for this project)

Provide One 400 amp. 3-pole, 120/208 volts, 3-phase, 4-wire, NEMA type 1 automatic transfer switch for Optional Standby Branch. Provide One 100 amp., 3-pole, 120/208 volts, 3-phase, 4-wire, NEMA Type 1 automatic transfer switch for Emergency Life-Safety Branch.

AUTOMATIC SEQUENCE OF OPERATION

Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

Time Delay to Start Alternate Source Engine Generator: 0 to 10 seconds, adjustable for Emergency Life Safety Branch.

Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

Time Delay Before Transfer to Alternate Power Source: 0 to 60 seconds, adjustable for Optional Standby Branch.

Initiate Re-transfer Load to Normal Source: Upon permission by normal source monitor.

Time Delay Before Transfer to Normal Power: 0 to 30 minutes adjustable.

Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, unloaded operation.

Operating transfer time of the switch in either direction shall not be greater than 1/6 of a second.

ACCESSORIES

Manual Operator: Provide manual operator to allow switch to be operated under no-load conditions from behind a barrier partition or with the door closed.

Indicating Lights: LED type. Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.

Test Switch: Mount in cover of enclosure to simulate failure of normal source by interrupting the power signal to the normal source monitor.

Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.

Transfer Switch Auxiliary Contacts: Minimum 2 normally open; 2 normally closed.

Normal Source Monitor: Monitor each line of normal source voltage; adjustable set points; initiate transfer when voltage drops below 85 percent.

Alternate Source Monitor: Monitor alternate source voltage and frequency; adjustable set points; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal voltage.

The switch shall contain an in-phase monitor or adjustable time delay transition to inhibit closing of the switch into high levels of motor residual voltage.

A factory installed equipment ground bar shall be provided in each switch enclosure.

Three-pole transfer switches shall contain a factory installed fully rated solid neutral lug assembly.

Provide digital metering on all transfer switches 200A and larger. Metering shall provide, at a minimum, measurement of voltage, current and kW demand for each phase on the load side of the switch.

PART 3 - EXECUTION

INSTALLATION

Install according to manufacturer's instructions.

Starting contacts for all transfer switches shall be wired in parallel to the generator starting circuit so that any transfer switch that senses a loss of normal power will start the generator. This control wiring is not shown on the plans but is required to be provided by the electrical contractor.

FIELD ADJUSTMENTS

The contractor shall field adjust all timing and voltage settings of the transfer switch as necessary for proper operation of the switch, related loads and sources.

AGENCY TRAINING

Provide factory training to Wisconsin Department of Transportation (D.O.T.) maintenance department (minimum of 2 hours).

END OF SECTION 26 36 23

Section 26 43 13 – Transient Voltage Suppression for Low-Voltage Electrical Power Circuits

PART 1 – GENERAL

SCOPE

Provide and install a Transient Voltage Surge Suppression device at the Service Entrance switchboards as shown or indicated on the Drawings.

SHOP DRAWINGS

Required.

PART 2 - PRODUCTS

TRANSIENT VOLTAGE SURGE SUPPRESSION UNIT

APT Model No. TE/4000HPS/CX or equal product by Current Technologies, EPT or Leviton.

- MOV-type surge suppression.
- 120KA/phase surge capacity.
- 200,000 AIC individual fusing per module.
- NEMA 12 enclosure.
- Cover-mounted indicators for MOV status.

PART 3 - EXECUTION

INSTALLATION

Install unit at main service entrance in close proximity to switchboard.

Provide and install 3-pole circuit breaker in switchboard to serve as service disconnect for Surge Suppressor. Size circuit breaker as recommended by manufacturer. (Circuit breaker size on panel board schedules is for bidding purposes only.)

Connect all wiring as directed by manufacturer. All wiring shall be installed in EMT conduit.

Verify proper operation of unit and instruct owner on routine maintenance and inspection requirements.

END SECTION 26 43 13

Section 26 51 13 – LED Lighting

PART 1 – GENERAL

SCOPE

Provide luminaires, lamps and accessories according to the Contract Documents.

STANDARDS

Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:

- Luminaires UL 57, UL 1570, UL 1571, UL 1572, UL676.
- Exit and Egress Luminaires NFPA 70 and 101, UL 924.

SUBMITTALS

Submit shop drawings and manufacturers' data for the following items according to the conditions of the contract and as specified below.

- Major luminaires and special luminaires shall show cross sections. Indicate finished dimensions, metal thicknesses, and materials.
- Show mounting details, including hung ceiling construction.
- Indicate LED Drivers to be utilized and quantity and submit photometry.
- Shop drawings shall include a complete listing of all luminaires on a single sheet. This listing shall contain the luminaire type, manufacturers catalog number, applied voltage and Driver type and luminaire quantities.

PART 2 - PRODUCTS

APPROVED MANUFACTURERS

Luminaires:

- Acceptable manufacturers are listed in the Lighting Fixture Schedule shown on the Drawings.
- Only LED Lighting Fixtures will be used for this project.

FABRICATION

Provide luminaires, completely factory assembled and wired and equipped with necessary sockets, LED Drivers, wiring shielding, reflectors, channels, lenses, etc., and deliver to job ready for installation.

MATERIALS

Finish: Porcelain or baked enamel finish matte white on interiors with minimum tested reflectance of 90 percent matte white finish or as specified in visible exterior. Thoroughly clean base metal and bonderize after fabrication.

Luminaire Wiring: Minimum individual luminaire wiring number 18 gauge with insulation with rated operating temperature of 105 degrees Centigrade or higher.

Where utilized as raceways, luminaires shall be suitable for use as raceways. Provide feed through splice boxes where necessary.

PART 3 - EXECUTION

INSTALLATION

Architect's reflected ceiling plans show actual location of luminaires. Report to the architect/engineer any conflict between these plans and the electrical documents. Perform the work according to the architect/engineer's instructions. At the time of bid, include the most stringent requirement.

Spaces for luminaire insertion will be provided by the trade that installs the ceiling. Furnish plaster and other frames for setting and installing under another section of these specifications.

The contractor is required to protect luminaires from damage during installation of same and up to time of acceptance by the architect and any broken luminaires, glassware, plastics, lamps, etc. must be replaced by the contractor with new parts, without any additional expense to the owner.

Prior to final payment this contractor shall clean all luminaires. Also touch up all scratch marks, etc. in an approved manner.

Install exit lights as indicated on the drawings, but not higher than 10' 0" AFF. All exit lights shall be installed with the downlight component fully operational. Size and color of lettering shall comply with local codes.

END SECTION 26 51 13

Section 26 51 15 – Low Voltage Lighting Control

PART 1 – GENERAL

SCOPE

The work under this section includes power supplies, control equipment, enclosures and switches associated with low voltage lighting control. The lighting Control Panel shall control all exterior lighting fixtures. Not all components are specifically shown. The contractor is responsible to for all design and layout.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

SUBMITTALS

Submit product data indicating system and component construction, ratings, and operating parameters.

Submit manufacturer's installation instructions.

RECORD DOCUMENTS

Accurately record location of switches, power supplies, and control enclosures. Include description of switching and circuiting arrangements.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

PART 2 - PRODUCTS

COMPONENTS

Provide One Hubbell CX, Eight Relay Commercial Lighting Control Panel. Model number CX-08-2-S-08-3L-M.

Includes an LCD User Interface on door of Control Panel and uses simple intuitive scrolling menus to program, check status or update the panel.

Includes an astronomical clock, 365 day programming with 64 schedules.

Programmable dry contact inputs.

Programmable inputs accepts low voltage switches, photocells, or motion sensors.

Low-voltage dry contact output relays.

Five Year warranty.

Power Supply: ANSI/NFPA 70; Class 2 energy limited. 120/24-volt transformer, 40 VA continuous, with silicon rectifier rated 20 amperes intermittent, 7.5 amperes continuous, 30 VAC.

Low Voltage Relays: Heavy duty, latching type remote control relays with contacts rated 30 amperes at 120 volts and with isolated and non-isolated pilot contacts where indicated. Include clamp type screw terminals for line voltage connections.

Switches: Digital programmable type, model #CXSW-2. Two button ON/OFF control.

Switch Plates: Per section 26 27 26.

Remote Control Interface: System shall be able to operate with remote input on an individual local switching basis.

Cabinets and Enclosures: Shop fabricated and wired. Include appropriate barrier strips for mounting relays and separating energy- limited wiring from line voltage wiring. Include knockouts for relay mounting. Include space for 50 percent minimum additional relays and one additional power supply in each cabinet and enclosure.

Provide low-voltage wiring as recommended by manufacturer.

Manufacturers: Douglas, Hubbell, Wattstopper, n-Light or Equal.

PART 3 - EXECUTION

EXAMINATION

Verify that surfaces are ready to receive work.

Verify field dimensions are as shown on Drawings.

Verify that required utilities are available, in proper location, and ready for use.

Beginning of installation means installer accepts existing conditions.

INSTALLATION

Install according to manufacturer's instructions.

Use 20 AWG copper conductor building wire in conduit for low voltage wiring or wiring as recommended by manufacturer.

Use 20 AWG copper conductor building wire ‘free-air’ for low voltage wiring (see section 26 05 23 for requirements) or wiring as recommended by manufacturer. Install relays to be accessible. Allow space for adequate ventilation and circulation of air.

END OF SECTION 26 51 15

Section 26 60 00 – Codes and Fees

PART 1 – GENERAL

SCOPE

Comply with all applicable Codes according to the Contract Documents.

CODES

The electrical installation shall be in compliance with the Wisconsin D.O.T. rules, requirements and Regulations, IBC, IECC, N.E.C. and the rules, regulations and requirements of the power company supplying power to the building.

The electrical installation and the contractor shall comply fully with all city, county and state laws, ordinances and regulations applicable to the electrical installations at this project site.

All equipment shall be equal to or exceed the minimum requirements of the N.E.M.A., the I.E.E.E. and U.L.

Should any change in Drawings or Specifications be required to comply with governmental regulations, the contractor shall notify engineer prior to execution of the Work. The work shall be carried out according to the requirements of such code according to the instruction of the engineer and at no additional cost to the owner.

FEES

All local fees and permits and services of inspection authorities shall be obtained and paid for by the contractor.

The contractor shall cooperate fully with local utility companies with respect to their services. The owner will pay any and all utility connection fees for:

Electrical power service.

Telephone/communications service.

Contractor shall be responsible to apply for service on behalf of the owner, act as the owner's agent during installation of the services, and fully coordinate activities of the service suppliers. All costs for such activities by the contractor shall be included in his bid.

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

NOT USED.

END SECTION 26 60 00

END OF DIVISION 26 – ELECTRICAL

DIVISION 27 – COMMUNICATIONS

Section 27 00 00 – Communications Cable and Equipment

PART 1 – GENERAL

SCOPE

This section describes the products and execution requirements relating to furnishing and installation of Telecommunications Cabling and Termination Components and related sub-systems as part of a Structured Cabling System at the new building. Backbone and Horizontal Station cabling comprised of Copper, and Fiber-Optic are covered under this document.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

- Section 26 05 00 – Common Work Results For Electrical
- Section 26 05 33 – Raceway and Boxes for Electrical Systems
- Section 26 05 36 – Cable Trays For Electrical Systems
- Section 26 27 26 – Wiring Devices
- Section 26 05 06 – Grounding and Bonding for Electrical Systems
- Section 26 05 29 – Equipment Connections and Coordination
- Section 26 05 53 – Identification for Electrical Systems

REGULATORY REFERENCES

All work and materials shall conform in every detail to the rules and requirements of the National Fire Protection Association, the Wisconsin Electrical Code and present manufacturing standards.

All materials shall be listed by UL and shall bear the UL label. If UL has no published standards for a particular item, then other national independent testing standards shall apply, and such items shall bear those labels. Where UL has an applicable system listing and label, the entire system shall be so labeled.

Other applicable standards are as follows:

- ANSI/IEEE C2 - National Electrical Safety Code
- NFPA 70- 2002 - National Electrical Code
- DILHR Chapter 16 - Wisconsin Electrical Code
- TIA/EIA Standards 526-14A (OFSPT-14A), 526-7 (OFSPT-7), 568B.1 (Category 6e), 568B.2 (Category 6), 568B.3, 569A, 606A, and 607 (with exception)
- IEEE/ANSI 142-1982 - Recommended Practice for Grounding of Industrial and Commercial Power Systems.
- ICEA publication S-80-576-2002

DESIGN INTENT

The Horizontal (Station) Cabling System is based on the installation of 4-Pair Unshielded Twisted Pair (UTP) DATA Category 6A and 4-Pair UTP VOICE Category 6A Copper Cables. The cables shall be installed from the Telecommunications Room (TR) serving that area and terminated as specified in this document.

Station cables shall be installed in conduit, free air and cable tray. Outlets shall be mounted flush on a wall-mounted box wherever possible, on Surface Raceway only where necessary. Information Outlet locations are to be identified on Project Drawings.

At the Hub Rooms Data, and IP Phone cable terminations shall be mounted on freestanding and /or wall-mounted equipment racks; (as indicated on the drawings) termination hardware related to Data and Voice Cabling shall be rack mounted.

All cables and related termination, support and grounding hardware, bonding, shall be furnished, installed, wired, tested, labeled, and documented by the contractor, as detailed in the following sections.

The contractor shall provide all labor and materials necessary to construct the system as described herein. This includes - but is not limited to - furnishing and installing cable, cable supports, racking and termination components, termination, testing, labeling and documentation.

WORK SEQUENCE

During the construction period, coordinate telecommunications schedule and operations with the architect, Engineer and Wisconsin D.O.T. IT department.

SUBMITTALS

Under the provisions of Section 26 05 00 and Division 1, prior to the start of work the contractor shall submit:

Six sets of Manufacturer’s Data covering all products proposed indicating construction, materials, ratings and all other parameters identified in Part 2 (Products) below.

Manufacturer’s installation instructions.

Submittals should be grouped to include complete documentation of related systems, products and accessories in a single submittal. Where applicable, dimensions should be marked in units to match those specified.

Submittals shall be original catalog sheets, photocopies, or electronic format (ADOBE Portable Document format “.pdf”) thereof. Electronic sheets shall be accepted.

Two sets of submittals. The engineer shall review the Submittals and annotate them indicating approvals and shall return to the contractor.

Work shall not proceed without the engineer’s approval of the submitted items.

If materials are furnished as specified no further qualifications is necessary, except for items requiring shop drawings. However, if the contractor wishes to substitute another manufacturer and/or catalog number, the following information in triplicate shall be submitted to the engineer:

- A complete description of the material which the contractor proposes to substitute (shop drawings, illustrations, catalog data, performance characteristics, etc.) and the reason for the substitution identifying any benefit to the owner.

The contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

PROJECT RECORD DOCUMENTS

Submit and record documents under provisions of 26 05 00.

Accurately record exact sizes, locations and quantities of cables.

QUALITY ASSURANCE

The manufacturer shall be a company specializing in communication cable and/or accessories with a minimum of five years documented experience in producing cable and/or accessories similar to those specified below.

The contractor shall have been in this line of business for a minimum of five years and completed four jobs of the magnitude specified in the following sections.

The installing contractor shall have at a minimum one Certified Installer trained to the latest industry standards to ensure the most reliable installation available. The Certified Installer shall have been trained by a company(s) that offer a minimum 15 year system warranty.

DELIVERY, STORAGE AND HANDLING

Cable shall be stored according to manufacturer's recommendations as minimum. In addition, cable must be stored in a location protected from vandalism and weather.

If the contractor wishes to have a trailer on site for storage of materials, arrangements shall be made with the owner. If necessary, cable shall be stored off site at the contractor's expense.

DRAWINGS

It shall be understood that the electrical and telecommunication details and drawings provided with the specification package are diagrammatic. They are included to show the intent of the specifications and to aid the contractor in bidding the job. The contractor shall make allowance in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

The contractor shall verify all dimensions at the site and be responsible for their accuracy.

Prior to submitting the bid, the contractor shall call to the attention of the engineer to any materials or apparatus the contractor believes to be inadequate and to any necessary items of work omitted, within 10 days prior to the Bid Due Date.

PART 2 - PRODUCTS

INFORMATION OUTLET

Station cables shall each be terminated at their designated workstation location in the connector types described in the sub-sections below. Included are modular jacks (Voice & Data) assemblies. These connector assemblies shall snap into a mounting frame. All ports shall be installed such that the opening faces the floor. The combined assembly is referred to as the Standard Information Outlet (SIO).

- SIO mounting configurations shall be as follows:
    a. Flush in new construction junction boxes.
    b. Surface mounted on Systems Furniture (base panel) - Systems Furniture Type shall be defined prior to construction. Only if required.
    c. All data/voice jacks shall be flush mounted where possible.
- The Telecommunications Outlet Frame shall accommodate:
    a. A minimum of two, when installed on a wall-mounted assembly.
    b. A minimum of two, when installed on modular furniture
    c. The outlet frame shall incorporate a mechanism for adjusting the surface plate to a plumb position.

Multiple Jacks - identified in close proximity on the drawings (and not separated by a physical barrier) - may be combined in a single assembly. The contractor shall be responsible for determining the optimum compliant configuration based on the products proposed and documenting these in the as-built records.

The same orientation and positioning of Jacks and Connectors shall be utilized throughout the installation. Prior to installation, the contractor shall submit the proposed configuration for each SIO type for review by the engineer.

Wall Mount Outlet Faceplates shall incorporate identifying labels.

Where stand-alone "Data" or "Voice" only Jacks are identified, the SIO Frame shall be configured as to allow for the addition of one additional jack (Voice or Data) to be installed to supplement each such jack as defined by this project. The installation of these supplemental Jacks IS NOT part of this project.

Any unused jack positions shall be fitted with a removable blank inserted into the opening.

The faceplate of the SIO shall be constructed of High Impact Plastic. Faceplate color shall (1) match the faceplate color used for wiring devices in the building or (2) when installed in Surface Raceway match the color of the Raceway.

Wall-mounted "Voice Only" outlets shall be installed where identified on the Floorplan Drawings to accommodate wall-mounted telephone sets. The Wall Plate shall be of Stainless-Steel construction, accommodate one voice jack as defined below, mount on a standard single gang outlet box or bracket and include mating lugs for wall phone mounting.

All Standard Information Outlets and the associated Jacks shall be of the same manufacturer throughout the project. An allowable exception, however, is the Wall-mounted "Voice Only" Outlet described above.

DATA AND VOICE JACKS

Data and Voice jacks shall be an 8-pin Modular Jack.

The interface between the jack and the station cable shall be a 110-Style block or insulation displacement type contact. Termination components shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

Data Jacks shall be pinned TIA-568B with the pairs as follows:

Voice Jacks shall be pinned TIA-568B with the pairs as follows:

- TIA-568B: Pair 1 - Pins 5 and 4
  Pair 2 - Pins 1 and 2
  Pair 3 - Pins 3 and 6
  Pair 4 - Pins 7 and 8

Transmission characteristics of the Data and Voice Jack shall be as required to meet the TIA/EIA Category 6A performance criteria. Refer to the Execution Section which details the required performance criteria of the completed Link of which the Jacks are a part.

The Jack shall be UL verified and listed.

Jack contacts shall have a minimum of 50 micro-inches of gold plating.

The color of the Data Jack shall be blue. Where used for another application a color unique from the data and voice jack shall be used. Alternately, a color-coded Bezel or Icon may be used to identify the Data and Voice Jack.

The Color of the Voice Jack shall be Electric Ivory.

WALL-MOUNT VOICE-ONLY OUTLETS

Wall mounted "voice Only" outlets shall be installed where identified ("W") on the Project Drawing(s) to accommodate wall-mounted telephone sets. The Wall Plate shall be of Stainless-Steel construction, accommodate one voice jack as previously defined, mounted on a standard single gang outlet box or bracket and include mating lugs for wall phone mounting.

DATA PATCH PANEL (CAT6A)

Data cabling shall be terminated at the Hub Room and Telecommunications Hub Room on panels incorporating Modular Jacks meeting the specifications for the Telecommunications Outlet detailed in the Section above.

At the Hub Rooms, these panels shall be rack mounted.

The Data Patch Panel shall consist of a Modular to 110-type connector system. Modular jacks shall meet the specifications detailed above (NON-KEYED 8-pin).

The largest single patch panel configuration shall not exceed 48 ports. Panels which are modular shall be fully populated (all ports occupied by jacks) and be provided in increments of no less than 12-jacks. High density patch panel configurations must incorporate horizontal cable management systems sized to accommodate the quantity of patch panel jacks being installed.

The Patch Panel blocks shall have the ability to seat and cut 8 conductors (4 pairs) at a time and shall have the ability of terminating 22- through 26-gauge plastic insulated, solid and stranded copper conductors. Data blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

The Data Patch Panel as a system (including jack, cable interface and intermediate components) must maintain Category 6A performance per the referenced TIA/EIA documents. All pair combinations must be considered, with the worst-case measurement being the basis for compliance.

Panels shall incorporate cable support and/or strain relief mechanisms to secure the horizontal cables at the termination block and to ensure that all manufacturers minimum bend radius specifications are adhered to.

The Patch Panel shall have color coded designation strips to identify cable count.

Transmission performance shall be maintained by the Data Patch Panel as a system (including jack, cable interface and intermediate components).

IP VOICE BACKBONE TERMINATION FIELD

At the Telecommunication Hub Rooms, each Voice "Backbone" Cable shall be terminated on rack mounted high density horizontal 110 blocks.

Each horizontal row of the cross-connect block must be capable of terminating one 25 pair binder group (Backbone Cables). Backbone blocks shall be segregated clearly identifying their function.

The mechanical termination shall:

- Have the ability of terminating 22 - 26 AWG plastic insulated, solid and stranded copper conductors.
- Provide a direct connection between the cable and jumper wires.
- Have less than 0.2-dB of attenuation from 1 - 16 MHz.
- Have less than 100 milli-Ohm of DC resistance.
- Have less than 5 milli-Ohm of resistance imbalance.
- Have minimal signal impairments at all frequencies up to 16 MHz.

Blocks shall identify pair position by a color designation - Blue, Orange, Green, Brown and Slate (Backbone only)

The blocks shall be designed to maintain the cable's pair twists as closely as possible to the point of mechanical termination.

The Voice Termination Hardware shall be 110-style.

- Voice Backbone Cabling Termination
- Five Pair Termination Clips (e.g., C5) shall be used in the termination of Voice Backbone Cabling

Horizontal Troughs incorporating plastic distribution rings shall be provided by the contractor to accommodate routing of jumpers. Troughs shall be positioned at the top of each column of termination blocks and between each 100-pair wiring block.

Vertical Troughs incorporating metal distributing rings shall be provided in the Entrance Room for vertical routing of jumper and/or cross-connect wire. In each telecommunication room, a backboard incorporating plastic distribution rings allowing for a change in direction in cross connect wiring shall be installed between the blocks on which station and backbone cabling are terminated.

EQUIPMENT RACKS (Two Required)

Free Standing Equipment Rack

At the Telecommunication Hub Rooms, Equipment Racks shall be furnished and installed by the contractor to house Cable Termination components (e.g., Copper Data/voice) and Network Electronics (by others). Refer to Part 3 ("Execution") of this Section for quantities required at each location.

- The rack shall conform to the following requirements:
- The rack shall comply with State Building Codes for the seismic area in which it is to be installed.
- Rack shall be 4 post-type, 84" in height and shall be self-supporting.
- Channel uprights shall be spaced to accommodate Industry standard 19” mounting.
- Rack must be constructed of aluminum and have either a coating or painted surface.
- Rack shall be double-side drilled and tapped to accept 12-24 screws. Uprights shall also be drilled on back to accept cable brackets, clamps, power strip(s), etc. Hole pattern on rack front shall be per EIA/TIA specifications (5/8"-5/8"-1/2"). Hole pattern on the rear shall be at 3" intervals to accept cable brackets
- Rack should be supplied with a supply of spare screws (minimum of 24).
- Base footprint should be no smaller than 15”x20”.
- Rack should be supplied with a ground bar and #6 AWG Ground lug.

Jumper Management

Rack shall be equipped with Vertical and Horizontal Jumper Management Hardware in the form of rings and guides, as to allow an orderly routing of twisted pair, optical fiber and coaxial jumpers from the patch panels to the customer provided network equipment. Jumper management hardware shall be as follows:

- Horizontal Jumper Management
- Panels shall be plastic (3.5" panel), have a minimum of five Jumper distribution rings (1.75" x 3.75" minimum dimension) and incorporate jumper routing clips (plastic) for individual jumpers.
- At minimum, horizontal cable management hardware shall be positioned above and below (a) each grouping of two rows of Jacks Data Patch Panels, (b) each grouping of two rows of “: F" connectors on Coaxial Patch Panels.
- Vertical jumper management shall provide for cable routing on front and rear of each rack and be 3½" square (minimum). Vertical Jumper Management hardware shall mount on spacers attached to the rack uprights and not on the upright itself. Where multiple racks are to be installed, this hardware shall be mounted between the uprights of adjacent racks. Rack uprights and the spacers shall be secured together per manufacturer recommendations.
- Each rack shall be supplied with a minimum of 12 releasable (e.g., "hook and loop") cable support ties.

NOTE: Where Cable Termination Hardware is wall mounted, the contractor shall be responsible for establishing a cable pathway for jumpers routed from the Equipment Rack(s) to the wall. This shall be in the form of slotted ducts, troughs, “D” rings or other means. The proposed method shall be included in the submittals required by this document and shall be approved by the engineer prior to installation.

MISCELLANEOUS MATERIALS

Voice Station Patch Cords

- The contractor is to furnish voice station patch cords which are six inches or less in length and consist of an 8P8C plug (pinned 568B) and connected to an 8P8C jack with Category 6A cable.
- The contractor is to furnish data station CAT6A patch cords, length as required between wall mounted data jack and IP Telephone.

Power Strip / Surge Suppressor

- At the Main Equipment Room and at each Telecommunications Room, one Power Strip / Surge Suppressor shall be furnished and installed by the contractor to provide for powering of the network electronics (by others).
- Power Strip / Surge Suppressor shall:
  a. be rack mountable (19-inch rack)
  b. be compliant with UL-1449, UL 1283 and UL-497A.
  c. provide Transient suppression to 13,000-A. Protection shall be in all 3 modes (hot-neutral, hot-ground and neutral-ground).
  d. shall meet or exceed IEEE 587 Category A and B specification.
  e. provide High Frequency Noise Suppression as follows:
  f. >20-dB @ 50-kHz
  g. >40-dB @ 150-kHz
  h. >80-dB @ 1-MHz
  i. >30-dB @ 6- to 1000-MHz
  j. provide a minimum of 320 Joules of AC Energy Absorption.
  k. be equipped with a 12-foot power cord
  l. provide a minimum of six outlets

UPS SYSTEM

Uninterruptible Power Supply (UPS) – Quantity of Two required.

- 2 U design for Rack or Tower mount.
- Hot swappable batteries.
- Rating: 2000VA.
- Power Factor: .99
- Operating Temperature: 32 to 104 degrees F.
- Input Voltage: 120VAC
- Input Frequency: 45-66 Hz.
- Nominal input current charging: 13.9 amps.
- Standard backup time resistive load: 7.2 min. (100% load), 12.0 min (75% load).
- Manufacturer: General Electric, model #UPS25512 or approved equal.
- Quantity: This project requires Two UPS Systems. Install in Electrical Room/Telecom #115.

SURFACE RACEWAY

It is anticipated that Surface raceway will be used in this project.

In open areas, Surface Raceway will be used as a cable path. No exposed wire shall be permitted.

With the agreement of the architect/engineer, if a need arises to add telecommunications outlets in areas where the walls cannot be fished, the station wire serving these outlets shall be covered with raceways. No exposed wire shall be permitted within offices, classrooms, corridors, conference rooms or like facilities.

The metallic surface raceway shall have a screw applied base and have a snap on cover.

The raceway shall originate from a surface mounted box located 14 inches off the floor and be attached to the wall and terminate above the ceiling. Raceway for a wall-mounted location shall originate from a surface mounted box located 48" off the floor.

The color of this raceway shall be electrical ivory or match the décor. All fittings including, but not limited to, extension boxes, elbows, tees, fixture boxes shall match the color of the raceway.

The raceway and all system devices must be UL Listed, exhibit nonflammable self-extinguishing characteristics, tested to specifications of UL94V-0 and be Category Compliant as defined by TIA/EIA 568B.

Refer to Section 26 05 33 “Raceway and Boxes for Electrical Systems” for metallic and/or non-metallic Raceway guidelines for this Project. Minimum bend radius shall be adhered to for UTP cable.

TELECOMMUNICATIONS GROUND

At each Telecommunications Room, a "Telecommunications Grounding Busbar (TGB)" shall be installed by the Electrical Contractor. Refer to Section 26 05 26 “Grounding and Bonding for Electrical Systems”.

The telecommunication ground cable is to be an isolated grounding system pursuant to TIA/EIA 607 with the exception that the ground cable is not to be tied to building steel except at the electrical service entrance.

PART 3 - EXECUTION

GENERAL

Contractor shall furnish and install all cables, connectors and equipment as shown on drawings and as specified above. It shall be noted that all cables shall be installed in continuous lengths from endpoint to endpoint. No splices shall be allowed unless noted otherwise.

Refer to Project Drawings which indicate the cable routes to follow and the termination location(s) within each building.

It is the contractor's responsibility to survey the site and include all necessary costs to perform the installation as specified. This includes any modifications required to route and conceal horizontal distribution wiring.

Beginning installation means contractor accepts existing conditions.

Contractor shall furnish all required installation tools to facilitate cable pulling without damage to the cable jacket. Such equipment is to include, but not limited to, sheaves, winches, cable reels, cable reel jacks, duct entrance tunnels, pulling tension gauge and similar devices. All equipment shall be of substantial construction to allow steady progress once pulling has begun. Makeshift devices, which may move or wear in a manner to pose a hazard to the cable, shall not be used.

All cable shall be pulled by hand unless installation conditions require mechanical assistance.

The contractor will be responsible for identifying and reporting to the architect/engineer any existing damage to walls, flooring, tiles and furnishings in the work area prior to start of work. All damage to interior spaces caused by the installation of cable, raceway or other hardware must be repaired by the contractor. Repairs must match preexisting color and finish of walls, floors and ceilings. Any contractor-damaged ceiling tiles are to be replaced by the contractor to match color, size, style and texture.

Where unacceptable conditions are found, the contractor shall bring this to the attention of the construction supervisor immediately. A written resolution will follow to determine the appropriate action to be taken.

Qualified personnel utilizing state-of-the-art equipment and techniques shall complete all installation work. During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.

Cable pulling shall be done according to cable manufacturer’s recommendations and ANSI/IEEE C2 standards. Manufacturer’s recommendations shall be a part of the cable submittal. Recommended pulling tensions and pulling bending radius shall not be exceeded. Any cable bent or kinked to radius less than recommended dimension shall not be installed. If any installed cable is kinked to a radius less than recommended dimension it shall be replaced by the contractor with no additional cost to the project.

All wiring shall be run “free-air”, in conduit, in a secured metal raceway, in cable tray or in modular furniture as designated on the floorplan(s). All cable shall be free of tension at both ends.

Avoid abrasion and other damage to cables during installation.

Pulling Lubricant may be used to ease pulling tensions. Lubricant shall be of a type that is non-injurious to the cable jacket and other materials used. Lubricant shall not harden or become adhesive with age.

The Cable system will be tested and documented upon completion of the installation as defined in the Section below.

A pull cord (nylon; 1/8” minimum) shall be co-installed with all cable installed in any conduit.

Should it be found by the engineer, that the materials or any portion thereof, furnished and installed under this contract, fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the contractor's expense.

SYSTEM TOPOLOGY AND CABLE SIZE REQUIREMENTS

Station Cabling

- Information Outlets cables with copper media (Voice & Data UTP) shall be located as detailed on the Project Drawings.
- The Bidder in determining materials quantities and routing should utilize these documents.
- Station Cabling shall be routed to the Telecommunications Room (TR) on that floor.
- Station cables shall be run to the Information Outlet from the Telecommunications Room serving each area in conduit, free-air above drop ceiling, in cable tray and/or in modular furniture.

- The maximum station cable drop length for Data and Voice UTP Category 6A shall not exceed 295-feet (90-meters) in order to meet data communications performance specifications. This length is measured from the termination panel in the wiring closet to the outlet and must include any slack required for the installation and termination. The contractor is responsible for installing station cabling in a fashion as to avoid unnecessarily long runs. Any area that cannot be reached within the above constraints should be identified and reported to the engineer prior to installation. Changes to the plan shall be approved by the engineer.
- All cables shall be installed splice-free unless otherwise specified.
- During pulling operation an adequate number of workers shall be present to allow cable observation at all points of duct entry and exit as well as the feed cable and operate pulling machinery.
- Avoid abrasion and other damage to cables during installation.
- All cable shall be free of tension at both ends. In cases where the cable must bear some stress, Kellom grips may be used to spread the strain over a longer length of cable.
- Where installed free-air, installation shall consider the following:
- Cable shall run at right angles and be kept clear of other trades work.
- Cables shall be supported according to code utilizing "J-" or "Bridal-type" mounting rings anchored to ceiling concrete, piping supports or structural steel beams. Rings shall be designed to maintain cables bend to larger than the minimum bend radius (typically 4 x cable diameter).
- Supports shall be spaced at a maximum 4-foot interval unless limited by building construction. If cable "sag" at mid-span exceeds 6-inches, another support shall be used.
- Cable shall never be laid directly on the ceiling grid or attached in any manner to the ceiling grid wires.
- Cables shall not be attached to existing cabling, plumbing or steam piping, ductwork, ceiling supports or electrical or communications conduit.
- Manufacturer’s minimum bend radius specifications shall be observed in all instances.
- Care should be taken in the use of cable ties to secure and anchor the station cabling. Ties should not be over tightened as to compress the cable jacket. No sharp burrs should remain where excess length of the cable tie has been cut.
- Cable sheaths shall be protected from damage from sharp edges. Where a cable passes over a sharp edge, a bushing or grommet shall be used to protect the cable.
- A coil of 4 feet in each cable shall be placed in the ceiling at the last support (e.g., J-Hook, Bridal Ring, etc.) before the cables enter a fishable wall, conduit, surface raceway or box. At any location where cables are installed into movable partition walls or modular furniture via a service pole, approximately 15-feet of slack shall be left in each station cable under 250-feet in length to allow for change in the office layout without re-cabling. These "service loops" shall be secured at the last cable support before the cable leaves the ceiling and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
- At all Telecommunication Rooms (TR), approximately 10-feet of slack shall be left in each station cable under 250-feet in length to allow for changes in the telecommunication room layout without re-cabling. These "service loops" shall be secured to the ladder rack, with “J” hooks, or “D” rings above the equipment, racks, and patch panels and shall be coiled from 100% to 200% of the cable recommended minimum bend radius.
- To reduce or eliminate EMI, the following minimum separation distances from ≤480V Power lines shall be adhered to:
    a. 12 inches from power lines of <5-kVa.
    b. 18 inches from high voltage lighting (including fluorescent).
    c. 39 inches from transformers and motors.
- All openings shall be sleeved and firestopped per prevailing code requirements upon completion of cable installation.

- IMPORTANT: Within the room in which Data Cabling is to be terminated, Hook and Loop (e.g., “Velcro”) ties only shall be used from room entry to the point of termination. This is to facilitate the addition of future cables.
- Station Cabling on Modular Furniture:
    a. Where furniture panels are installed to include contact with a wall, cabling shall be fed to the furniture panels via existing conduit.
    b. Where modular furniture is installed without wall contact, the contractor shall install a power pole and route the station cabling via the ceiling.
    c. Cabling shall be protected in the transition from the power pole or Wall Fittings to the modular furniture via a length of flexible plastic conduit or other approved protective means. Conduit fittings shall be compatible with the power pole and Wall Fittings proposed. There shall be no exposed cable in the transition to the modular furniture. Fill Ratio (Cable Area vs. Conduit Area) in each feed shall not exceed 40%.
    d. For purposes of bidding, it is to be assumed that the cable pathway shall be limited to the bottom panel of the modular furniture only. Communications cables would be run through these channels to the jack location.
    e. For purposes of bidding, it is to be assumed that it will be the responsibility of the contractor to punch and re-install the bottom molding panels on the modular furniture as required to accommodate the Communications cabling and SIOs. The panels shall be marked prior to installation by the owner to identify the desired location of the SIOs. Any discrepancy between the Project Drawing identifying Outlet locations and the markings should be brought to the attention of the architect/engineer or Wisconsin D.O.T. IT Department.
    f. The SIO shall be secured to the panel via mounting tabs, pop-rivets, screws or other approved method. Use of adhesive tape is not acceptable. The method of securing the SIO to the panel shall not result in sharp protrusions (e.g., sheet metal screw tip) into the channel behind the panel.
- Information Outlet
    a. Information Outlets shall be flush mounted on wall-mounted boxes, on Surface Raceway and on modular furniture.
    b. Any outlets to be added where these conditions are not met shall be positioned at a height matching that of existing services or as directed otherwise by the Site Coordinator and the engineer. Nominal height (from finished floor to center line of Outlet) in new installation shall be as follows:
        1. Standard Voice & Data Outlet - 18-inches
        2. Wall-Mounted Telephone Outlet (Standard Voice only) - 54-inches.
        3. Wall-mounted Telephone Outlets for Wheelchair Persons:
        4. Approach head-on per ADA regulations
        5. Approach parallel per ADA regulations

CABLE TERMINATION

General

- At the Telecommunications Rooms, all Data and Voice Cables shall be positioned on termination hardware in sequence of the Outlet I.D. starting with the lowest number. Exceptions to the sequencing of terminations is allowed only with the permission of the A/E.
- Termination Hardware (Blocks and Patch Panels) Positioning and Layout must be reviewed and approved by the engineer prior to construction. The review does not exempt the contractor from meeting any of the requirements stated in this document.

Cable Termination - Voice UTP

- Voice pairs shall terminate on patch panels at the rack in the Telecommunication Room. The contractor shall coordinate the placement of patch panels with the engineer in order to integrate with other cabling.
- Patch Panels shall be provided to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.
- The contractor shall furnish and install cable management hardware (e.g., D Rings and cable guides) to neatly and securely route the cable to the cable termination hardware.
- The Height of the Voice Termination Field shall not exceed 6-feet (72-inches) above floor level to facilitate cable maintenance.
- Patch panels on which Station Cabling are terminated shall be positioned in separate columns. Backbone Cabling should be positioned to the Left; Station cabling to the Right and be in close proximity as to simplify installation and subsequent tracing of cross-connect wiring. Where new cabling is to be integrated with existing cabling, it will be the responsibility of the contractor, in cooperation with the owner, to coordinate placement of Voice Termination hardware.
- Cables shall be fed from below the Termination Hardware in a manner that will facilitate growth.
- Horizontal Troughs incorporating split plastic distribution rings shall be provided by the contractor to accommodate routing of jumpers. Troughs shall be positioned at the top of each column of termination blocks and between each 100-pair wiring block. Rings shall be positioned between the Backbone and Station blocks for vertical routing of jumpers and/or cross-connect wiring.
- The installer shall ensure that the twists in each cable pair are preserved to within 1.0-inch of the termination for all Voice UTP cables and within 0.5-inch for Category 6e cables. The cable jacket shall be removed only to the extent required to make the termination.

Cable Termination - Data UTP

- Data Patch Panels shall be designed and installed in a fashion as to allow future station cabling to be terminated on the panel without disruption to existing connections.
- Data Patch panels shall be sized to accommodate a minimum of 20% growth in the quantity of stations relative to the initial installation.
- At Information Outlets and Data Patch Panels, the installer shall ensure that the twists in each cable pair are preserved to within 0.5-inch of the termination for Data cables. The cable jacket shall be removed only to the extent required to make the termination.

Voice Cross Connects

- The contractor shall be responsible for the “Cross-connect” wiring between the Station (horizontal) and Backbone Voice cabling.
- Four pairs in each station cable shall be cross-connected to the Backbone (riser or tie) cable. 4-pair Cross-connect wire, color coded to identify each pair, shall be used. The 25TH pair position of each riser voice block shall remain vacant.
- Fastening cables directly to support brackets with wire or plastic ties will not be accepted. All cabling shall be neatly laced, dressed and supported.
- The contractor shall be responsible for cross-connects between the cabling terminations at the Entrance Room and the SNI. It shall be the responsibility of the contractor, to work with the owner and Site Coordinator(s) and provide the necessary assistance to allow owner and/or Telephone Company personnel to make the necessary connections to establish service on the new cable system. These activities include, but are not limited to cross connect documentation, general wiring overview and cable pair identification.

Equipment Racks

- Equipment racks shall be furnished and installed by the contractor.
- The contractor shall bolt the rack to the wall/floor as recommended by the manufacturer. Multiple racks shall be joined, and the ground made common on each. Rack shall also be stabilized by extending a brace extending to the ceiling if required. Alternately, overhead cable tray over which the cabling accesses the equipment rack(s) shall provide this function.
- A space between the rack upright and the wall (~4") should be planned to allow for cabling in that area. The rear of the rack should be ~30" minimum from the wall to allow for access by maintenance personnel. In all cases, a minimum of 40” workspace in front of the rack is also required. Locations where these guidelines cannot be followed should be brought to the attention of the engineer for resolution prior to installation.
- All hardware and equipment is to be mounted between 18" and 79" above floor level. This is to afford easy access and, in the case of the lower limit, prevent damage to the components. Positioning of hardware should be reviewed and approved by the engineer and Site Coordinator(s) prior to installation.
- Equipment Rack shall be equipped with cable management hardware on both the front and back of rack as to allow an orderly and secure routing of twisted pair cabling to the data patch panels. At minimum, one such Horizontal Jumper Management Panel shall be installed by the contractor.
- The rack shall be grounded to the Telecommunications Ground Busbar (TGB) using a #6 AWG (or larger) insulated stranded copper conductor (GREEN jacket or GREEN jacket with one or more yellow stripes).

Identification and Labeling

- Refer to Section 26 05 53 “Identification for Electrical Systems” for Identification and Labeling guidelines for this Project.
- All Copper Station Cables, Outlet Faceplates and Termination components (e.g., Voice Field & Data Patch Panel) shall be clearly labeled.
- Prior to installation, the contractor shall provide samples of all label types planned for the project. These samples shall include examples of the lettering to be used.

Work by Owner

- NONE.

Cooperation

- The contractor shall cooperate with other trades in locating work in a proper manner. Should it be necessary to raise or lower or move longitudinally any part of the work to better fit the general installation, such work shall be done at no extra cost, provided such decision is reached prior to actual installation. The contractor shall check the location of electrical outlets with respect to other installations before installing.

TESTING AND ACCEPTANCE

General

- The contractor is responsible to perform acceptance tests as indicated below for each sub-system (e.g., backbone, station, etc.) as it is completed.
- All tests shall be documented.
- The contractor is responsible for supplying all equipment and personnel necessary to conduct the acceptance tests. Prior to testing, the contractor shall provide a summary of the proposed test plan for each cable type including equipment to use used, set-up, test frequencies or wavelengths, results format, etc. The method of testing shall be approved by the engineer.

- The contractor shall visually inspect all cabling and termination points to ensure that they are complete and conform to the wiring pattern defined herein. The contractor shall provide the engineer with a written certification that this inspection has been made
- The contractor shall conduct acceptance testing according to a schedule. The contractor shall provide a minimum of one week advance notice to the engineer as to allow for such participation. The notification shall include a written description of the proposed conduct of the tests including copies of blank test result sheets to be used.
- IMPORTANT: Failure to provide the above information shall be grounds for the owner/engineer to reject any and all Documentation of Results on related testing and to require a repeat of the affected test.
- Tests related to connected equipment of others shall only be done with the permission and presence of contractor involved. The contractor shall ascertain that testing only as required to prove the wiring connections are correct.
- The contractor shall provide test results and describe the conduct of the tests including the date of the tests, the equipment used, and the procedures followed. At the request of the engineer, the contractor shall provide copies of the original test results.
- All cabling shall be 100% fault free unless noted otherwise. If any cable is found to be outside the specification defined herein, that cable and the associated termination(s) shall be replaced at the expense of the contractor. The applicable tests shall then be repeated.
- Should it be found by the engineer that the materials or any portion thereof furnished and installed under this contract fail to comply with the specifications and drawings, with the respect or regard to the quality, amount of value of materials, appliances or labor used in the work, it shall be rejected and replaced by the contractor and all work distributed by changes necessitated in consequence of said defects or imperfections shall be made good at the contractor's expense.

Voice Cabling (Copper UTP)

- Backbone Cabling
    a. Backbone Voice cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity and conductor position on the termination blocks (e.g., 110). Any mis-positioned pairs shall be identified and corrected. The percentage of “bad” pairs shall not exceed 3% in any Backbone (Riser or Tie) Cable based on total pair count. All bad pairs must be identified and documented.
- Voice Station Cabling (Category 6A)
    a. Testing shall be done from the voice jack at the SIO to the voice 110 blocks/patch panel at the TR where the cables are terminated. When the SIO is located on/in the wall behind modular furniture, a patch cord may be inserted into the SIO to allow the furniture to be returned to its normal location. Cat 6A cable testing, in this case, will be done with the patch cord. The cabling must pass all Cat 6A TIA requirements. If the cable test fails only due to the length of the patch cord, the owner will accept the cable as passing.
    b. Horizontal “Station” cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.
    c. Testing of the Cabling Systems rated at TIA Category 6A shall be performed to confirm proper functioning and performance.
    d. Where cross-connection of cabling sub-systems (e.g., Station & Backbone) by the contractor is specified, each subsystem shall be tested separately as defined above followed by a Voice Channel Test after the cross-connection is complete.
- Voice Channel
    a. The end-to-end voice transmission between the building TR and the Standard Information Outlet (Voice) including patch cords/jumper cables.

- Voice Channel Test
    a. The contractor shall perform a voice channel test on all voice cable pairs from the Standard Information Outlet (Voice) to the pair appearance at the TR. All 4 pairs are to be free of shorts; verified for continuity, pair validity, polarity, and conductor position on the terminating blocks. Any mis-positioned pairs shall be identified and corrected. Any patch cords/jumper cables which cause the voice channel test to fail shall be replaced and the channel retested.
- Data Station Cabling (Category 6A)
    a. Testing shall be from the Jack at the SIO to the Data Patch Panel at the TR on which the cables are terminated. When the SIO is located on/in the wall behind modular furniture, a patch cord may be inserted into the SIO to allow the furniture to be returned to its normal location. Cat 6A cable testing, in this case, will be done with the patch cord. The cabling must pass all Cat 6A TIA requirements. If the cable test fails only due to the length of the patch cord, the owner will accept the cable as passing.
    b. Horizontal “Station” cables shall be free of shorts within the pairs, and be verified for continuity, pair validity and polarity, and Wire Map (Conductor Position on the Modular Jack). Any defective, split or mis-positioned pairs must be identified and corrected.
    c. Testing of the Cabling Systems rated at TIA Category 6A/ shall be performed to confirm proper functioning and performance.

- Category 6A Performance Testing
    a. "In addition to the above, Performance Testing shall be performed on all cables. Testing of the Transmission Performance of station cables (Category 6A) shall include the following:
        1. Length
        2. Attenuation
        3. Pair to Pair NEXT Loss (new limits)
        4. PSNEXT Loss
        5. Pair to Pair ELFEXT Loss (Equal Level Far End Cross-talk)
        6. PSEFEXT Loss
        7. Propagation Delay
        8. Delay Skew
        9. Return Loss
        10. Alien CrossTalk
    b. Cables shall be tested to the maximum frequency defined by the standards covering that performance category. Transmission Performance Testing shall be performed using a test instrument designed for testing to the specified frequencies. Test records shall verify "PASS" on each cable and display the specified parameters - comparing test values with standards based "templates" integral to the unit.
    c. Category 6A testing shall be per ANSI/TIA/EIA 568B.1Permanent Link test configurations and ANSI/TIA/EIA 568B.1 Category 6e.
    d. The maximum length of station cable shall not exceed 90 meters which allows 10 meters for equipment and patch cables. Worst case performance at 20°C, based on a Horizontal Cable length of 90 meters and Equipment Cord length of 4 meters, shall be as follows:

- Category 6A Test Parameters:

Category 6A Cable

Permanent Link Test

TIA/EIA 568B.1 Insertion Loss Frequency	TIA/EIA 568B.1 Next Pair to Pair Attenuation	TIA/EIA 568B.1 Coupling	TIA/EIA 568B.1 PSNEXT Worst Case Loss	TIA/EIA 568B.1 ELFEXT Worst Pair to Pair Loss	TIA/EIA 568B.1 PSELFEXT Loss	TIA/EIA 568B.1 Return Loss Worst Pair t
Mhz	Max. dB	dB	DB	dB	dB	dB
1.00	2.1	>60.0 >	57.0	58.6	55.6	19.0
4.00	3.9	54.8	51.8	46.6	43.6	19.0
8.00	5.5	50.0	47.0	40.6	37.5	19.0
10.00	6.2	48.5	45.5	38.6	35.6	19.0
16.00	7.9	45.2	42.2	34.5	31.5	19.0
20.00	8.9	43.7	40.7	32.6	29.6	19.0
25.00	10.0	42.1	39.1	30.7	27.7	18.0
31.25	11.2	40.5	37.5	28.7	25.7	17.1
62.50	16.2	35.7	32.7	22.7	19.7	14.1
100.00	21.0	32.3	29.3	18.6	15.6	12.0

- Propagation Delay
  a. The maximum propagation delay determined according to the TIA/EIA –568B.1 for a Permanent Link configuration shall be less than 498-ns measured at 10MHz. (Note: In determining the permanent link propagation delay, the propagation delay contribution of connecting hardware is assumed to not exceed 2.5 ns from 1 MHz to 100MHz).
- Delay Skew
  a. The difference in propagation delay between the fastest and slowest pair in a cable shall not exceed the parameters below. Delay skew shall be measured according to annex D of ANSI/TIA/EIA-568-B.2.
  b. Category 6A 44ns between 1 MHz and 100MHz
  c. In order to establish testing baselines, cable samples of known length and of the cable type and lot installed shall be tested. The cable may be terminated with an 8-position Category 6A Modular plug (8-pin) to facilitate testing. Net Propagation Velocity (NPV) and nominal attenuation values shall be calculated based on this test and be utilized during the testing of the installed cable plant. This requirement can be waived if NPV data is available from the cable manufacturer for the exact cable type under test.
  d. In the event results of the tests are not satisfactory, the contractor shall make adjustments, replacement and changes as are necessary, and shall then repeat the test or tests which disclosed faulty or defective material, equipment or installation method, and shall make additional tests as the engineer deems necessary at no additional expense to the project or user agency.
- Shielded Cabling (T1) - Testing
  a. Shielded "T1" Cables shall be free of conductor-to-conductor and conductor-to-shield shorts.
  b. All pairs shall be verified for continuity, pair validity and polarity and conductor position on the termination blocks (e.g., 110). Any mis-positioned pairs must be identified and corrected, and retested again
  c. Shield and Drain wire continuity shall also be verified.

DOCUMENTATION

General

- Upon completion of the installation, the contractor shall provide three (3) full Documentation Sets to the engineer for approval. Documentation shall include the items detailed in the sub-sections below.
- Documentation of Test Results shall be submitted in hard copy or in electronic form (preferred). Electronic documents may be submitted on CD-ROM (preferred) for review and distribution. Where documentation provided in electronic form requires unique software (other than an MS-Word compatible Word Processor or MS-Excel spreadsheet) for viewing test results, the contractor shall provide along with the above documentation, one licensed copy of such software. The software shall run on a MICROSOFT Windows-based personal computer supplied by the owner.
- Documentation shall be submitted within 10 working days of the completion of each testing phase (e.g., subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase.
- The engineer may request that a 10% random field re-test be conducted on the cable system at no additional cost to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the contractor, additional testing can be requested to the extent determined necessary by the engineer, including a 100% re-test. This re-test shall be at no additional cost to the owner.

Test Data - Copper Media

- Test results shall include a record of test frequencies, cable type, conductor pair and cable (or Outlet) I.D., measurement direction, test equipment type, model and serial number, date, reference setup, and crew member name(s).
- Printouts generated for each cable by the wire test instrument (e.g., Penta Scanner) shall be submitted as part of the documentation package. Alternately the contractor may furnish this information in electronic form on CD-ROM.
- Cross-Connect Data
    a. As noted above, it shall be the responsibility of the contractor to work with the owner and Site Coordinator(s) and provide the necessary assistance to allow owner and/or Telephone Company personnel to make the necessary connections to establish telephone service on the new cable system. These activities include but are not limited to (1) a general wiring overview and (2) detailed cross connect documentation (relating SIO I.D., Room Number and Riser pair). The latter shall be in the form of an electronic format database (dBase, MS Excel or convertible format).

AS-BUILT CONSTRUCTION DRAWINGS

Drawings included with the specifications set shall be modified by the contractor to denote as-built information.

The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons and drawing conventions used shall be consistent throughout all documentation provided.

The architect through the Consultant will provide floor plans in paper formats on which as-built construction information can be added. These documents will be modified accordingly by the contractor to denote as-built information as defined above and returned to the Consultant for acceptance. This information shall be supplied to the Consultant/Engineer no later than four weeks prior to the scheduled occupancy of the affected floors.

The contractors shall annotate the base drawings and return to the A/E in hard copy form.

Each drawing submitted by the contractor as part of the Project Documentation shall be identified as an "As-built" drawing and include the following (1) The contractor name and/or logo (2) The date of the drawing.

All documentation, including hard copy and electronic forms shall become the property of the owner.

WARRANTY

This contractor shall guarantee all materials, equipment, etc., two years from date of substantial completion of this work. This guarantee shall include all labor, material and travel time. See Division 1, GENERAL CONDITIONS, and GENERAL REQUIREMENTS - Guarantee Documents for further requirements.

END OF SECTION 27 00 00

Section 27 51 16 – Public Address and Audio/Visual Systems

PART 1 – GENERAL

APPLICABLE PROVISIONS

Drawings and general provisions of contract, including general and supplemental conditions and Division 1 specification sections, apply to work of this section.

APPLICABLE PUBLICATIONS

Conform to requirements of current ANS/NFPA 70 – National Electric Code.

Conform to current Underwriters Laboratories (UL) Specifications and Standards.

Conform to current Telecommunications Industry Association (TIA/EIA).

Compliant with limits for Federal Communications Commission (FCC) Class B device.

Conform to current National Electrical Manufacturers Associates (NEMA) Standards.

DESCRIPTION OF WORK

Furnish and install a complete and operable system(s) as indicated on the drawings and as specified herein.

The following specification is a description of the system requirements. The contractor/supplier shall design build the system to provide the components and operation as required to provide the indicated functions.

All necessary equipment required to meet the intent of these specifications, whether or not listed within these specifications, shall be supplied and installed to provide a complete and operational system.

Furnish and install all head-end equipment and all field equipment.

Furnish and install all low-voltage cabling required for a complete and operating system.

Provide and install equipment racks.

SYSTEM PERFORMANCE

Conference Room Sound Reinforcement System

- Provide a sound reinforcement to the Conference Room for speech and full bandwidth music from microphone, auxiliaries and pre-recorded input sources, including Video Conferencing Service.
- Integrate Audio & Video equipment such that they operate in conjunction with each other without delays, echoes, or timing issues.
- Provide distribution of reinforced sound throughout the area. Sound distribution through the loudspeakers shall be plus or minus 3dB nominal, side to side and back to front for the octave bands between 1kHz and 4kHz. System performance shall be confirmed by using an analyzer in post installation tests. Total deviation from best to worst shall not exceed plus or minus 3dB.
- Provide adequate dynamic range at an acoustic distortion level sufficiently low and without clipping to ensure minimum listening fatigue. The system shall be capable of delivering 95dB SPL at any seating location with a 10dB peaking margin.

Video Projection Systems

- Provide a high-definition video projection system in the Conference Room from HD DVD Blue Ray, Video Conferencing Service, S Video, Component Video, HD Sources.
- Control will be provided such that the Conference Room may be split into two independent systems that can be used simultaneously.
- Integrate Audio & Video equipment such that they operate in conjunction with each other without delays, echoes, or timing issues.

Conference Room flat Panel Display, Input/Output Jacks, Video Conferencing Equipment

- Provide Flat Screen HD Video displays, input/output jacks, and video conferencing camera. Install and provide all necessary cables, connections, integration to provide a full functioning system.

SHOP DRAWINGS

Submit shop drawings include the following:

- Wiring diagram indicating wire size and type for each individual piece of equipment.
- Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
- Complete front elevation drawing of equipment and interconnecting components layout within rack.
- All drawings must be in CADD format.
- Block diagram indicating major system components and their relationship with other components.
- A complete riser diagram indicating all head-end and other components with wire type and wiring diagrams.

OPERATION & MAINTENANCE MANUALS

Submit Operations & Maintenance Manuals that include:

- As built Drawings/Operating Instructions: Provide three sets. These drawings shall include up-to-date drawings that include any changes made to the system during installation. Circuit diagrams and other information necessary for the proper operation and maintenance of the system shall also be included. Include a single 3-ring binder containing all pertinent information and two copies of the same material on a CD-ROM with a browsing feature. As a minimum, as-built submittals shall include:
    a. System Operating Instructions. The sound contractor shall write a manual specifically for this system. This manual shall explain in detail all operational functions and control functions of this system. It shall include instructions for the main system and all subsystems. System operating instructions and user manuals shall be included together as a complete sound system guide.
    b. System schematic diagrams.
    c. Component operating manuals.
    d. Component maintenance and service manuals.
    e. Control settings for programmable processors.

WARRANTY

The supporting devices shall be warranted for a period of not less than one year from the date of commissioning against defects in materials and workmanship.

The warranty shall be comprehensive. No deductible shall be allowed for travel time, service hours, and repair parts cost.

Submit a written warranty executed by the installer agreeing to repair or replace any public address equipment that fails within the warranty period.

During the guarantee period there shall be no charges to the owner for service calls for guarantee work. However, when service work is required to repair items damaged by neglect, misuse, or vandalism, costs shall be reimbursed to this contractor.

PART 2 – PRODUCTS

Provide Building Paging, Sound Reinforcement, Video Projection, Video Conferencing Systems.

BUILDING PAGING:

Provide the following equipment:

1. Surface paging horn speaker – Quam System QH16T – Inspection, and Outdoor Speakers 25/70V. Compression type, double re-entrant horn loudspeaker, 16 Watt-25/70V Rotary Select, 5 tap, Transformer.

WIRE AND CABLE

Microphone & Aux/line level circuits shall be 22 AWG twisted pair with foil shield and PVC jacket.

- (AR) West Penn

Main speaker circuit wire shall be 14 AGW 2 conductor, stranded, twisted pair with PVC Jacket.

- (AR) West Penn

Video Distribution Cabling

- Consult System Equipment Supplier & Drawing

Wireless Microphone Extended Antenna & Wireless Listening System Extended Antenna Cabling

- Consult System Equipment Supplier & Drawing

PART 3 - EXECUTIONS

WIRING

All wiring, except in cabinets, shall be in conduit and shall be according to manufacturer's directions.

No mic, line, speaker or AC wiring shall share the same conduit.

Identify and mark all cables with a permanent type of label to denote function or location served.

All rack and terminal cabinet wiring and cable shall be neatly routed, and tie wrapped along rack sides. Mic level, line level and AC cables shall not be run together. AC cabling shall only cross lines level and Mic level cabling at 90-degree intersections. All connections shall be by plug, solder, or screw terminal strips. All cable runs shall be home runs without splices.

All cable connections to console shall be neatly tie-wrapped and routed through countertop as necessary to J-box.

Grounding/AC wiring: All power for sound system equipment shall be obtained from a single electrical panel. Said panel shall be free of dimmer, inductive lighting and motor loads. All outlets for sound system shall utilize 20A circuits with isolated grounds.

Patch panels shall utilize full tip/ring/sleeve normal in to allow complete make/break of the independent ground connections at the jacks. The patch panels shall not to utilize a bused grounding system.

Audio shields shall be continuous from source to input points.

- Shields shall be continuous from house Mic/line input jacks through patch panels to the input source following the patch panel outputs.
- Unbalanced circuits shall have audio shields connected at device inputs and outputs. Attach the shield to the negative of each run.

LOUDSPEAKER INSTALLATION

Provide and install loudspeakers as indicated on drawings.

IDENTIFICATION

Front panel controls of rack-mounted equipment used in the normal operation of the system shall be clearly labeled using plastic laminate engraved labels or approved equal labeling system. Labels shall be firmly affixed to the panel or device. Labels shall be white lettering on black background. Heat transfer style labels are unacceptable.

Console master outputs, group outputs, master aux. output controls shall be labeled per the function of the system they feed/control.

Each major system electronic components shall be labeled as to function and area served. Labeling system shall be approved as described in 3.03A.

Patch panel and wall plate mic jacks shall be engraved and filled.

ADJUSTMENTS AND TESTS

Loudspeakers

- Equalization: The loudspeakers shall be equalized utilizing an analyzer.
    a. Speaker system shall be equalized for flat response from 100Hz to 15 kHz using the real time analyzer function and pink noise.

INSTRUCTION OF OWNER

Prior to project close-out, the sound contractor shall make arrangements to visit the jobsite and conduct a demonstration and instruction to the use of the system.

FINAL CHECKOUT AND ACCEPTANCE

Verify that the system is complete and fully operational before requesting final approval and before scheduling system completion review with Sound Consultant.

Be available to demonstrate operation and the use of the system to the owner's representative(s).

At the time of the demonstration, contractor shall furnish to the owner three copies of complete record manuals.

Final acceptance of the system will be given upon completion of all of the above requirements.

SYSTEM GUARANTEE

Guarantee all equipment and workmanship to be free of defects for a period of one year from final acceptance.

END OF SECTION 27 51 16

END OF DIVISION 27 – COMMUNICATIONS

Section 28 05 13 – Closed Circuit Television (CCTV) Communication System

PART 1 – GENERAL

SCOPE

The work of this section includes the complete installation of a CCTV surveillance system, with multiple cameras, monitor, switching controls, digital recorder and necessary software, controllers, etc.

DESCRIPTION OF WORK

Furnish all labor, materials and equipment for a complete system, as shown on the Drawings and herein specified.

Perform all required operations and coordinate with other crafts.

Obtain and pay for all permits and fees.

COORDINATION

Coordinate with all Trades to ensure cameras are installed in the optimum location for best coverage and clarity.

QUALITY ASSURANCE

CCTV system shall be installed by a contractor normally engaged in the installation of these systems.

In the acceptance or rejection of work performed under this Section, no allowance will be made for lack of skill on the part of the workman.

All equipment and work shall conform to the requirements of the local building Codes and all legal authorities having jurisdiction.

Contractor shall be licensed for such work in the State of Wisconsin.

Contractor shall have successfully completed a minimum of three similar projects in Wisconsin within a 75-mile radius of the Project Site.

CONTRACT DRAWINGS

The CCTV components are shown on the Drawings in schematic format only. Not all components are specifically shown. The contractor is responsible for all design and layout.

It is the contractor’s responsibility to facilitate installation of the system, avoid interference’s, coordinate with other trades and comply with the installation requirements of the manufacturer.

A complete set of Project Drawings in software format will be provided upon request for use in preparing Shop Drawings.

SUBMITTALS

Within fifteen (15) working days after award of contract, the contractor shall submit, at one time, six copies each of brochures of all manufactured items furnished, and six copies of shop drawings of the complete system for approval.

SHOP DRAWINGS

The contractor shall prepare detailed shop drawings of the CCTV system on the contract drawings. Sufficient sections and details shall be shown to allow complete review of the system. The contractor shall coordinate with all trades in preparing the shop drawings.

A complete “point-to-point” wiring diagram is required, showing all cabling by type. Connection details are required.

Include specific installation and mounting details for control cabinets, wall-mounted or ceiling mounted equipment, and any other features that are “visible” in the finished space.

Manufacturers Literature: Provide brochures of all manufactured items clearly marked indicating the size, performance, materials, installation details, etc. inapplicable items shall be marked out.

RECORD DOCUMENTS

During progress of the work, keep an up-to-date set of prints showing all changes made in the system from the original shop drawings and materials shown on the approved submittals. After completion of work provide the engineer with six sets of as build shop drawings.

PRODUCT HANDLING

Protection: Use all means necessary to protect the work and materials of this section before, during and after installation and to protect the work and materials of all other trades.

GUARANTEE

All labor and materials for one year after Substantial Completion certificate is prepared. All defective work shall be replaced to the full satisfaction of the engineer, and at no additional cost to the owner.

The manufacturer shall provide a three year warranty on the specified control panel and software, as well as any other component that is “proprietary” in nature.

The product specified shall be manufactured by a firm whose quality system is in compliance with the I.S. /ISO 9001/EN 29001, QUALITY SYSTEM.

PART 2 – PRODUCTS

MANUFACTURERS

Panasonic or approved equal.

CONTROLLER AND NVR RECORDER

16 Channel digital video recorder

30 Days of storage capacity

MPEG-4 compressor

Up to 480 images per second (IPS) recording rate.

Support for continuous motion, alarm and schedule recording

Search by calendar and date, or sensor and motion event per channel

Variable playback speed.

Audio playback will synchronize with video.

Video can be viewed remotely on a local network system.

Back up video via CD/DVD or with USB thumb drive

Manufacturer: Lenovo, model # NVR-RL-1-48TB-V3 or approved equal.

INTERIOR/EXTERIOR PAN-ZOOM – TILT (PZT) CAMERA

High quality 10X optical zoom lens

True day/night camera

Indoor/outdoor application

¼” Sony super HAD CCD image sensor

More than 480 TV lines horizontal resolution.

Pan-Zoom – Tilt (PZT)

Operating temperature: -40º F to 122º F.

Fan and Heater for outdoor.

Manufacturer: Panasonic, model # WV-X6531N or Approved Equal

MONITOR

Professional CCTV 19” LCD color Monitor

High resolution, high contrast ratio

Panel and base detachable.

5.6 MS response time

Manufacturer and Model Number as recommended by manufacturer.

JOY STICK

Must communicate with PZT camera

Presets, tour, auto-scan, vadom scan, and frame scan control.

Full control of PZT cameras, able to select camera, zoom in/out function.

As recommended by manufacturer representative.

WALL MOUNT BRACKET (if required)

Support up to 10KG weight

Indoor/outdoor application

Cable feed through

Compatible with PZT Dome cameras and housing

POWER SUPPLY

120 VAC input, 24 VAC output

12 A capacity

18 outputs

Input and output fuse protection

Compatible with camera, domes, pan-zoom tilts.

Manufacturer and model # as recommended by Representative.

CAMERAS

Panasonic or approved equal.

Interior:

- Panasonic, model #WV-U2130L or Approved Equal.
- Panasonic, model #WV-U2132L or Approved Equal.

Exterior:

- Panasonic, model #WV-S1536LN or Approved Equal.
- Panasonic, model # WV-X6531N or Approved Equal (Pan-Zoom-Tilt)

WIRE AND CABLE

High-grade video cable with attached power supply if recommended by the manufacturer. Installer to coordinate with the supplier to understand all cabling requirements.

The owner shall not be charged for any cabling that was not understood as part of the sealed bid.

PART 3 - EXECUTION

EXAMINATION

Verify surfaces and areas are ready to receive work.

Verify field measurements are accurate and shown on drawings.

Verify field measurements prior to submitting bid.

Verify proper power connections are installed.

Proceed with installation only after unsatisfactory conditions are corrected.

All wiring shall test free from grounds and shorts.

INSTALLATION

General:

- The complete installation shall be done in a neat, workmanlike manner according to all applicable codes and the manufacturer’s recommendations.
- Install all fixtures, materials, assemblies and equipment in strict accordance with manufacturer’s recommendations and instructions. Consult manufacturer/equipment supplier for all wiring diagrams, schematics, sizes, outlets, etc. before installing.
- Install power supplies as required based on equipment per manufacturer.
- Mount all equipment except portable equipment firmly in place. Clearly, logically and permanently mark all switches, jacks and receptacles.

Cable Installation:

- Install all equipment per manufacturer's instructions and directions.
- In areas where cable trays are not used for cable properly support cable throughout. Cables shall not be installed in a hap-hazard manner across the ceiling grid system.
- In those areas where there is not an existing ceiling, all system cables shall be routed through conduit, through the non-ceiling area, into an area where there is ceiling cavity. There shall be no open cables routed through ceiling areas, unless it is indicated otherwise on the drawings.

Cleaning:

- Prior to turning the system over to the owner, the system shall be physically cleaned.
- All appearance defects shall be carefully and professionally touched up so that the equipment is in “factory new” condition.
- At the completion of the work, remove from the building and the premises all rubbish and debris resulting from the work.

Cable:

- Cable type, size, and quantity to be as shown on drawings. Vendor to verify exact cable required based on the equipment and provide appropriate cable.
- All cables to be plenum rated.
- All wire runs shall be continuous lengths, without splices.
- Marker strips shall be attached to the field wiring. These markers shall not change when devices are replaced during repair or maintenance.
- Within equipment cabinets, all wires and cables shall be contained in wire management channels and dressed and labeled in such a manner that all wires may be easily traced, and such that they do not obstruct access to components which may need to be replaced or serviced.

On Site Programming:

- The system supplier shall provide on-site programming. He/She shall program the unit in conjunction with the owner's requirements. The systems supplier shall plan on spending a minimum of one day on site with the owner to provide all programming for the system.

Final Testing:

- All wiring shall test free from all grounds and shorts.
- Upon completion of the installation, the system must be tested by the manufacturer's representative and all necessary modifications and/or adjustments must be made to assure compliance with this specification.
- Upon completion of the testing, the manufacturer or his representative shall issue to the owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with this specification.

OWNER TRAINING

Provide complete operator training for the owner’s personnel.

Provide four-hour training session at time set by the owner.

The field service representative shall have specialized experience in the operation and maintenance of the system and shall instruct the owner's personnel in the techniques involved in the operation of the systems.

Diagrams, Drawings and Instruction Manuals:

- Turn over neat and readable as built drawings along with all owner’s manuals shipped with the products supplied.

Additional Services:

- The systems supplier shall provide two 4-hour service calls during the first two years of use. These two service calls shall be included as part of the system package.

END OF SECTION 28 05 13

END OF DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

57. Emergency Generator, Item SPV.0060.104.

A Description

The work under this section includes providing and installing a complete factory assembled packaged engine generator system with controls and startup testing. The generator is intended to provide electrical power for critical building operations for the SWEF building during power outages.

B Materials

Refer to article Section 26 32 00 - Packaged Generator Assemblies under SWEF Building, Electrical, SPV.0060.103 for materials information. The department desires that generator for the SWEF building be of the same manufacturer as the generator for the communications tower.

C Construction

Refer to article Section 26 32 00 - Packaged Generator Assemblies under SWEF Building, Electrical, SPV.0105.104 for construction and installation information.

D Measurement

The department will measure the Emergency Generator SWEF Building bid item 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.0060.104	Emergency Generator SWEF Building	EACH

Payment is full compensation for Emergency Generator SWEF Building, measured as provided above will be paid for at the contract lump sum price, which price shall be full compensation for furnishing the generator and installing all equipment, all utility hook-ups, equipment, calibrating and testing, warranties, training, tools and incidentals items for installing and supplying the Emergency Generator SWEF Building.

58. Lightning Protection and Grounding System, Item SPV.0060.105.

A Description

This special provision describes furnishing and installing a ground grid system to provide a ground path for lightning protection and an equal potential ground plane for the entire site. The Communication Tower will have a separate system and is included under a separate bid item. Install all work according to standard spec 651 through 660, as approved by the engineer, and as hereinafter provided.

B Materials

Ground rods shall be 10 foot long by 5/8 inch in diameter copper clad steel. Ground conductors shall be bare soft drawn stranded copper number 1/0 or larger. All connections between ground rods and ground conductors shall be exothermic welded.

C Construction

Install ground rods with ground whips to equipment noted as required by code. In addition, provide a minimum of three ground rods at each high mast lighting unit spaced a minimum of 20 feet apart and bonded together by a 1/0 ground wire. Provide a ground conductor from the base of this ground grid to the ground rod at the top of the high mast tower structure.

All conductors and ground grids shall be installed with a minimum of 12 inches of cover in areas with vegetative growth to allow the soil to maintain high moisture content.

Test ground grids by the contractor using the fall of potential method. Results shall be recorded and submitted to the engineer for review. Any readings below 10 ohms shall be given to the engineer immediately for further action.

D Measurement

The department will measure the Lightning Protection and Grounding System bid item 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.0060.105	Lightning Protection and Grounding System	EACH

Payment is full compensation for furnishing and installing system, for testing system, and incidentals necessary to complete the work.

59. Emergency Generator Communications Tower, Item SPV.0060.106.

A Description

This special provision describes all work by contractor to provide and install a complete factory assembled packaged engine generator system including Automatic Transfer Switch, LP fuel system, concrete pads, conduits, fuel piping, controls, wiring and associated equipment and materials for the SWEF communications tower site within the work limits as noted in the drawings as produced by Edge Consulting Engineers, Inc. (pages 139-163). The generator is intended to provide electrical power for critical building operations for the SWEF communications tower site during power outages. The work shall be according to the applicable drawings and the following specifications included with this special provision.

Providing and installing the equipment shelter is included in another bid item (SPV.0060.300).

Installation of the automatic transfer switch and LP fuel monitoring system within the equipment shelter is covered under this bid item.

Installation of conduits and wiring between generator, LP tank and equipment shelter is covered under this bid item.

B Materials

Refer to following specification sections for materials information related to this special provision. The department desires that generator for the Communications Tower be of the same manufacturer as the generator for the SWEF building.

C Construction

Refer to following specification sections for construction and installation information related to this special provision.

D Measurement

The department will measure the Emergency Generator Communications Tower bid item 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.0060.106	Emergency Generator Communications Tower	EACH

Payment is full compensation for Emergency Generator Communications Tower, measured as provided above will be paid for at the contract lump sum price, which price shall be full compensation for furnishing the generator and installing all equipment, all utility hook-ups, and for furnishing all labor, supervision, equipment, calibrating and testing, warranties, training, tools and incidentals items for installing and supplying the Emergency Generator Communications tower.

TABLE OF CONTENTS

Emergency Generator Communications Tower, Item SPV.0060.105

Section 26 32 00 – Packaged Generator Assemblies

PART 1 – GENERAL

SCOPE

The work under this section includes providing a complete factory assembled packaged engine generator system with controls and startup testing. Included are the following topics:

RELATED WORK

Applicable provisions of Division 01 govern work under this section.

Section 26 36 23 - Transfer Switches.

REFERENCES

NFPA110 – Emergency and Standby Power Systems.

ANSI/NEMA MG 1 - Motors and Generators.

UL2200 – Stationary Engine Generator Assemblies.

PERMITS

The contractor shall be responsible for obtaining all necessary permits for the complete installation of the generator fuel system and related equipment.

SUBMITTALS

Submit shop drawings showing plan and elevation views with overall and interconnection point dimensions, fuel consumption rate curves at various loads, ventilation and combustion air requirements, and electrical ratings and diagrams including schematic and interconnection diagrams.

Submit manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

QUALITY ASSURANCE

Manufacturer: Company specializing in packaged engine generator systems with minimum 10 years documented experience.

Supplier: Authorized distributor of engine generator manufacturer with service facilities within 100 miles of project site.

WARRANTY AND PREVENTATIVE MAINTENANCE SERVICE

Warranty: Provide five-year comprehensive warranty. Warranty shall include complete coverage for the package generator system, including one automatic transfer switch of same manufacturer.

Preventative Maintenance Service: Provide all manufacturers’ scheduled preventative maintenance service on the package generator system, including one automatic transfer switch of same manufacturer for a period of one year from the date of substantial completion.

EXTRA MATERIAL

Provide two additional sets of each fuel, oil, and air filter elements required for the engine generator system and one additional set of all required belts.

PART 2-PRODUCTS

SYSTEM RATINGS

Generator Set Rating:50 KW, 50 KVA, .8pf, 240/120 VAC, 1 phase, 3 wire, 12 wire re-connectable, 60 Hz at 1,800 rpm. Standby power rated.

Motor starting KVA shall be 50 KVA based on a sustained RMS voltage drop of no more than 35% of no-load voltage with the specified KVA load at near zero power factor applied to the engine-generator set.

The generator set manufacturer shall verify the engine as capable of driving the generator with all accessories in place and operating at the nameplate rating after de-rating for the range of temperature expected in service and the altitude of the installation.

The engine-generator set shall be capable of picking up 100% of nameplate kW, less applicable derating factors, in one step with the engine-generator set at operating temperature.

Voltage regulation shall be ±1.0% of rated voltage for any constant load between no load and rated load. Random voltage variation with any steady state load from no load to full load shall not exceed ±1.0% of rated voltage.

Frequency regulation shall be ±0.5% from steady state no load to steady state rated load.

Harmonic distortion shall not exceed 5% total harmonic distortion at full linear load and no single harmonic shall exceed 3% of rated voltage.

ENGINE AND ENGINE EQUIPMENT

Engine Type: Water-cooled, turbo-charged, four cycle, internal combustion engine.

Fuel Type: LP.

Governor: Isochronous electronic type to maintain engine speed within 0.5 percent, steady state, and 1 percent, no load to full load, with recovery to steady state within 2 seconds following sudden load changes.

Safety Devices: Engine shutdown on high water temperature, low oil pressure, overspeed, and engine over crank. Limits as selected by manufacturer.

Include remote starting control circuit, with RUN-OFF-AUTO selector switch on engine generator control panel.

Engine Accessories: Include intake air filter, fuel filter, fuel priming pump, automatic electric fuel shutoff, fuel/water separator, gear-driven water pump, positive displacement mechanical full pressure lubrication oil pump, full flow lubrication oil filters with replaceable elements, dipstick oil level indicator, and oil drain valve with hose extension. Include engine mounted battery charging alternator with solid state voltage regulator. Include fuel pressure gauge, water temperature gauge, and lube oil pressure gauge on engine-generator control panel.

Engine Jacket Heater: Thermal circulation type water heater with integral thermostatic control, sized to maintain engine jacket water at 90 degrees F (32 degrees C). Heater voltage shall be served from integral Branch Circuit Panelboard.

Cooling System: Unit mounted radiator using glycol coolant, with blower type fan, coolant pump and thermostat temperature control sized to maintain safe engine temperature in ambient temperature of 105 degrees F. The equipment supplier shall provide 50% ethylene glycol antifreeze solution to fill engine cooling system.

Exhaust System:

- Provide critical grade silencer, with muffler companion flanges and flexible stainless steel exhaust fitting, suitable for horizontal orientation, sized according to engine manufacturer's instructions. Contractor shall mount muffler, so its weight is not supported by the engine.
- Flexible exhaust connections shall be provided as required for connection between engine exhaust manifold and exhaust line, in compliance with applicable codes and regulations.
- Provide an exhaust condensation trap with manual drain valve to trap and drain off exhaust condensation and to prevent condensation from entering the engine. Provide drain line to drip pan.
- Provide a suitable rain cap at the stack outlet. Provide all necessary flanges and special fittings for proper installation.

Fuel System:

- The generator shall be capable of accepting liquid propane (LP) fuel. LP fuel will be the primary source of fuel.
- Provide flexible supply and return line fittings and all connections for connecting fuel system to the engine in compliance with applicable codes and regulations. All fuel piping shall be pressure tested for minimum 2 hours.

Batteries:

- Heavy duty, diesel starting type, lead-acid storage batteries. Provide a DC volt system with number of batteries and battery capacity as sized by the manufacturer adequate for four 30 second cranking periods (total of 2 minutes) along with all additional loads being run on the DC system.

Mounting: Provide unit with suitable spring-type vibration isolators and mount on structural steel base.

ALTERNATOR

Insulation: ANSI/NEMA MG 1, Class H.

Alternator Speed: 1,800 rpm

The unit shall be single bearing, self-aligning 4-pole, brushless, synchronous type, revolving field windings, and direct driven centrifugal blower for proper cooling and minimum noise. No brushes will be allowed.

The unit shall be 1-phase, broad-range, re-connectable and shall have 12 leads brought out to allow connection by user to obtain any of the available voltages for the unit. Leads shall terminate in NEMA 1 connection enclosure. A fully rated, isolated neutral connection shall be included by manufacturer.

The alternator shall meet temperature rise standards of UL2200 (120 degrees C). The insulation system material shall be class “H”.

The regulator design shall include torque-matching characteristics to allow the engine to use its fullest power producing capacity (without exceeding it or overcompensating) at speeds lower than rated, to optimize motor starting capability and provide the fastest possible recovery from transient speed dips. Regulators which use a fixed volt per hertz characteristic are not acceptable.

The alternator shall include a permanent magnet generator (PMG) exciter and electronic voltage regulator and shall be self-ventilated drip-proof construction built according to NEMA, AIEE and ANSI standards.

The alternator shall be protected against overloads and short circuits by electronic control panel protective functions. Functions shall be implemented electronically in the control panel. The generator design shall be of the self-protecting type as demonstrated by the prototype short circuit test. Systems utilizing 3-wire, solid state control elements rotating in the rotor, will not be acceptable.

OVER CURRENT PROTECTIVE DEVICE

Circuit breaker required: Provide a mainline molded case circuit breaker(s), 80% thermal magnetic, 200 Amp, on generator output with adjustable long time and short time delay and instantaneous trip; complying with NEMA AB 1 and UL489. Trip settings shall be factory set to generator thermal damage curve.

ACCESSORIES

Provide the following accessories with the engine generator set.

Silencer: Outdoor enclosure mounted: Critical grade, minimum 30 dB reduction. Silencer shall be located inside enclosure.

Enclosure: Standard Weather protective housing with the following features:

- Vandal-resistant.
- Rodent-proof.
- Galvanized steel body.
- Lifting points on base frame.
- Stainless steel flush fitting latches and hinges.
- Stainless-steel fasteners.
- Sheet steel components pre-treated with zinc phosphate prior to polyester powder coating.
- Lockable wide door on each side installed to allow 180 degree opening rotation.
- Radiator fill access door with lockable cover.
- Lube oil and coolant drains piped to the exterior of the enclosure skid base.

- Lockable fuel fill cap.
- Battery can only be reached through lockable doors.
- UL listed base tank sized as indicated elsewhere in these specifications.

Load Center - Enclosure: Integral load center 30/2 amps to serve accessories including, but not limited to, the battery charger, engine heater, enclosure lighting, and convenience receptacle.

Load center style panelboard: plug-on circuit breaker type, fully rated, Type 3R enclosure, 3-3/4" D, 14.25" W, code gauge steel, surface mounted with ground bar and lock kit. Copper bus, minimum system (i.e., individual component) short circuit rating: 10,000A. Provide with typed circuit identification directory label.

Load center shall be independently supported to equipment pad or unit frame on frame side of engine isolation to avoid load center vibration.

Electrical Devices - Enclosure: GFCI WP receptacle. Devices and associated circuitry shall be field installed by the Electrical Contractor.

Electrical Lighting - Enclosure: Manual switch inside access door and LED lighting fixture(s). Lighting fixture, switch and associated circuitry shall be field installed by the Electrical Contractor.

Battery Heater: Thermostatically controlled battery blanket heater, 120VAC.

Battery Tray: Plastic coated metal tray treated for electrolyte resistance, constructed to contain spillage of electrolyte.

Battery Charger: A 10-ampere voltage regulated battery charger shall be provided for the engine-generator set. Charger shall be equipped with float, taper and equalize charge settings. Charger shall include overload protection, voltage surge suppressor, DC voltmeter and fused AC input. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120 VAC, 30 VDC for remote indication of:

- Loss of AC power-red light (no relay contact).
- Low battery voltage-red light.
- High battery voltage-red light (no relay contact).
- Chargers fail-red light.

Engine-Generator Digital Control Panel - Unit mounted: Provide a control panel with the top not more than 6 feet above finished floor (this may require remote mounting). NFPA – 110, NEMA Type 1 generator mounted control panel enclosure with engine and generator controls and indicators containing the following:

- Automatic remote start capability.
- "Run-Off-Auto" switch.
- Shut-downs as required by NFPA 110 5.6.5.2(3).
- Alarms as required by NFPA 110 5.6.5.2(4).
- Individual alarm indication as required by NFPA 110.5.6.5.2(4) and table 5.6.5.2.
- Controls as required by NFPA 110 5.6.5.2(5).

Include remote starting control circuit, with RUN-OFF-AUTO selector switch on engine generator control panel.

Fuel pressure, water temperature, and lube oil pressure shall be monitored by the engine-generator controller.

The control shall include surge suppression for protection of solid state components. A front control panel illumination lamp with On/Off switch shall be provided. The engine-generator set starting batteries shall power the monitor.

Auxiliary Relay: 3PDT, operates when engine runs, with contact terminals prewired to terminal strip.

Remote Alarm Contacts: Pre-wire form C contacts to terminal strip for remote alarm functions required by ANSI/NFPA 110.

Remote Mounted Annunciator Panel (Equipment Shelter): Surface Mounted. Digital. Annunciator panel shall be powered from unit storage battery and located within the equipment shelter. A remote, audible alarm shall be provided per NFPA110-5.6.5.2(4).

The annunciator shall have provisions for spare relay-based inputs for audible/ visual alarms to meet the requirements of these specifications. Refer to Generator Source Alarm Annunciation/ Indication.

The annunciation alarm shall be capable of being silenced and the panel shall include repetitive alarm circuitry so that after the audible alarm has been silenced, it re-activates after the fault condition has been cleared.

Provide all wiring and raceway systems as required.

Emergency Stop “Mushroom” Switch: Provide emergency shut off switch on the unit generator within the generator enclosure.

Devices installed outdoors shall be installed in approved wet location wiring method.

Shut off switch: Red button with (2) N.O. and (2) N.C. contact block. Switch shall be capable of lockout and tagout.

Provide label with “Emergency Shut Down”- White letters on Red background.

Provide all wiring, raceways and mounting systems as required.

Generator Feeder: The ampacity of the conductors from the generator terminals to the first distribution device containing overcurrent protection shall not be less than 115% of the nameplate current rating of the generator.

Alarm Contact Wiring: Provide two alarm wiring cables (Cat 5, color: red) from generator unit to punch block within shelter. Provide services loops in cable at each end.

Remote Access and Control System: Generator system shall be provided with an Ethernet connection (TCP/IP) for remote monitoring and control of generator system functions. Provide all hardware and software to enable customer to remotely view and control generator and transfer switch via the Ethernet ModBus Connection. The software shall allow for viewing, control and set-up of the generator and transfer switch through a personal computer operating on a Microsoft operating system.

PART 3 - EXECUTION

EXAMINATION

Verify that required utilities are available in proper location and ready for use.

INSTALLATION

Install according to manufacturer's instructions.

Generator set shall be anchored to the concrete pad.

Interior and exterior Generator installations shall be provided with battery powered emergency lighting to illuminate area surrounding generator/ generator enclosure.

Generator Emergency Shutdown switch shall be located within the generator enclosure.

Outdoor Generator Enclosure Accessory Panelboard: The accessory source panel and all related branch circuitry shall be furnished and installed by the Electrical Contractor. This includes, but is not limited to, the circuiting for the battery charger, engine heater, enclosure lighting, and convenience receptacle.

Feeders:

Feeder wiring serving emergency loads shall be installed per NEC 700.10(D)(1) through (D)(3).

Control Conductors:

All generator control conductors installed between transfer equipment and the emergency generator serving Emergency, Legally Required Standby and Optional Standby systems shall be kept entirely independent of each other and all other wiring. This shall require a dedicated conduit system between each transfer switch and the emergency generator.

All Emergency branch control conductors installed between transfer equipment and the emergency generator shall be installed per NEC 700.10(D)(1) through (D)(3).

Grounding:

When 3-pole transfer switches are utilized, the generator shall be installed and connected as an equipment connection (not a separately derived system) and the factory installed generator ground/neutral bonding strap shall be removed.

FIELD QUALITY CONTROL

Operational testing of complete emergency electrical system shall be conducted prior to scheduling the required full load test to ensure complete system operation.

Provide full load testing utilizing a portable test bank for four hours continuous, minimum. During the first two hours, step increase the load from 0% to 100% in at least six equal steps. At the end of two hours, continue running test at 100% load. Record the following in 20-minute intervals throughout the four-hour test: kilowatts, amperes, voltage, coolant temperature, room temperature, generator frequency (Hz), oil pressure, fuel consumption.

Full load testing utilizing a portable test bank shall be conducted with minimum outside temperature of 32 degrees F.

After the generator has cooled down from the four-hour test, shut it down and then simulate a power failure including operation of the transfer switch, automatic cycle, and automatic shutdown and return to normal.

AGENCY TRAINING

Provide on-site factory training to owner by manufacturer trained technicians (minimum of 2 hours).

END OF SECTION 26 32 00

Section 26 36 23 – Automatic Transfer Switches

PART 1 – GENERAL

SCOPE

The work under this section includes transfer switches (less than 600V) for standby generator systems.

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 26 32 00- Packaged Generator Assemblies.

QUALITY ASSURANCE

Manufacturer: Company specializing in automatic transfer equipment with five years documented experience.

SUBMITTALS

Submit product data showing overall dimensions, electrical connections, electrical ratings, all specified accessories, interlock methods, and environmental requirements.

Submit manufacturer's installation instructions.

OPERATION AND MAINTENANCE DATA

All operations and maintenance data shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

In addition to the general content specified under GENERAL REQUIREMENTS, include instructions for operating equipment under test and emergency conditions.

PART 2 - PRODUCTS

AUTOMATIC TRANSFER SWITCHES

Open Transition Type: Furnish and install Open Transition Automatic Transfer Switch (ATS) with number of poles, ampere rating, voltage, and withstand ratings as indicated on drawings. Each automatic transfer switch shall consist of a double throw power transfer switch mechanism and microprocessor controller to provide automatic operation. Where multiple switches are required, all shall be by same manufacturer.

Description: NEMA ICS 2; automatic transfer switch.

Configuration: The transfer switch shall be electrically operated and mechanically held. The electrical operation shall be by a solenoid mechanism operating from the same source to which the load is being transferred.

The switch shall be rated for continuous duty and be mechanically interlocked to be in either the normal or the emergency position.

The switch shall be controlled by a single built-in microprocessor with serial communications module. Controller shall be connected to the transfer switch by plug type with associated interconnected wiring harness. Relays shall be industrial grade with dust covers, mounted separate from the transfer switch.

All customer wiring connections shall be to a common terminal block for ease of field wiring. The switch shall be designed and built so that it can be manually operated under no-load conditions from behind a barrier partition or with the door closed. The enclosure shall allow for inspection of the internal operation of the switch through a full sequence of the transfer cycle with the door open and the switch de-energized.

In applications where the switch serves as the service entrance disconnect, the switch shall be rated as suitable for use as a service disconnecting means.

RATINGS

Ratings: As scheduled on drawings.

SEQUENCE OF OPERATION

Controller keypad and display: Provide minimum 4 line, multi character LCD display and keypad controller for viewing all available data and settings operational parameters. Provide serial communications input port.

The following parameters shall be adjustable via DIP switches: Nominal line voltage and frequency, single or three phase sensing.

Voltage, frequency and phase rotation sensing: Continuously monitor voltage and frequency on both normal and alternate sources with pickup, drop out and trip setting capabilities.

Voltage and frequency settings shall be field adjustable in 1% increments via keypad or serial communications port.

The controller shall sense the phase rotation of both sources.

Source information shall be indicated on data screen for normal and alternate sources to provide readout of voltage on all phases, frequency and phase rotation.

Time delay settings shall be adjustable utilizing LCD display and keypad or serial communications port.

TIME DELAYS

Initiate Time Delay to Start Alternate Source Engine Generator: Upon initiation by normal source monitor.

Time Delay to Start Alternate Source Engine Generator: 0 to 10 seconds, adjustable.

Initiate Transfer Load to Alternate Source: Upon initiation by normal source monitor and permission by alternate source monitor.

Time Delay Before Transfer to Alternate Power Source: 0 to 60 seconds, adjustable.

Initiate Re-transfer Load to Normal Source: Upon permission by normal source monitor.

Time Delay Before Transfer to Normal Power: 0 to 30 minutes adjustable.

Time Delay Before Engine Shut Down: 0 to 30 minutes, adjustable, unloaded operation.

Operating transfer time of the switch in either direction shall not be greater than 1/6 of a second.

ACCESSORIES

Engine Exerciser: Digital control, start engine every 7 to 31 days adjustable; run for 0 to 120 minutes adjustable, before shutting down. Bypass exerciser control if normal source fails during exercising period.

Manual Operator: Provide manual operator to allow switch to be operated under no-load conditions from behind a barrier partition or with the door closed.

Provide three position momentary test switch for the test/ automatic/ reset. The test position will simulate a normal source failure. The reset switch shall bypass the time delays on either transfer to alternate source or retransfer to normal.

Return to Normal Switch: Mount in cover of enclosure to initiate manual transfer from alternate to normal source.

Indicating Lights: LED type. Mount in cover of enclosure to indicate NORMAL SOURCE AVAILABLE, ALTERNATE SOURCE AVAILABLE, SWITCH POSITION.

Transfer Switch Auxiliary Contacts: Minimum two normally open; two normally closed, rated 10 amps. Minimum one shall be closed when ATS is connected to the normal source and one closed when ATS is connected to the alternate source.

Normal Source Monitor: Monitor each line of normal source voltage; adjustable set points; initiate transfer when voltage drops below 85 percent.

Alternate Source Monitor: Monitor alternate source voltage and frequency; adjustable set points; inhibit transfer when voltage is below 85 percent or frequency varies more than 3 Hertz from rated nominal voltage.

In phase monitor shall control transfer so the motor load inrush currents do not exceed normal starting currents and shall not require external control of power sources.

The switch shall contain an in-phase monitor or adjustable time delay transition to inhibit closing of the switch into high levels of motor residual voltage.

A factory installed equipment ground bar shall be provided in each switch enclosure.

Three-pole transfer switches shall contain a factory installed fully rated solid neutral lug assembly.

Provide digital metering on all transfer switches. Metering shall provide, at a minimum, measurement of voltage, frequency, current and power, energy and power factor on the load side of the switch.

PART 3 - EXECUTION

INSTALLATION

Install according to manufacturer's instructions.

Starting contacts for all transfer switches shall be wired in parallel to the generator starting circuit so that any transfer switch that senses a loss of normal power will start the generator. This control wiring is not shown on the plans but is required to be provided by the electrical contractor.

FIELD ADJUSTMENTS

The contractor shall field adjust all timing and voltage settings of the transfer switch as necessary for proper operation of the switch, related loads and sources.

TESTING

Maintenance and operational testing shall be per NFPA 110-8.3.

Operational inspection and testing shall be per NFPA 110-8.4.

AGENCY TRAINING

Provide on-site factory training to owner by manufacturer trained technicians (minimum of 2 hours).

END OF SECTION 26 36 23

Section 33 50 00 – LP Fuel Systems

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing and installing LP fuel tanks, remote LP fuel monitor systems and LP fuel piping systems.

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 26 32 00 – Packaged Generator Assemblies

Section 31 23 16.13 - Trenching

REFERENCES

Abbreviations of standards and organizations referenced in other sections are as follows:

ANSIB16.3	Malleable Iron Threaded Fittings
ASTMA53	Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless
ASTMA234	Pipe Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures
AGA	American Gas Association
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CGA	Compressed Gas Association
EPA	Environmental Protection Agency
GAMA	Gas Appliance Manufacturers Association
MCA	Mechanical Contractors Association
MSS	Manufacturer’s Standard Society of the Valve and Fitting Industry
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
UL	Underwriters Laboratories Inc.

SUBMITTALS

Refer to Division 1, General Conditions, Submittals.

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.

Submit test report of installed LP fuel piping system.

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.

OPERATION AND MAINTENANCE INSTRUCTIONS

All operations and maintenance instructions shall comply with the submission and content requirements specified under section GENERAL REQUIREMENTS.

QUALITY ASSURANCE

Supplier: Authorized supplier of LP fuel systems and fuel supply with service facilities within 100 miles of project site.

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.

Any installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the owner.

Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

DELIVERY, STORAGE AND HANDLING

Promptly inspect shipments to ensure that the material is undamaged and complies with specifications.

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.

Offsite storage agreements will not relieve the contractor from using proper storage techniques.

Storage and protection methods must allow inspection to verify products.

RECORD DRAWINGS

Refer to Division 1, General Requirements, Record Drawings.

Record as-built drawing locations of all installed below grade piping.

PART 2 - PRODUCTS

LP FUEL TANK

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.

Tank shall be an above ground steel type with lockable cover all which are primed and painted suitable for outdoor environments.

Tank shall include direct read gauge to monitor fuel level.

REMOTE LP FUEL MONITOR SYSTEM

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.

The system shall be a LevelCon Model#: STM94442A, or equivalent.

LP FUEL PIPING

All LP fuel piping components shall be specifically manufactured for use in LP fuel applications.

Below grade fuel piping shall be direct buried polyethylene tubing of the size indicated in the plans. Below grade tubing shall include tracer wire.

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.

Above grade hard piping at generator and LP tank shall be steel gas rated piping which is primed and painted for outdoor environments.

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.

LP FUEL PRESSURE REGULATORS

Cast iron body, aluminum spring and diaphragm, Nitrile diaphragm, threaded ends, 150psi W.O.G., -20°F to 150°F.

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.

SHUT-OFF VALVES

Two inch or smaller: Ball valve, bronze body, threaded ends, stainless steel or chrome plated ball, full or conventional port, Teflon seat, blowout-proff system, two-piece construction, suitable for 150psig working pressure, U.L. listed for use as LP gas shut-off.

PART 3 - EXECUTION

LP FUEL TANK

Verify size of concrete foundation is suitable for tank to be installed. Install concrete foundation slab per the plans and specifications.

Mount tank on slab concrete slab and secure legs to slab with galvanized anchor bolts.

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.

Install LP gas monitor system per these specifications.

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.

REMOTE LP FUEL MONITOR SYSTEM

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.

Install remote LP gas monitor system per manufacturer’s instructions.

Mount remote monitor unit within the equipment building at the location as indicated in the drawings.

Seal conduits containing hard wire leads between LP tank and equipment building at both ends per drawings.

LP FUEL PIPING

Trench and install LP fuel piping between LP tank and generator as detailed in the drawings.

Install AGA approved ball shut-off valve at the generator.

Install LP fuel pressure regulators per manufacturers requirements at the locations noted in the drawings.

Provide fuel line support as noted in the drawings.

Provide sediment trap/dirt leg in hard piping at generator.

Install flexible LP fuel gas tubing between hard piping and generator for vibration isolation.

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 33 50 00

60. Weigh-In-Motion System, Item SPV.0060.200.

Summary

7. System Acceptance
    7.1. System Review
    7.2. Acceptance Tests
        7.2.1. Factory Acceptance Tests
        7.2.2. Site Acceptance Tests
        7.2.3. Continuous Operating Test (COT)
8. Training
9. Warranty
10. Materials
11. Standard Products
12. Lightning Protection
13. Measurement
14. Payment

1. Introduction

This special provision describes the work to remove the existing Weigh-In-Motion (WIM) System and install a new system to be utilized at the reconstructed Hudson Safety and Weight Enforcement Facility (SWEF) to pre-weigh vehicles, sort, and provide direction to vehicles in motion along eastbound IH 94 in advance of the Hudson SWEF. Changeable Message Signs (CMS) shall be utilized along the mainline to direct vehicles to report or bypass the Weigh Station based on their perceived level of compliance as determined from the mainline pre-screening WIM system. The system will also include Open/Closed CMS signs, Weigh Station Changeable Message Signs (CMS), and Variable Message Signs (VMS).

A vehicle that has been directed to enter the Weigh Station shall be screened and verified once more on the ramp. Based on the results of this second screening, automatic directional signals shall direct the vehicle to either bypass or report to the scale house for further inspection.

The sorting decisions will be based on compliance of speed, side to side balance, axle-to-axle balance within tandem, axle spacing, axle weights, axle group weights, bridge formula (front and rear), gross vehicle weights with the pre-set tolerances, overheight detection, tire anomalies, and credentials.

Separate from this project, Wisconsin DOT will be deploying PrePass and Drivewyze E-Screening Systems to interface with the mainline WIM sorting system. The contractor’s system must be able to successfully interface with theses E-Screening Systems and provide consistent messages when notifying vehicles. This must be a fully integrated system.

The Mainline and Ramp WIM Systems shall include various components that interact together. The components shall include the following:

- Weigh-In-Motion (WIM) sensors
- Axle and loop detection
- Overview image camera
- Automatic Traffic Recorder (ATR) System
- Lane directional signals for Mainline and Ramp Systems
- Weigh Station computer system
    - Virtual Graphics Display
    - Scale Manager
    - Vehicle Display
    - Station PC
    - Override Console
    - Data Collection System
- Printer
- Weigh Station Variable Message Signs (VMS)
- Weigh Station Changeable Message Signs (CMS)
- Open/Closed CMS Signs

- On-site Communication System
- AVI (automatic vehicle identification) with PrePass and Drivewyze Interface.
- Automatic USDOT Reading (AUR) System with optical character recognition.
- License Plate Reading (LPR) System with optical character recognition.
- Overheight Detection System.
- Tire Anomaly System.
- Local credential repository.
- Cellular modem for remote communication.

The scope of work is to supply and install the following:

- WIM scales, axle sensing, loops, WIM electronics and cabinets.
- Lane directional signals for the ramp system – support Structure S-55-76 paid for under standard WisDOT bid items.
- Lane directional signals including support structures for the mainline system.
- Overview image camera installation including support structures.
- AUR system installation including support structures.
- LPR system installation including support structures.
- Overheight detection system including support structures.
- Tire anomaly system including support structures.
- Tracking loops to activate lane directional signals and monitor traffic flow downstream of lane directional signals.
- New communications conduit and wiring for all equipment.
- Electrical power wiring and conduit.
- Weigh Station Variable Message Signs (VMS) – support Structure S-55-77 paid for under standard WisDOT bid items.
- Open/Closed Signs – support structures paid for under standard WisDOT bid items.
- On-site Communication System.
- Monitoring capability and equipment at Hudson SWEF.

The objective of the department is to have a fully operational Mainline and Ramp Sorting Systems, capable of accurately and automatically pre-screening vehicles in motion for enforcement purposes. Based on the weights obtained from the WIM screening, the system shall automatically direct the selected vehicles to the enforcement scales, as illustrated in the attached plans and these specifications.

The purpose of this project is not for the research and development of a system which might perform the objectives as described above. Therefore, the contractor shall be required to furnish documentation which demonstrates to the satisfaction of the department that all equipment proposed for use in the Mainline and Ramp WIM Systems is of standard manufacture; that the manufacturer has had similar equipment available for purchase for not less than ten years; and has a proven acceptable performance history while in use under conditions similar to those for the intended use.

The scope of work is to complete the following work strictly per these provisions and associated plans:

2. Removals

The following shall be removed and disposed unless otherwise noted:

1. Existing WIM cabinet including all electronics and wiring.
2. Existing mainline and ramp WIM scales.
3. Existing overview camera, illumination, pole, and base.
4. Existing OPEN/CLOSED CMS sign, posts, and bases at Station 339+94 EB.
5. Existing OPEN/CLOSED CMS sign, posts, and bases at Station 347+89 EB.
6. Existing Overheight Detector, pole, and base.
7. Existing Ramp Lane Control (Arrow) Signals (3), poles, and bases.

8. Existing Variable Static Scale Message Signals (5), poles, and bases.
9. Existing Static Scale Scoreboard.
10. Existing WIM system electronics in the SWEF building utility room.
11. Existing WIM system electronics in the SWEF building scale area.

After coordination with the NW Region Electrical Unit, the existing equipment shall be disconnected and transported off site to the NW region electrical facilities and/or to a recycling/garbage facility as directed by the engineer in the field.

Supply and install the following:

1. WIM quartz sensors, axle sensors, loops, WIM electronics and cabinets.
2. Lane directional signals including support structure (structure paid for separately) for the ramp system.
3. Weigh Station Changeable Message Signs (CMS) including support structures for the mainline sort system.
4. Overview image camera, License Plate Reading (LPR) system, Overheight Detector, Tire Anomaly system, and Automated USDOT Reading system including support structures at the mainline WIM location.
5. Overview image camera, License Plate Reading (LPR) system, Off-Scale detection including support structures at the ramp WIM location.
6. Thermal imaging inspection system and support structures on the static scale lane.
7. Camera at/viewing the rear of vehicles sitting on the static scale and support structure.
8. Tracking loops to activate lane directional signals and monitor traffic flow downstream of lane directional signals.
9. Weigh Station Variable Message Signs (VMS) including support structures (structure paid for separately).
10. LED OPEN/CLOSED signs (2) as specified in section 6.1.11 including support structures (structure paid for separately).
11. On-site Communication System.
12. WIM system software.
13. All conduit and wiring as required. Conduit shall be sized to accommodate additional future wiring.
14. Cellular modem for remote access of system.

Minimum power/communication requirements needed to run the system and its various components are the responsibility of the successful vendor. As a part of the contract, the department is paying for the coordination of power and communication to the various sites on the project and the successful contractor should be actively involved in this coordination to ensure their systems' minimum requirements will be met. The department will not pay for additional upgrades to the facilities after installation to the sites has been completed.

3. Submittals

Prior to manufacturer approval, the contractor and the engineer shall arrange the following:

1. The contractor shall furnish electronically collected accuracy performance data from a pre-existing system to the engineer. This data shall be in a common database and include WIM records (axle and gross) and static (platforms and gross) weights that have been electronically collected (manually entered data will not be accepted). This report shall contain at least 20,000 vehicle records.
2. The contractor shall furnish verification of the static scale system passing an 80,000 amperes lightning strike test.
3. List a minimum of five Weigh Stations and provide the owner's name, address, persons to contact and telephone numbers of similar enforcement installations in the United States.

At the pre-construction conference, the contractor shall furnish:

1. The engineer with written documentation and information of the WIM and static scales.
    a. Manufacturer's name.
    b. Model number, supported by descriptive material for, but not limited to, the standard package system.
    c. All accessories identified.
2. Submittals shall be supported by descriptive material such as:
    a. Catalogs
    b. Cuts
    c. Diagrams
    d. Other data published by the manufacturer, to demonstrate to the engineer the contractor's intent to comply with the technical special provisions and plan requirements.
3. List a minimum of five weigh stations and provide the owner's name, address, persons to contact and telephone numbers of similar enforcement installations in the United States.

The system manufacturer shall submit the following:

1. Equipment drawings
2. General arrangements
3. Foundation requirements for any roadside structures including camera reader and any other poles. In addition, foundation plans shall be submitted if modifications from the plan are required to Structures S-55-76 or S-55-77 based on the contractor’s selected materials. All foundations to be stamped by a PE licensed in Wisconsin.
4. Circuit diagrams
5. Field wiring diagrams
6. Instruction manuals
7. Bill of Materials
8. Spare parts list
9. Manufacturer’s product data
10. Certified test reports
11. Material certifications

The contractor shall submit the following equipment documentation for acceptance prior to fabrication:

1. Detailed description of how the System requirements are met, including a step-by-step description of how the System would function in processing each of the following violations as well as the compliant scenario.
    a. Overweight
    b. Off-scale
    c. Manual override of the system for truck selection either programmed or random.
    d. Compliant
    e. Over-length
    f. King Pin Violator
    g. Back parking lot/inspection traffic.
    h. Imbalance
        i. Side to side
        ii. Axle to axle within a tandem
2. Inductive loops, according to the contract documents.

The contractor shall submit six complete sets of full-size drawings. The contractor shall:

1. Design all roadside structures including camera reader and any other poles (not needed for Structures S-55-76 or S-55-77 unless modifications are required). All foundations to be stamped by a PE licensed in Wisconsin.
2. Submit shop drawings along with the supporting calculations to the engineer for review and approval.

3. Obtain a professional engineer registered in the State to document, sign and seal all structural drawings.

Two weeks prior to the Continuous Operating Test (COT), the contractor shall supply the following to the engineer for the maintenance of the system:

1. Narrative description of system operation in detail.
2. Narrative technical description of the following:
    a. Major system component interaction
    b. Subsystem component interaction
3. Drawings:
    a. Major system component operation/interconnection
    b. Internal Printed Circuit Board (PCB) operation detailing what electronic function and process is being performed on that board
4. Schematics shall reveal diagrams related to troubleshooting/maintenance including:
    a. Input and output voltage levels on WIM related PCBs
    b. Voltage test points at various stages on the WIM process
    c. Data sheets on any specialized proprietary Integrated Circuits (IC's) or boards in the system
    d. Jumper and switch settings on all PCB's for normal operation
    e. As-built drawings shall show type and location of all conduits, pull boxes, junction boxes, loops, traffic signs, directional signals and PA speakers
5. Technical documentation on all accessories used in the system (Open/Closed signs, directional signals, etc.).
6. Contractor shall provide names and phone numbers of contacts that user may contact for technical help.

Acceptance of bid or approval of shop drawings by the engineer does not relieve the contractor of the responsibility or the necessity of furnishing material and/or performing work as required by the plans and these provisions, nor from the requirements of the Continuous Operating Test (COT) as contained within these provisions.

The equipment approved by the engineer shall be provided and installed according to the plans and these provisions. Should the equipment proposed by the contractor become unavailable, the engineer may approve in writing alternate equipment proposed by the contractor due to the unavailability of the originally specified equipment.

4. Mainline & Ramp WIM Operational Overview

4.1 Mainline WIM System

Commercial vehicles approaching the Weigh Station shall be directed into the right-hand lane by means of static signing as provided by the Wisconsin Department of Transportation. A vehicle approaching the Weigh Station will pass over the Mainline Weigh-In-Motion (WIM) system, which is embedded (cast-in-place) in the highway prior to the Weigh Station exit ramp. The right lane will be equipped with WIM quartz sensors that meet or exceed ASTM E1318 Type III accuracy. WIM electronics will be located at the roadside adjacent to the WIM quartz sensors and shall process the information collected by the in-road equipment.

The WIM system will collect axle weight and spacing, vehicle speed, classification and other relevant data to create a vehicle record. An overview image of the passing vehicle will be included in the vehicle record along with both a USDOT and License Plate image. Using optical character recognition, the USDOT and license plate read will be included in the vehicle record. The license plate jurisdiction will be a part of the license plate read. The overheight detector and tire anomaly system results will be added to the vehicle record as well. The combination of USDOT, license plate number and license plate jurisdiction, vehicle height, and tire anomaly results will be checked against a local database on the Weigh Station computer for non-weight violations. Based on a comparison of the vehicle record to the parameters set by the station system, the WIM system will make a sort decision and advise the driver to either exit to or bypass the Weigh Station via the Mainline Sort System Changeable Message Signs (CMS) located on the side of the road. However, the actual sorting operation can be overridden by the operator using the virtual graphics display or override control in the Weigh Station. Non-violating vehicles may be randomly selected from the mainline for visual inspection at the scale house.

An AVI detection system will be provided separately to identify PrePass or Drivewyze vehicles but shall be integrated into the WIM check system. The Mainline WIM system will be such that a vehicle may be called in to report based on its PrePass or Drivewyze credential check, as well as its WIM weight check.

WIM quartz sensors in the eastbound left lane shall be installed to detect commercial vehicles bypassing the WIM quartz sensors in the right lane and not complying with signage.

The WIM quartz sensors installed in the westbound lanes of IH 39/90 shall be used for site data collection only as a part of the ATR system. The contractor shall furnish the following for the ATR system: Loop Detector and Piezo Conduit, Loop Detector Wire and Lead In Cable, Junction Box Fittings, PVC Conduit, Quartz Sensor PVC Conduit, Concrete Control Cabinet base, Maintenance Platform, and Pull Boxes according to the details shown in the plans.

The Open/Closed signs shall be able to be controlled by a physical switch on the Override Console.

The system should be able to collect continuous data on the vehicles entering the station for statistical analysis. The data collection system should save vehicle information in a compressed format complete with a date and time stamp. As a result, the information can be downloaded and, with the aid of commercially available software, the user will be able to generate reports based on user inputs. The stored data must be remotely accessible by cellular modem communications.

4.2 Mainline Sort System

Changeable Message Signs (CMS) shall be used to communicate with the driver after a mainline vehicle analysis has been completed. The Mainline Sort System (MSS) shall consist of two changeable message signs and inductive loops (as determined by the contractor), which are installed along the side of the roadway downstream from the advance WIM system. The MSS shall be controlled by electronics in an interface cabinet, which receives the sort decision from the Weigh Station Computer. The MSS ensures that the sign ON/OFF switching is synchronized according to the detection and tracking of a vehicle passing over strategically placed loops. In this way, only the vehicle for which the message is intended will see the illuminated sign.

The Virtual Graphics Display will provide manual control to the Weigh Station for the operation of the Changeable Message Signs.

The contractor will coordinate efforts with PrePass and Drivewyze to ensure that no conflict occurs within the signing sets, i.e., there shall be no contradictions between the roadside signs and the in-cab transponders.

Typical roadside sign messages are as follows:

Message 1: TRUCK MUST EXIT
TO WEIGH STATION

OR

Message 2: TRUCK BYPASS
WEIGH STATION

The components of the system shall provide heartbeat communications so the system’s health can be monitored.

4.3 Mainline Compliance System

A compliance system shall be located on both lanes of mainline IH 94 and the SWEF entrance ramp. The system shall consist of a set of WIM quartz sensors that meet or exceed ASTM E1318 Type II accuracy to track the commercial vehicles that bypass the Weigh Station. As commercial vehicles go over the compliance system, it shall continuously and automatically verify the trucks vehicle record from the roadway upstream. The verified vehicle shall be determined to be compliant or non-compliant.

All vehicle information, including violation information, will be determined in real time and shall be displayed on the scale house Vehicle Display Windows on the Weigh Station Computer.

The components of the system shall provide heartbeat communications so the system’s health can be monitored.

4.4 Enforcement Camera Systems

The enforcement camera system will consist of an overview image camera, license plate reader (LPR), and automated USDOT reader (AUR) mounted alongside the roadway on mainline IH 94. The overview camera system will capture an image of passing commercial vehicles to be linked with the vehicle record as an identifier. The camera will be capable of full color photos during daytime operation, and black-and-white near-infrared images during nighttime operation. The camera system electronics, which will be located with the other System Electronics, will store the image, and shall link it with the correct vehicle record.

The LPR system shall capture an image of the commercial vehicles license plate to be linked with the vehicle record. The camera will be capable of black-and-white near-infrared images during daytime and nighttime operation. The camera system electronics, which will be located with the other System Electronics, will store the image, and will link it with the correct vehicle record.

The AUR system shall capture an image of the commercial vehicles USDOT number to be linked with the vehicle record. The camera will be capable of black-and-white near-infrared images during daytime and nighttime operation. The camera system electronics, which shall be located with the other system electronics, shall store the image, and shall link it with the correct vehicle record.

4.5 Ramp WIM System

The accuracy of the Ramp WIM system shall meet or exceed ASTM E1318 Type III “Standard Specifications for Highway Weigh-in-Motion (WIM) Systems. Calibration and accuracy tests shall be performed as specified below. The contractor shall ensure the roadway meets the requirements of Section 6 of ASTM E1318.

The WIM system shall be provided with a roadside cabinet to house the WIM electronics. The WIM computer and its peripherals may optionally be installed inside the scale building.

As commercial vehicles enter the Weigh Station entrance ramp, the sorter system will continuously and automatically verify the trucks vehicle record from the mainline system. The WIM System will determine whether the vehicle is compliant. Violating Pre-Pass or Drivewyze vehicles from the mainline will be directed to report to the static scale via an in-cab transponder notification. All vehicle information, including violation information, will be determined in real time and shall be displayed on the scale house Vehicle Display Windows on the Weigh Station Computer.

The system will function under either manual or automatic control. Under automatic control, the compliance system will automatically direct a suspected violator to the static weigh scales and compliant violators to exit the station. The virtual graphics display will be used to control the system and will allow the operator to direct all vehicles to either the scale or bypass lanes. The WIM system will not be able to direct vehicles according to vehicle information collected in this mode (manual) but will continue to display vehicle information to the operator.

The system will have the ability to track the suspect violators while on route to the static scale.

The components of the system shall provide heartbeat communications so the system’s health can be monitored.

4.6 Mainline WIM Settings

Using the Weigh Station computer, the operator may set the sorting threshold and allow for random sorting. The sorting threshold determines at what percentage of legal weight a vehicle must be measured to be required to report. In this way, the operator may set the WIM to bring in the maximum number of trucks that the station can process, without exceeding the station capacity. Random sorting allows the operator to require a set percentage of compliant trucks to report. This allows the enforcement officials to perform random safety checks on otherwise compliant trucks.

The Weigh Station computer system will receive the WIM record from the roadside WIM electronics at the mainline location. The Weigh Station computer contains electronic records that will be used to ascertain weight compliance. After the Weigh Station computer creates the WIM record, it shall immediately begin to analyze the data contained in the record in order to determine whether the vehicle weights and dimensions are within local compliance regulations. If the measured vehicle weight is within the allowable limits, the driver will be given a bypass message through the Mainline Sort System. If the vehicle is not compliant or if it is randomly selected for inspection, the driver will receive a message to report to the Weigh Station.

The Weigh Station computer system will provide safety features to detect and prevent backups and unsafe conditions. These will include:

1. An audible message to alert operators of a backup at the ramp WIM scale.
2. Automatically close the station in a direction if a backup occurs on the entrance ramp from IH 94. An audible message will sound to alert operators. Once the backup has cleared the station will automatically reopen.
3. Automatically sort all vehicles including violators to the bypass lane on static scale lane back up.

Operators will have the capability to override the automatic close and automatic sort to bypass on static lane back up feature on the Override Console.

4.7 Data Collection System

Vehicle information is to be collected continuously by the roadside Mainline WIM electronics for all lanes. This information shall be made available to the user and a variety of reports summarizing the data can be generated. This data can be shared between departments if the agency responsible for weight enforcement is separate from the roadway maintenance, planning and/or design departments.

4.7.1 Capabilities

An operator at the site may download the vehicle data directly from the roadside WIM System Electronics, or the data may be transferred to a remote location via access thorough a cellular modem.

Manufacturer host software can be used to automatically call one or several WIM systems to obtain traffic data from the site. The user configures the frequency of the calls and the information to be obtained. Once the data has been obtained, office analysis software capable of computing various classification schemes shall be used to provide various report capabilities based on the data collected. This system shall store at least 60 days of vehicle records (over 2 million vehicle records) in a compressed format.

4.7.2 Information Available

The following information shall be made available from the data collection feature of the Mainline and Ramp WIM systems:

- Reports over any selected time period in hourly increments, daily, weekly, or monthly.
- Summary of vehicle speeds.
- Summary of vehicle classification counts.
- Equivalent Single Axle Load (ESAL) count.
- Reports on the number of violating and non-violating axles, axle groups and gross vehicle weights.
- User selected reports based on adjustable parameters such as periods and vehicle types.
- Customization for generating reports for specific needs that are not available using basic parameters.

5. WIM System Functional Requirements

5.1 Mainline

5.1.1 WIM Sensors

The WIM sensors comprising the mainline WIM location shall be of two varieties: WIM quartz sensors (right/weighing lane) and axle sensors (left lane). The accuracy of the WIM quartz sensors (and thus the WIM system) shall meet or exceed ASTM E1318 “Standard Specifications for Highway Weigh-in-Motion (WIM) Systems performance requirements for a Type III system. The WIM accuracy on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be:

1. Single axle weights + 15% (95% of trucks)
2. Tandem weights + 10% (95% of trucks)
3. Gross weights + 6% (95% of trucks)
4. Axle spacing + 6 inches or 5% (68% of axles), whichever is greater

Blanket grind the existing concrete pavement in the mainline drive lane beginning 200 feet prior to the WIM scale location and ending 100 feet after the WIM scale location, for a total of 300 feet, with a minimum 36 inch blanket grinder to ensure that the roadway meets the requirements of Section 6 of ASTM E1318 prior to installation of the WIM system.

The WIM quartz sensors shall have the following characteristics:

- Quartz sensors shall be capable of accurately measuring gross vehicle weight, wheel load, axle load, axle group load, speed, and axle spacing when traveling at speeds of 5 to 75 mph.
- The quartz sensors shall be capable of being reground up to 0.4 inch with no loss of functionality in the event of roadway deformations and move resulting in a quartz sensor unit protruding above the surrounding pavement surface.
- The quartz sensors shall have uniform and consistent sensitivity without experiencing any signal drift or phantom axles.
- Shall operate without degradation in ambient air temperature ranges of -20°F to +120°F and in relative humidity ranging from 10% to 95% non-condensing.
- Quartz sensor performance shall be insensitive to temperature changes (i.e., less than 1% for a temperature range of 90°F). Sensing element shall be encapsulated in an aluminum die cast housing providing a vibration proof, frost-resistant, and watertight carrier unit prior to shipment.
- Be capable of being installed directly into a cut out channel in the roadway pavement using a manufacturer recommended epoxy material that encapsulates each quartz sensor unit.
- The height of the quartz sensor shall not exceed 44mm to minimize pavement depth cut in roadway.

The contractor shall deploy a minimum of four quartz sensors per lane on the mainline.

Axles sensors shall meet or exceed ASTM E1318 “Standard Specifications for Highway Weigh-in-Motion (WIM) Systems performance requirements for a Type II system.

5.1.2 Detector Loops

Each detector loop shall have a minimum loop area of 6-foot x 6-foot. Detector loops shall conform to WisDOT standard specifications.

Loop wire shall be 1 conductor, 14 AWG, IMSA 51-5. Loop leads shall be 2 conductor, 14 gauge, IMSA 50-2 cable.

Loops shall not be cut directly into the existing roadway and loop sawcuts will not be exposed to the roadway surface. In situations where the roadway is PCC and is not continuously reinforced, the appropriate PCC section of roadway will be removed, loops will be installed, and the appropriate PCC section will be replaced.

Detector loops shall be provided in order to control signals and for the system to operate as described in these special provisions. Loop detectors shall be installed in the WIM system electronics of the mainline WIM and ramp WIM systems. The mainline WIM and ramp WIM systems shall use the signals from these detector loops to switch the message of signs and signals throughout the system and to track vehicles. CMS signs shall be switched in a tracking sequence to direct a sorted vehicle to enter the Weigh Station.

5.1.3 Compliance System

The compliance system may consist of vehicle detection loops and WIM quartz sensors in the following configuration:

"loop – right WIM quartz sensor – left WIM quartz sensor"

The compliance system shall monitor vehicles signaled to bypass or report the Weigh Station. It will be interfaced to the Weigh Station Computer.

An audible alarm shall be sounded on the Virtual graphics display in the event that a commercial vehicle does not take the lane as directed by the Mainline Sort System or Lane Control Signals.

5.1.4 WIM Electronics

The system electronics shall be capable of receiving and analyzing the data gathered from the Mainline and Mainline WIM and Compliance System locations. The electronics shall also be responsible for communicating and transmitting vehicle weight data from the WIM site to the Weigh Station Computer in the SWEF building.

The system electronics shall be capable of receiving inputs from the WIM quartz sensors and loops, as well as serial and digital devices. Output control options shall be included for a variety of serial, digital and AC power devices, such as CMS, and LCS.

The system shall be compatible with automatic vehicle identification (AVI) equipment, as specified by PrePass or Drivewyze, including communications ports and software.

All quartz sensor modules shall be field replaceable, and every module shall feature self-testing and built-in fault diagnosis.

The Mainline WIM system shall be provided with a roadside cabinet to house the System Electronics and the overview image freeze frame camera equipment, the LPR equipment, the AUR equipment, the overheight equipment, the tire anomaly equipment, and other system peripherals. The Ramp WIM cabinet will have System Electronics, as well as the other system peripherals for the location. The electronics for the AVI reader located on the Mainline WIM section shall be supplied by PrePass and Drivewyze.

The roadside cabinets shall be lined and insulated and shall be installed with a fan and heater. All cutouts and openings shall be vermin proofed.

All wires from quartz sensors, off-scale sensors, loops, sign control lines, shall be terminated on terminal strips or screw terminal connectors. The terminal strips shall be identified by terminal strip number and screw connection number. These terminal strips shall be readily accessible. All cables shall be long enough to easily reach these terminal strips. Terminal strips, splices, or other type of connections prior to these standard terminal strips shall not be allowed except for splicing of a loop to a shielded twisted loop lead.

All AC power connections shall be shielded to prevent electrical shock.

The System Electronics shall abide by the following requirements:

1. Communications
    a. On-board Ethernet interface (wireless or fiber).
    b. One RS-232 serial interface dedicated to external interface.
    c. Local user interface for system configuration and fault diagnosis.
    d. Remote administration via Telnet or Windows remote desktop.
    e. Remote file download via FTP.
2. Peripherals
    a. Non-volatile storage for vehicle information to prevent data loss during power outages.
    b. Sensor inputs from WIM Scale, loops and Piezos.
    c. Output control for CMS and LCS.
3. Software
    a. Records data logs on operational status, condition and safety system activity.
    b. Weight Compliance and Classification with user-defined classification scheme.
    c. Automated Mainline and Ramp Weigh Stations.
    d. Data Analysis and Reporting.
4. Digital I/O Module
    a. Report on rising edge, falling edge or both.
    b. Adjustable input debounce.
    c. Control output state, single pulse, or square wave.
    d. Adjustable timeout on inputs.

5.1.5 Overview Camera System

The Overview Camera System shall consist of the following system components:

1. Color and Black/White video camera
2. Illuminator system
3. Video capture system

The video system shall monitor traffic flow on the mainline. It shall capture still images of trucks having violations for identification and enforcement purposes. The images shall be displayed on an operator interface located in the scale house. Each vehicle record number shall be displayed with the vehicle image.

One camera shall be provided and installed on a pole located near the Mainline WIM location. The camera shall provide overview images of the passing commercial vehicles, detailing their cab and side. Color images shall be provided for daylight use, and black/white images shall be provided for night use.

The overview capture system shall be located in one of the System Electronics. The overview capture system shall provide control and display facility to display image outputs from one source to one monitor.

The camera poles and bases shall conform to the requirements of standard spec 657.

5.1.6 LPR System

The LPR system shall be capable of collecting, storing, and transmitting all commercial vehicle license plate images and OCR data to the Weigh Station Computer for configurable periods. The OCR read accuracy on license plates shall meet 77% of readable plates including jurisdiction including at night.

5.1.7 Automatic USDOT Reading System

The AUR system shall be capable of collecting, storing, and transmitting all commercial USDOT and OCR data to the Weigh Station Computer for configurable periods. The OCR read accuracy on license plates shall meet 77% of readable numbers.

5.1.8 Overheight Detection System

An overheight vehicle detection system shall be installed at the Ramp WIM system location. The overheight system shall be designed such that an alarm will sound for objects that are at least 2 inches in diameter and 1 inch above the line of detection. The over height detection system shall have the ability to monitor the system's health from the Weigh Station Computer.

5.1.9 Local Credential Database

The system manufacturer will provide a local database that can hold PRISM and CVIEW data to be used to query LPR and DOT reads against. The State will assist in getting the system manufacturer setup with FMCSA to receive PRISM and CVIEW data files. The system manufacturer will be responsible for connecting, downloading, and updating the database on a daily basis.

For assistance in accessing CVIEW and PRISM data, contact:

Christopher Smith (State Patrol)
608-846-8525 (Office)
608-516-0064 (Cell)
christopher.smith@dot.wi.gov

Carolyn Hunt
(608) 266-8568

5.1.10 Mainline Sort System Changeable Message Signs (CMS)

The Mainline Sort System shall consist of the following system components:

1. x Changeable Message Signs (CMS)
2. Detector loops (as determined by the contractor) to track vehicle compliance.

The CMS shall direct vehicles to enter the Weigh Station or bypass the Weigh Station, based on the results of the mainline sort decision.

The Mainline Sort System shall consist of two CMSs that are sequentially switched by the Mainline WIM system. The CMS, under control of the Mainline WIM system, shall synchronize the sign switching upon detection of the tracked vehicle passing over or through strategically located detector loops.

The CMS, under control of the Mainline WIM system, shall also be consistent with the PrePass or Drivewyze notification signal to the PrePass or Drivewyze in-cab transponder. The WIM System, upon notification from PrePass or Drivewyze, shall blank all CMS such that all messages regarding truck compliance and reporting instructions are decided by PrePass or Drivewyze and communicated via transponder.

Each CMS shall be capable of displaying the following two messages:

Message 1:

TRUCK MUST EXIT

TO WEIGH STATION

OR

Message 2:

TRUCK OK TO BYPASS

WEIGH STATION

Each CMS shall have the following characteristics:

- All letters shall be 10-inch series E formed by single rows of LED pixels.
- Dimming option with photocell shall be provided.
- 120 VAC shall be required for activation of messages.
- ½-inch aluminum angle shall be provided top and bottom for mounting.
- Exterior of sign housings shall be wet painted, semi-gloss black enamel.
- Communication with the CMS signs shall have feedback communication to the scale house as to whether the signs are functioning properly.

The CMS shall be mounted on breakaway steel sign supports conforming to the requirements of standard spec 531 and standard spec 635. Concrete bases along the mainline shall be a minimum of 34 feet from the edge of travel lane and flush with the surrounding ground.

The messages must be clear and legible under any lighting conditions. When not energized, the sign shall completely blank out without any ghost images.

Furnish, install, and make operational LED OPEN/CLOSED CMS inserts on WEIGH STATION signs.

5.1.11 Tire Anomaly System

The tire anomaly system shall be capable of screening commercial vehicles to identify missing, underinflated, or mismatched tires. The results of the screening shall be incorporated into the sort decision for the Mainline WIM system. Vehicles identified with a potential tire issue shall be directed to enter the Weigh Station. The tire anomaly system shall have the ability to monitor the system's health from the Weigh Station Computer.

5.2 Compliance/Ramp Area

5.2.1 WIM Quartz Sensors

The WIM quartz sensors in the compliance area shall be the same as the Mainline WIM quartz sensors and meet the requirements specified in section 5.1.1. The contractor shall deploy a minimum of four quartz sensors in the ramp lane.

5.2.2 Detector Loops

Each detector loop shall meet the requirements specified in section 5.1.2.

For each VMS/CMS there shall be a detector loop. Loop detectors shall be provided for interface to these detector loops.

The Ramp system shall use signals from these loops to switch the lane directional signals and the CMS located downstream of the Static Scale.

5.2.3 Electronics

The Compliance System Interface Electronics shall be located next to the weigh in motion scales in a roadside cabinet. The weigh in motion electronics will be responsible for retrieving truck data and communicating it to the Weigh Station Computer in the scale house.

The electronics should include interfaces to the following components:

1. Weigh-in-Motion quartz sensors
2. Loops
3. Off-scale detectors
4. Operator display
5. Lane directional signals
6. Weigh Station Computer system

The electronic system must be of a modular design to aid in system maintenance, troubleshooting and in-field servicing.

All components of the electronic system, including inductive loop detectors, shall contain necessary electrical protection to prevent damage from electrical surges, spikes and the effects of lightning.

The system must be of a durable, industrial design and construction and enable continuous operation, with automated startup in the event of a power outage.

All quartz sensor and ancillary equipment connections must be conveniently located on the system front panel. All connections, where possible, should be a plug-in, quick-connect style.

Where possible, all printed circuit boards and components should be of a commercially available design. This includes but is not limited to, the system central processing unit (motherboard) and CPU related interfaces such as digital input/output interfaces.

The specifications for the Compliance system electronics are to follow the minimum specifications as set out for the Mainline WIM Electronics.

All cutouts and openings in the electronics housing cabinet shall be vermin proofed.

All wires from scales, off-scale sensors, axle sensors, loops, sign control lines, shall be terminated on terminal strips or screw terminal connections. The terminal strips shall be identified by terminal strip number and screw connection number. These terminal strips shall be readily accessible. All cables shall be long enough to easily reach these terminal strips. Terminal strips, splices, or other type of connections prior to these standard terminal strips shall not be allowed except for splicing of a loop to a shielded twisted loop lead. All AC power connections shall be shielded to prevent electrical shock.

5.2.4 Ramp Lane Control System (LCS)

A Ramp Lane Control System (LCS) shall be located on the ramps prior to the sorting point.

The LCS shall consist of the following components:

- Two Directional Signals, with Red “X” and Green “ARROW” ↓ graphics.
- The directional signals will be two sided so they can be viewed from the building and be a minimum of 18” x 18”.
- Support structure and base (S-55-76) to suspend the signals above the lanes of travel.
- A pole and base will provide support for signals.

The support structure and base (S-55-76) have been designed to meet department structural requirements based on material selections from previous contractors. If the provided materials differ from what is shown in the plans, revised plans shall be submitted by a licensed PE in Wisconsin.

The left sign will display a green arrow ↓ to an oncoming truck if it is cleared to bypass the static scale; otherwise it will display a red X as a signal to report to the static scale. Conversely, an oncoming truck will receive a red X to bypass or a green arrow ↓ to report for the scale lane on the right sign.

The Virtual Graphics Display shall provide manual control to the Weigh Station for the operation of the Lane Control Sign.

5.2.5 Variable Message Signs (VMS)

Two variable message signs shall be located downstream of the static scale and mounted on S-55-77. All VMSs shall be constructed using the same technology.

The VMS mounted over the right (scale) lane shall have the following message options:

Message 1:

PULL ONTO

SCALE - in yellow with animation

Message 2:

PULL FORWARD

SLOWLY – in yellow

This message will be displayed until the truck hits the point on the static scale where it needs to be stopped to be properly positioned.

Message 3:

STOP – in red with animation

This message will be displayed to automatically stop the truck on the static scale for proper weighing

Message 4:

STOP – in red, static

Message 5:

BACK UP

SLOWLY – in yellow

Message 6:

OK

GO AHEAD – in green

Message 7:

PARK IN LOT – in green

Message 8:

PULL INTO

BAY 1 – in green

Message 9:

PULL INTO

BAY 2 – in green

Other messages as determined by the scale operator.

The VMS mounted over the left (bypass) lane shall have the following message options:

Message 1:

STOP – in red

Message 2:

OK GO AHEAD – in green

Message 3:

SLOW DOWN - in yellow with animation

Message 4:

25 MPH - in yellow

The system shall have the capability to create or edit messages. A message shall be displayed for every commercial vehicle.

Each message character shall be at least 5.5 inches high. The sign shall have a viewing angle of minimum of 90 degrees horizontally, and minimum of 40 degrees vertically. Messages shall be programmable via computer in the scale house and be:

1. Password protected.
2. A message shall not exceed two lines of 16 characters per line.
3. Shall store minimum 20 messages.
4. Allow for active messages.
5. Active messages shall be controllable via static scale program, static scale mouse, keyboard, or graphics panel.

Each sign shall have color capacity of 256 or more colors. Each sign shall have 3 LEDs per pixel (1 red, 1 green, 1 blue). Each sign shall have an estimated life of 100,000 hours plus. Each sign shall have front access.

Each sign shall be capable of displaying text, graphics, logos, basic animation, multiple font styles and sizes.

VMS signs shall be powered by 120/240 VAC single phase.

VMS signs shall be capable of communicating via RS232, RS422, modem, serial fiber, or Ethernet fiber.

VMS sign shall have 64 levels of display dimming (automatic or manual control).

The VMS shall be mounted on a breakaway steel sign support which meets crash requirements as set forth by NCHRP 350 and approved by an engineer licensed in the state of Wisconsin. Concrete bases shall be flush with the surrounding ground.

The messages must be clear and legible under any lighting conditions. When not energized, the sign shall completely blank out without any ghost images.

5.2.6 Thermal Imaging System

The thermal imaging system shall be integrated into the primary operating system and capable of capturing thermal images of all wheel sets of each axle (left and right). The system shall automatically identify anomalies such as wheel bearing failures, loose wheels, flat tires, and inoperative or hot brakes. The results should be linked to the vehicle record and displayed on the same monitor by the time the vehicle is on the static scale. This display will indicate what the anomalies are so the operator can determine if further inspection is necessary due to faulty equipment. 90% of the displayed images must be legible to the operator for vehicles operating within the Contractors preferred speed range and during good weather conditions identified by the Contractor and agreed to by the state. A potential location (along with roadside protection) for the system is shown on the plans based on previous projects. It is the Contractors responsibility to locate the system on the site in a location that works for their system. All components of the system must be protected from being damaged due to external factors (such as snowplows during the winter months). The thermal imaging system shall have the ability to monitor the system's health from the Weigh Station Computer.

5.3 Scale House

5.3.1 Weigh Station System Operational Overview

The Weigh Station system shall be located in the scale house and will collect data from the Mainline and Compliance WIM electronics and static scale, for central monitoring and control of the facility operation. The system shall provide two operator displays at the scale house. The operator can monitor vehicle movements, view and print reports and adjust system parameters, i.e., alter message signs, adjust random sorting %, adjust overweight %, etc.

The Weigh Station System will be made up of the following components:

- Vehicle Display Window (displays will vary by manufacturer)
- A Virtual Graphics Display
- An Override Console
- A Weigh Station Computer
- Static Scale Manager

5.3.2 Vehicle Display Windows

The Vehicle Display Window shall display:

- sequence number
- time and date
- class
- speed
- gross vehicle weight
- lane-time and date
- direction of travel
- OCR read of the vehicles license plate and jurisdiction
- OCR read of the vehicles USDOT number
- violations highlighted in red
- right and left weights per axle with violations highlighted in red
- individual axle weights with violations highlighted in red
- individual, front bridge, rear bridge, and full vehicle spacing
- tandem weights as measured by the WIM electronics with violations highlighted in red
- front and rear bridge weights as measured by the WIM electronics with violations highlighted in red
- alerts from the tire anomaly system
- images from thermal imaging system
- thumbnail image of the vehicle from the overview camera
- thumbnail image of the USDOT number
- thumbnail image of the vehicle license plate

A vehicle record shall be displayable in either graphic form or in text form. Another alternate shall be a tabular view of all records in the queue.

The length from axle to axle shall be shown on a linear scale with axle spacings plotted below the scale line. Red text for an axle shall indicate the location of an overweight axle or axle group.

The display of vehicle record must show the following violation information in addition to dimension and weight violations:

1. Off-scale – The off-scale detector was triggered during the weighing operation.
2. Vehicle speeding
3. Overheight
4. Credential
5. Tire anomaly
6. Thermal image warnings

The vehicle display windows shall allow the following options at any time without going to alternate screens or menus:

1. Freeze vehicle record.
2. Print vehicle record.
3. Double click on the overview thumbnail image to see a larger view.

Each vehicle record shall contain a digital image of all vehicles and shall be similar to the following acceptable examples:

747 15:21:51 Class:9 Speed:36 Gross:81400 Plate:2VG154 ST:OK USDOT:1202
AxleOverWt BridgeOverWt TndmOverWt GrossOverWt Credential

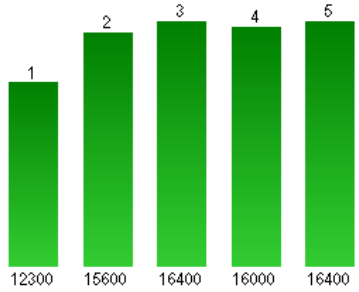
```
1.................2...3.................................4...5
|------17.5-------|4.3|---------------35.1---------------|4.0|
|---------21.8--------|                                    |
|                   |--------------------43.4--------------------|
|-----------------------------60.9-----------------------------|
```

Axle	1	2	3	4	5
RGHT	5700	8200	8400	7600	10100
LEFT	6100	7800	8300	9000	10200
TOTL	11800	16000	16700	16600	20300
Tndm:		32700		36900	

InBr: 1-3 44500 2-5 69600

740 15:16:56 Class:9 Speed:38 Gross:76700 Plate:AO14978 ST:MS USDOT:237655
Credential

```
1.................2...3.............................4.........5
|-------19.0-------|4.3|------------29.8-------------|--10.0---|
|----------23.3--------|                              |---10.0--|
|                   |--------------34.1---------------|         |
|-------------------------------63.1-------------------------------|
```

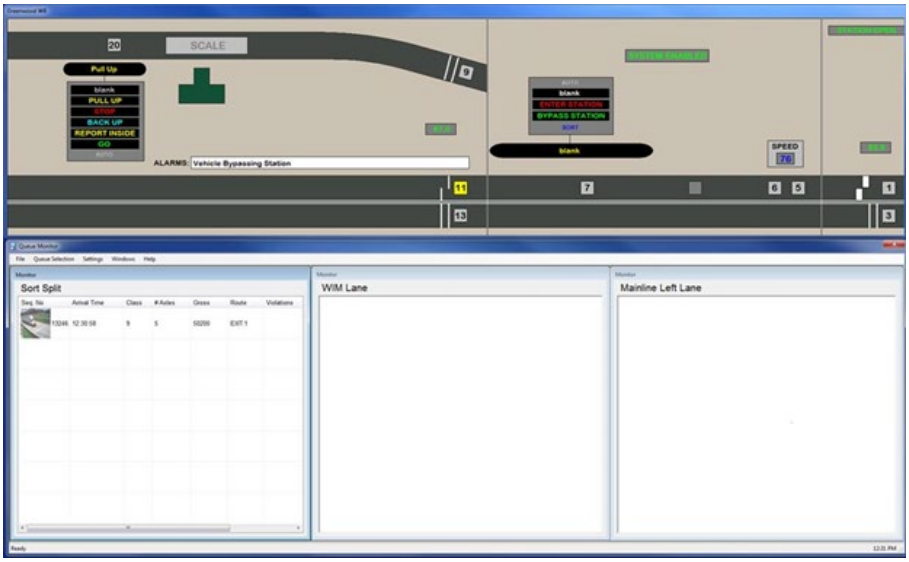


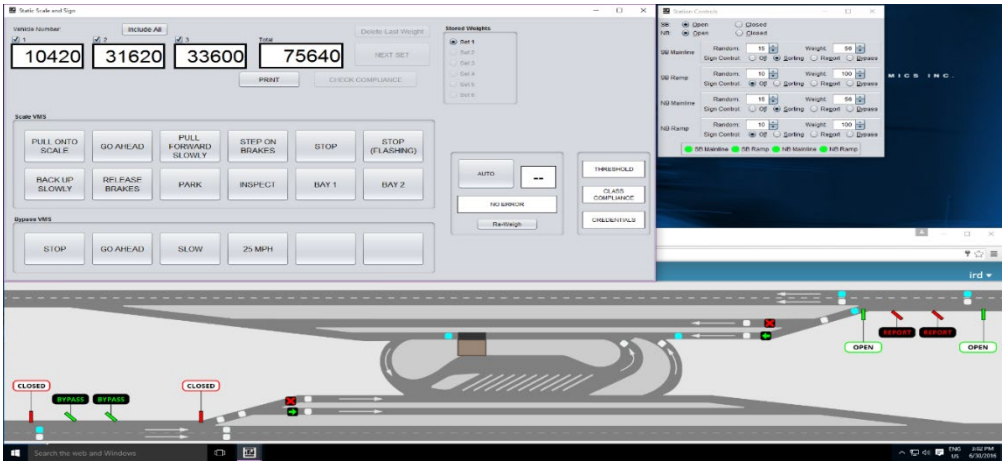
5.3.3 Virtual Graphics Display

The Virtual Graphics Display shall provide software representing the overhead layout of the Weigh Station on the Weigh Station Computer to provide control and monitoring of the Weigh Station. The Station Console shall provide the ability for an operator in the Weigh Station to select the control operation of each the Mainline Sort System CMS and Ramp LCS manually. The graphics display shall have visual indicators to identify the mode of control of each system signs and signals. In addition, vehicle movement information will be displayed using indicators on the graphical panel. It shall provide the following functions:

1. Select automatic sort control of each LCS system or the manual control of the LCS by the operator.
2. In manual control of the Mainline CMS by an operator, it can be set for all vehicles to enter the weight station or to bypass.
3. In manual control of the Ramp LCS by an operator, it can be set for all vehicles to come the static scale or the bypass lane.
4. Real-Time monitoring of the station operation by showing indicators when the appropriate sensors are activated and deactivated including loops.
5. Graphics representing the color and status of the directional signals. The graphics will continuously display the status of the mainline message signs, overhead signals, OPEN/CLOSED signs, static scale message sign, and bypass lane message sign.
6. Select automatic sort control of the bypass and static scale lane VMS's or manual control by the operator.
7. Manual selection of the bypass and static scale lane VMS messages.
8. The Weigh Station system must provide an audible warning for the following conditions:
    a. WIM scale backup.
    b. Weigh Station violator.
    c. Violator in the bypass lane.
    d. Weigh Station automatically closing because ramp is backed up.
    e. Weigh Station is automatically reopening because ramp has cleared.
    f. Vehicle waiting on the static scale.
9. Include a 24-inch (minimum) flat panel monitor with speakers and shall interface with the Weigh Station Computer. This monitor shall be one of the two monitors located at the Weigh Station Computer.
10. Provide a graphical representation of the weigh station layout with symbols to indicate the function of vehicle tracking devices.
11. Allow for a true manual control of all signs.

The Virtual Graphics Display shall be similar to the following acceptable examples with the layout matching site conditions:

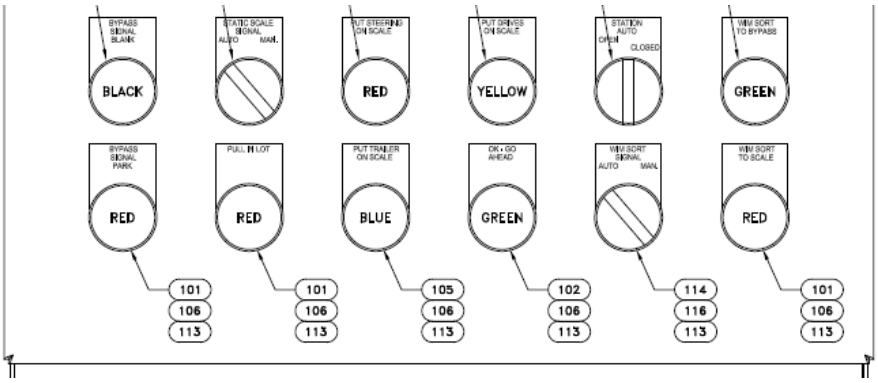




5.3.4 Manual Override Console

A Manual Override Console shall be provided as an interface that allows the operator to override the Mainline and Compliance Systems in order to gain control of various system components. The console will include control of the OPEN/CLOSED signs. The console will also include the ability to control the static scale message sign and turn the scoreboards on/off.

The override console will provide the ability for the operator to manually override all signals and signs. It will be a minimum of 24” long and 10” wide with large push buttons and switches to allow officers to quickly locate and change signal controls when override is required. The Override Console must be operationally independent of the weigh-in-motion interface electronics, the Virtual Graphics Panel, and the Weigh Station Computer to control all signs and signals. The override console shall remain operational even if the Weigh Station Computer is not functioning. The Manual Override Console shall be similar to the following acceptable examples:



5.4 Weigh Station Computer

The Weigh Station Computer shall:

1. Be an Intel microprocessor-based computer with the Microsoft Windows 8.1 or 10 operating system.
2. Have the following minimum features and configuration:
    a. Most current pc standards for memory, hard drive, and other hardware
    b. Two 24-inch flat screen color monitors with non-glare screen
    c. Keyboard
    d. Mouse
    e. System utilities and diagnostic software
    f. Surge protection
    g. System password protected lock for user access restriction
    h. All access ports, cables, and accessories to provide a working computer.

The Weigh Station Computer shall provide the following functions:

1. Perform mainline and ramp sort operations.
2. Weigh all vehicles travelling in the right lane.
3. Classify all vehicles travelling on all instrumented lanes of the highway with WIM quartz sensors.
4. Perform weight compliance analysis on vehicles according to department regulations.
5. Monitor safety conditions of the facility these include:
    a. A WIM scale back up
    b. Ramp back up
    c. Static scale lane back up
6. Perform sorter operation according to decisions based on weight compliance analysis, other violations (speeding, improper maneuver, sudden speed change, etc.), Virtual Graphics panel Override console selection, safety conditions, and operator selected action.
7. Insert sequence numbers for vehicle records for tracking purposes.
8. Display of vehicle record in multiple queue windows.
9. Track vehicle movement in the execution of sorter operation.
10. Control message display of the CMS/LCS to synchronize with the movement of a vehicle being tracked.
11. Provide vehicle records for those that have been sorted to or come to the static scale.
12. Automatically position each vehicle on the static scale using the static scale VMS sign.
13. Provide real time display and control of the static scale.
14. Allow operators to automatically sequence vehicles across the static scale or manually weigh by accumulating axles.
15. Automatically determine and provide operators feedback based on whether a vehicle is actually overweight based on axle spacings, axle, axle group, gross, and front/rear bridge weights based on Wisconsin regulations.
16. Automatically or manually release vehicles that are not overweight based on Wisconsin regulations and do not have other violations.
17. Allow operators to print weight tickets.
18. Provide audible message alarms to alert operators of conditions that may require their attention.

19. Provide reports on system operation.
20. Perform data collection, data storage (6 months minimum), file management, and report generation functions for collected vehicle information.
21. Allow adjustment of WIM and system settings.

The Weigh Station system shall have application programs to detect prolonged power failure conditions to initiate orderly shutdown operation.

5.5 Scale Manager

The Scale Manager will be software located on the Weigh Station Computer and facilitate processing vehicles that are sorted or volunteer to come to the static scale. As officers primarily focus on vehicles that are potential violators this will be the main screen that they work with. The screen will also give the operator the ability to control system settings and view and run reports. It shall provide the following functions:

1. Interface with the static scale indicator and WIM systems.
2. Display and accumulate static scale weights and display WIM data for the vehicle that is positioned on the static scale.
3. Provide adjustable thresholds to each axle platform, tandem, font bridge, rear bridge and gross weight based on Wisconsin regulations for axle spacing and weight.
4. Automatically check weights to thresholds and release vehicle if in auto mode or alert operator of violation with audio and visual alerts.
5. Automatically or manually allow operators to control the static scale sign with buttons matching the sign messages.
6. Provide the following features within the display:
    a. Selectable auto release
    b. Display hour and daily counts
    c. Violations displayed in red
    d. Zero scale
    e. Reset scale
7. Print requirements include:
    a. Site identification
    b. License plate
    c. USDOT number
    d. Individual weights (axles and axle groups)
    e. Gross weight
    f. Time and date
    g. WIM axle spacing
    h. Thumbnail image of vehicle
8. Shall continuously show updated static scale counts for each hour for the day.
9. Utilities
    a. View individual live raw counts for static scale load cells.
    b. Allow remote diagnostics access.

If a vehicle is not positioned properly or is a weight violator the operator shall be notified by visual and audio alarms and the vehicle will not be auto-released when in auto-sequencing mode.

To eliminate costly ramp calibrations, the Weigh Station System shall electronically interface with the Mainline WIM system for auto-calibration. On a continuous basis the Weigh Station System shall ensure WIM accuracy and calibration.

Calibration of the mainline WIM shall be automatic and performed by electronic recording of WIM and static weights on 50 vehicles from the vehicle stream which are loaded to within 75% of the legal allowable limit. Auto-calibration will be done with different factors for speed range and vehicle class to provide more accurate results. The settings shall allow for a minimum of 10 different speed ranges and 13 different classes to be used.

Acceptance testing shall confirm the WIM accuracy performance which shall be verified in a report. This report shall be created by continuous (24/7) electronic recording of vehicles from the vehicle stream. The actual stable static weights and WIM weights shall be saved in a common database to determine WIM scale accuracy compliance, as opposed to the method described in ASTM E1318. This information is to be easily accessible to state personnel in reports and shall be printed on a weekly basis throughout the continuous operating test and in everyday use of the Weigh Station afterwards.

The accuracy requirements required under the WIM scale section above exceeding ASTM E1318 for a Type III WIM shall be met.

All reports will be available from the Scale Manager for one central place to view reports. The following reports shall be available:

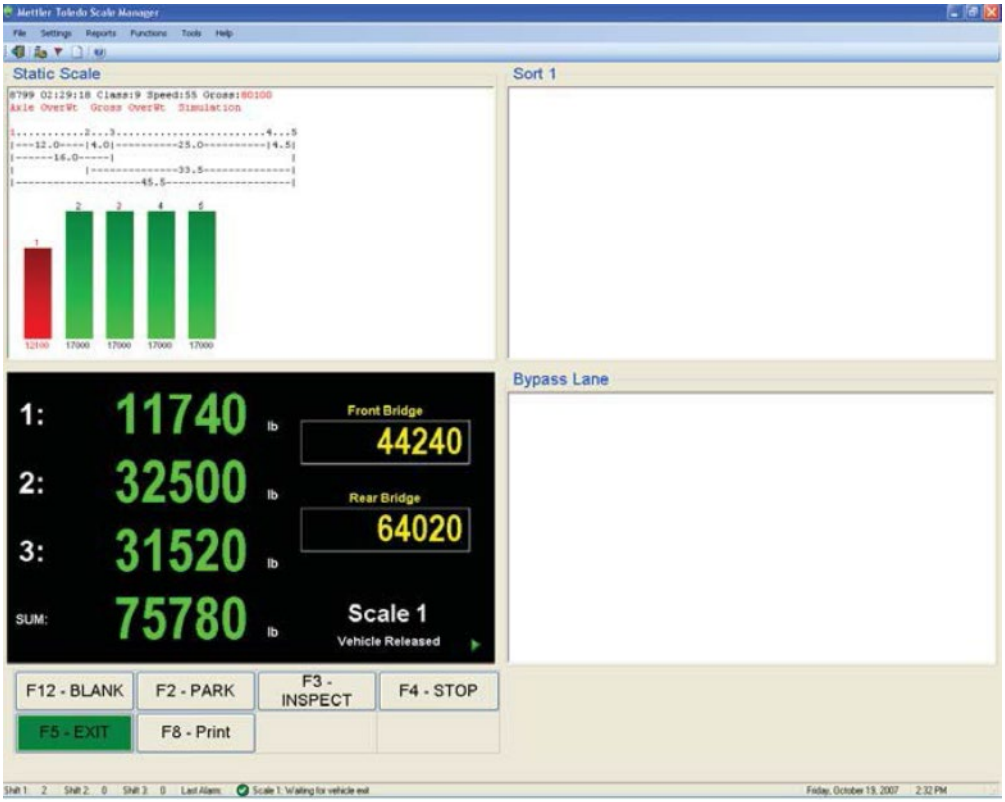
1. Number of vehicles per lane across the WIM by class, hour, and day for a selected period.
2. Number of trucks per lane across the WIM by hour and day for a selected period.
3. Axle and GVW weights by class for a selected period.
4. Number of vehicles per lane by weights, class, and hour for a selected period.
5. Number of vehicles across the static scale by class, hour, and day for a selected period.
6. WIM accuracy performance by class for a selected period.

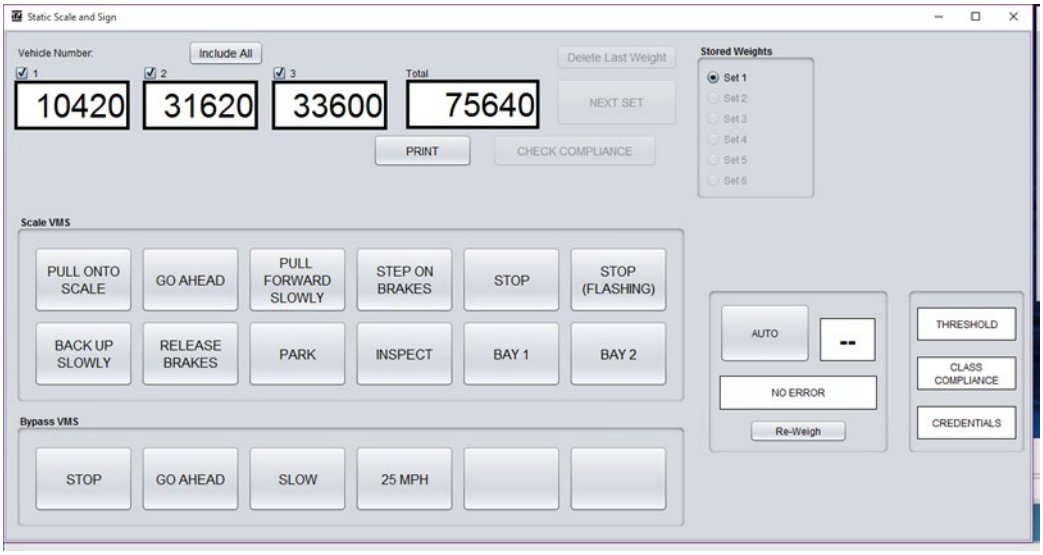
A selected period for report generation shall include starting date and ending date. Reports shall be generated manually by operator action. Reports shall have an option to display a chart view, and to be exported into Microsoft Office compatible formats.

The Static Scale Manager shall have utility programs do the following:

1. Set up and configure the operation of the Mainline WIM system.
2. Set up and configure the operation of the Mainline Sort System.
3. Initiate and reset traffic counting operation of the WIM System.
4. Perform maintenance functions of the Weigh Station systems.

The Static Scale Manager shall be similar to the following acceptable examples:





6. Conduit and Pull Boxes

All cables shall be in conduit unless specifically approved by the engineer. All conduit and pull boxes shall conform to the requirements of Chapters 652 and 653 of the standard specifications.

All materials shall comply with the "National Electrical Code" and the current standard specifications, "Highway Division Standard Drawings for design and Construction", and special requirements by State weigh in motion and automatic vehicle identification system specifications. Duct seal shall be used to seal all conduits in the cabinets and in all junction boxes. All conduits shall have a polyethylene pull string with at least 210-pound break strength left in place at completion of construction.

Separate conduits shall be used for AC/DC power and low voltage signal cables. Low voltage signal cables shall include video, digital communication, sensor signal cable, and sensor excitation cables where voltage is under +/- 20 volts DC. Conduits for video and RF cables shall be of a large enough size to accommodate the maximum bend radius using factory 90-degree “bends”. Conduits shall be sized to accommodate additional future wiring.

All cables shall be in conduits unless specifically approved by the engineer.

Tracer wire shall be run along all conduit from structure to structure. Wire shall be taped to each length of conduit at a minimum of two points. A maximum of one splice will be allowed between each pull box. Use detectable warning tape over all piping.

Install detectable warning tape into pullbox by drilling and sealing tape 300mm (12”) from top of structure into sidewall. Install detectable warning tape to be accessible at cover of clean-out if the conduit does not terminate at a pullbox. Test tracer wire for connectivity after backfilling.

Tracer wire shall be solid 14 gage, 600 volt, type TW

7. System Acceptance

The complete WIM Systems shall be accepted subject to fulfilling the following conditions:

1. System review
2. Acceptance tests (meeting WIM, LPR and AUR accuracy on a weekly basis).
3. Training

7.1 System Review

The WIM Contractor shall submit six copies of a system layout and cut sheets for each individual site prior to award of their subcontract. These layouts shall be submitted to the department for review. Approval shall be either an official from the department or designated representative. If the potential WIM Contractor does not fully meet the specifications the department may instruct the contractor to select another WIM Contractor.

A preliminary on-site meeting shall be held for each site to discuss contractors' plans for the routing of conduits, cables, and placement of equipment.

7.2 Acceptance Tests

The complete WIM System, all-inclusive as contracted, shall be designed, built and tested by the WIM Contractor, and as proof of operation, the systems, overall and singularly, shall be tested at various times according to the test specifications. All field tests shall be performed by the WIM Contractor and observed by the engineer with all reports submitted to the engineer.

7.2.1 Factory Acceptance Tests

Prior to shipment of any equipment, Factory Acceptance Tests shall be performed for each system to verify the equipment operating as described in the contract documents and according to the test specifications approved by the engineer. The Factory Acceptance Tests shall include at minimum the following:

1. A physical inspection to verify that the quality of material and workmanship satisfy specified requirements and standards and that the equipment and software under test are complete and ready for delivery.
2. A functional test to verify that the equipment and software operate as described in the contract documents.
3. A performance test to verify that the equipment satisfies performance and operation criteria.

For the purpose of these tests the equipment and software shall be configured as nearly as possible to the final configuration. Any field inputs not available at the factory test site shall be simulated to provide a close approximation to actual site conditions.

7.2.2 Site Acceptance Test

After all the equipment and software have been installed at the site, the contractor shall run tests to ensure that all equipment shall operate as specified therein contract documents. These tests shall be witnessed or conducted by the department within one week of the manufacturer notifying the department that the system is ready for testing.

The camera systems shall be tested at the sites to verify that the images taken at daytime and nighttime are clear and integrated properly with the vehicle record from the systems. The contractor shall collect data observed by the department and provide the results of the images taken for the duration of the testing during day and nighttime operation. Success will be determined by images that are non-blurred, crisp, properly integrated, and correctly read with the vehicle data received by the systems.

The contractor shall perform the in-motion calibration tests of WIM subsystem after installation is completed and prior to the beginning of the burn-in period. The contractor shall provide the engineer one week's notice of the in-motion calibration tests as well as the calibration weights. The calibration tests cannot begin until the static scales have been certified.

- Only one reboot per shift shall be allowed.
- The engineer shall check the accuracy performance by printing an accuracy report from an electronic database which is created and stored on the static scale computer.
- The report for WIM accuracy must be printed from the static scale computer by the engineer and met weekly during the APT period.
- WIM accuracy on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be as follows:
    - Single axle weights + 15% (95% of trucks)
    - Tandem weights + 10% (95% of trucks)
    - Gross weights + 6% (95% of trucks)
    - Axle spacing + 6 inches (68% of axles), whichever is greater

The contractor shall provide to the engineer proof that they are ready to start the COT by submitting one week's worth of data that passes the Continuous Operating Test (COT) requirements. This will serve as the final verification of the Site Acceptance Test.

7.2.3 Continuous Operating Test (COT)

Following successful completion of the Site Acceptance Test, a Continuous Operating Test shall be conducted for a period of 26 weeks. The contractor shall submit a detailed test plan to the department for approval no later than 90 days after notice to proceed. Within 2 weeks of receiving notice from the engineer verifying the Site Acceptance Test was successful, the contractor must begin the COT. Once the COT is initiated, the WIM sorting system must pass the COT within 35 weeks of the initiation date. In

no case will the COT be extended beyond 35 weeks. To successfully pass the COT, the Weigh Station and its weigh sorter system shall:

1. Operate for a period of 26 weeks excluding “off-line” time within the 35-week threshold under normal traffic conditions with a minimum of eight weeks occurring during the months of December – March.
2. Accrue less than four strikes.
3. Have the final 4 weeks completed uninterrupted by a strike or off-line time.

It is expected that there will be some operational issues during the COT. The engineer will notify (by phone and email) the contractor if the WIM system is experiencing operation issues. The following table will be used to address operational issues during the COT:

	Definition	Examples	Response Time*	Support Effort	Potential Strike**
Severity 1 – Critical	An issue that causes an urgent, critical impact affecting safety. Direct business impact with no workaround available.	Complete failure of traffic control system and no workaround is available.	2 Business Hours	Contractor will work 24/7 to develop a solution or workaround. Status updates will be provided to customer every 2 hours while work is progressing.	Yes, if not resolved by noon of the 2nd workday.
Severity 2 – Major	Significant loss of functionality or performance, with no workaround available.	Issue affecting multiple cameras/sensors, preventing normal operations.	4 Business Hours	Contractor will work during business hours as a high priority to develop a solution or workaround. Status updates will be provided to customer as determined by case.	Yes, if not resolved by noon of the 2nd workday.
Severity 3 – Moderate	Issue that impairs use of the service, but is low impact to the business, or can be avoided with a workaround.	Failure in non-critical or redundant component.	8 Business Hours	Contractor will make a best effort to work on the problem during business hours to develop a solution or workaround.	Maybe***
Severity 4 – Minor	Enhancement requests or issues that result in no impact to normal operations.	Question regarding usage of system.	2 Business Days	Contractor will make reasonable efforts to resolve the request or issue at or prior to the next Scheduled Service.	No

* Response time is the maximum time to perform an initial assessment and assign staff to the issue.
** Times are measured at the Hudson SWEF.
***If contractor provides a workaround solution that restores the use of service before noon of the second day a strike will not be issued but the system may accrue some off-line time.

The system will be deemed “off-line” when:

1. The same component/equipment has failed on two previous occasions.
2. More than one reboot of the system is required in a day.
3. A severity 1 or severity 2 issue occurs. Off-line time may be assessed to a severity 3 issue on a case by case basis.

The Tire Anomaly System, Thermal Imaging System, and Overheight Detection System are excluded from being considered for off-line time since the Weigh Station can still perform its main function of screening and inspecting vehicles without these systems operating.

The engineer will notify the contractor when the system is off-line. The system will remain off-line until the contractor formally requests the system be brought back online. The system can be reinstated to online when the system operates as it did during the Site Acceptance Test and the performance report passes for all measurement categories.

While the system is off-line, the COT will be paused, and off-line days will be accumulated while the 35 weeks continue to accrue. Both COT and off-line time are counted in full days based on the status of the system for the majority of work hours with 12:00 Noon Central Standard Time as the midpoint. If the system is operational for the majority of the day, then it will count as a COT day, otherwise it will count as an off-line day.

The system will be assessed a strike when:

1. An operational issue (Severity 1, 2, or 3) that is not resolved within the timeframes laid out in the table above
2. For each consecutive 7-day period that the system is deemed off-line, unless corrective action is performed, and the contractor is awaiting parts (must be agreed to by the engineer and the department)
3. The two week average of the WIM accuracy report does not meet the performance thresholds as laid out below.^

^ Note: The department will endeavor to maintain staffing at SWEF a minimum number of hours to ensure that 80 qualifying vehicles are compliance checked (static scale) per week. If 80 qualifying vehicles are not compliance checked in that week, then those results will roll over to the following week and the combined 2-week period will be evaluated for accuracy.

The contractor will be permitted remote access to the system. The engineer shall be notified prior to accessing the system and making any changes. The notification should include the reason for requesting access and what work/changes will be being performed during the access period.

The contractor shall provide to the engineer weekly accuracy reports from an electronic database which is created and stored on the Weigh Station Computer. This database shall be created by continuous electronic recording of vehicles from the vehicle stream, which are loaded to within 75% (60,000 lbs.) of the legal allowable limit. The actual stable static weights and WIM weights shall be stored in this common database to determine WIM scale accuracy compliance, as opposed to the method described in ASTM E1318. The contractor shall also provide the option for the engineer to be able to print the report for themselves. The report shall contain:

- Automated WIM accuracy reporting on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be as follows:
    - Single axle weights + 15% (95% of trucks)
    - Tandem weights + 10% (95% of trucks)
    - Gross weights + 6% (95% of trucks)
- The contractor shall coordinate with State Patrol staff to manually measure two vehicles per month to be included in the report to verify the axle spacing accuracy:
    - Axle spacing + 6 inches (68% of axles), whichever is greater
- The LPR and USDOT images and OCR reads shall be captured, and a report generated showing how each image was read and total read rate percentages for readable plates including jurisdiction and numbers. The images will be provided for department verification. The read rates must meet or exceed 77%. In the event of read rates not meeting 77%, an identification rate (identification rate = # of correctly ID'd vehicles / total vehicles) of the vehicles may be submitted. The identification rate must meet 85%.

The engineer and contractor shall meet weekly during the COT period to discuss the report results and determine in any corrective action is necessary. It is the contractors responsibility to provide results with all calculations completed for the department's verification against accuracy requirements. Vehicles that are flagged as off-scale can be removed from the results, but WisDOT/engineer have final discretion over removing vehicles due to this issue.

The WIM Contractor must leave the site prior to the start of the COT and may only return if a problem is encountered or accompanied by the engineer.

The COT shall demonstrate to the satisfaction of the engineer that the weigh-in-motion/static enforcement system has been constructed and consistently meet the performance requirements of the plans and of these Special Provisions.

The COT shall be the basis for acceptance or rejection of the system as a result of demonstrated performance. If the system is rejected and there have been more than three strikes and re-starts of the COT, the department may then exercise its rights as provided in standard spec 108. Following such negotiations, if the same are unsuccessful, the department may execute the performance bond. Notwithstanding the foregoing, the contractor will retain/be entitled to receive all amounts paid or payable to the contractor according to the following payment schedule, agreed-to by the parties:

PAYMENT

1. Payment upon safe and secure delivery of all equipment at a storage location approved by the engineer 20%
2. Complete installation of the entire SYSTEM 30%
3. Completion of Site Acceptance Test 20%
4. Completion of the COT to the satisfaction of the engineer 30%

The department will issue a Certificate of Final Acceptance upon successful completion of the Continuous Operating Test and training program.

The WIM acceptance procedure for the Weigh Station system will be based off of officers printing the database comparison of mainline WIM and static scale weights and the WIM accuracy meeting project specifications.

8. Training

The contractor shall set up and conduct formal training programs for the State Patrol personnel on the operation, maintenance and installation of the system components of the Mainline, Ramp and Virtual WIM Systems. The training shall include the following:

1. Two half-day operator training sessions providing an introduction to the operation and installation of the Mainline, Ramp and Virtual WIM Systems, and to the functions performed by the major system components. A class size of up to eight individuals per session can be expected.
2. Two one-day "hands-on" guidance sessions for operators in the operation of the systems. A class size of up to four individuals per session can be expected. This training will occur during the first two days of the Continuous Operating Test. The training program shall be scheduled the week following the completion of the operations test.

The cost for the first training sessions shall be included in the contract price. The department will, from time to time review any future training requirements. The contractor shall agree to provide future and additional training sessions upon receipt of requests from department. The department will reimburse the WIM Contractor the cost of providing additional training sessions on a per diem basis and at a rate agreed upon by department at the time of the request. The department will provide classroom space for training session.

The contractor shall provide six hard copies and an electronic file of the WIM System Operator’s Manual. The manual shall contain detailed information and instructions covering all aspects of the WIM System.

9. Warranty

The WIM Contractor shall warrant all subsystems and system components as supplied and installed for five years from the date of issuance of the Certificate of Final Acceptance of the WIM System by the engineer. This warranty and associated maintenance work are defined and covered under a separate bid item, Weigh-In-Motion System Warranty Maintenance.

10. Materials

Materials used in the construction of this equipment shall be of good commercial quality entirely suitable for the intended purpose. Materials shall be free from all defects and imperfections that might affect serviceability of the finished product.

11. Standard Products

The equipment shall be constructed of standard material, so that the prompt and continuing service and delivery of spare parts may be assured. The component parts need not be products of the same manufacturer.

12. Lightning Protection

Ground rod(s) and lightning protection shall be provided as per manufacturer’s requirements. All system components and equipment shall be properly grounded.

13. Measurement

The department will measure Weigh-In-Motion System by each system, acceptably completed.

14. Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.200	Weigh-In-Motion System	EACH

Payment is full compensation for removal and disposal of old equipment along with furnishing and installing all materials; performing all pavement grinding; and for supervision, equipment, calibrating and testing, and training.

The department will pay separately for Weigh-In-Motion System Warranty Maintenance, Sawing Asphalt, Sawing Concrete, Removing Pavement, Drilled Dowel Bars, Drilled Tie Bars, Base Aggregate Dense 1 1/4 Inch, Concrete Pavement Repair, Concrete Pavement Replacement, Concrete Pavement 10 or 11-Inch, Signs Type II, Drilling Shaft 30-Inch and 42-Inch, Foundation Single-Shaft Type MC-III and Type MF-II, Monotube Cantilever Type III, and Monotube Full Span Type II.

61. Static Scale System, Item SPV.0060.201.

A General

Design, furnish and install one motor truck scale with dual tandem axel capacity of 70,000 lbs, a gross capacity of 100 tons and triple weighing platforms placed end to end in the same pit. Equipment to consist of parts designed to act as a unit by a manufacture experienced in design, construction, and operation of equipment for the purpose required. Design and install the scale pit according to the plan details and these specifications.

The Static Scale System shall be tightly integrated with the Weigh Station System.

Data acquired from the Static Scale System described in this specification must be such that it may be readily associated with other data for the same vehicle into a record that coherently represents data acquired from weigh in motion, static scale, and overview camera system. The following specifications represent the minimum static scale requirements.

Submit shop drawings for the static scale to the engineer for review and approval. Drawings shall be stamped by a professional engineer licensed in the State of Wisconsin.

B System Components

B.1 The Static Scale

Furnish and install motor truck scale with dual tandem axle capacity of 70,000 lbs, a gross capacity of 100 tons and weighing platforms of 42’11” x 12’ wide, 22’11” x 12’ wide and 15’3” x 12’ wide placed end to end in the same pit. Equipment to consist of parts designed to act as a unit by a manufacturer experienced in design, construction, and operation of equipment for the purpose required.

1. The static scale shall have seven sections (four weighbridge modules with factory-poured concrete).
    a. The static scale platforms shall have reinforced concrete decks.
    b. The concrete deck shall have a dual tandem axle capacity of 70,000 lbs on 4’ centers.
    c. Each of the platforms shall consist of a prefabricated factory-welded weighbridge assembly.
2. The weighbridges are of factory welded I-beam girder design and all steel surfaces of the weighbridge shall be hot-dip galvanized according to ASTM A123.
    a. The weigh bridge main girders shall be ASTM A572 steel, minimum of W24 x 68 lbs.
    b. The weigh bridge cross girders shall be ASTM A572 steel, minimum of W12 x 35 lbs.
    c. All in-house welding on the structure shall be either gas to metal, submerged or shielded arc process. All welding procedures to be in compliance with the American Welding Society D1.1-88 Structural Welding Code.
    d. All bolts will be hot-dip galvanized according to ASTM A153.

3. The deck surface shall be 10” thick concrete, having a minimum compressive strength of 4000 psi.
    a. The deck shall be lined along the bottom with 3/16” ASTM-A36 steel plate or galvanized deck sheeting, a double reinforcing mat shall be set into place the length and width of the scale deck, and the deck channel to have studs welded to the steel to form a composite structure when the concrete is added. The reinforcing mat and deck channel studs are to relieve surface tension in the concrete caused by expansion and contraction.
    b. The color admixture shall be reddish-brown (AMS-STD 595A No. 31136, Insignia Red) or similar color approved by the engineer. Add colored admixture to the mix per manufacturer’s written instructions in a pre-measured bag and not added by weight of cement content. Admixture shall be a colored, water-reducing, admixture containing no calcium chloride with coloring agents that are lime proof and UV resistant.
4. The scale shall be completely self-checking. No check rods shall be used. The scale shall not use the load cell as a checking devise.
5. No manholes are allowed in the scale deck. Scale pit access will be from an outside pit tunnel entrance.
6. The scale platform shall be treated with a protective surface treatment conforming to standard spec 502. The contractor shall ensure the protective surface treatment applied is on WisDOT’s Approved Products List. Do not apply traditional concrete curing compound to the platform to ensure proper adhesion and penetration of the protective surface treatment.

B.2 Load Cells

Load cells shall meet the following:

1. The weighing elements shall be stainless steel hermetically sealed load cells to guard against moisture ingression and barometric effects.
2. The cells shall have moisture protection to IP 68 standards.
3. Load shall be applied to the cells without the use of links, bolts, pins cables or flexure.
4. All load cells shall be self-centering.
5. Load cells shall provide analog or digital signal output.
6. The load cells shall be a minimum of 50 tons capacity each, and each cell must have stainless steel braided covering on the load cell cable.
7. All load cells must be manufactured of stainless steel.
8. The scale system shall have self-diagnostic capabilities able to identify load cell problems and failure.
9. The scale shall be able to identify each load cell individually.
10. The scale shall have the ability to view all of the load cells in the scale system simultaneously.
11. The design shall permit the individual load cells to be matched and the scale sections to be electronically calibrated.
12. Load cell shall have been tested and passed lightning simulated, lightning strike up to 80,000 amperes. Documentation to be provided with submittals.

B.3 Technical Specifications

Maximum Capacity (tons)	100 tons
Dual Tandem Axle Capacity (lbs.)	70,000 lbs
(Concentrated Load Capacity (CLC) is not the same as dual tandem axle capacity)	
Overall Scale Dimension	
(L x W) (Pit opening, in feet)	81’-4" x 12’-1 1/4"
Deck Material	Concrete (Colored)
Scale Accuracy	0.1%

Weighbridge:	
Weighbridge Design	I-Beam
Number of Sections	7
Number of Modules	4
Reinforcing Steel Size	Double welded mats minimum W16 x16 on 4"x4" centers
Number of Manholes	0
Type of Checking	Bumper
Deck Concrete	Yes
Pit Coping included (Y/N)	Yes
Deck Channel included (Y/N)	Yes
Load Cells:	
Load Cell Type	Rocker Column
Rated Capacity	50t (100,000 lbs)
Safe Overload	200 %
Ultimate Overload	300 %
Safe Sideload	100%
Material	Stainless Steel
Load Cell Cable	4 conductor 22 AWG Shielded
Load Cell Cable Protection	Stainless Steel Outer Jacket
NEMA Rating	6P
Rated Excitation	5 to 15 Volts
Temperature Compensation Range	-10 to +40 °C
Standard Instrument:	
Resolution	10,000 d commercial 50,000 d non-commercial
Display Size	16 lines @ 26 characters/line
Display Rate	0.1 to 10 sec. by 0.1 steps
Over Capacity Warning (Y/N)	Yes
Units Switching	Programmable
Zero Range	Programmable 2% or 100%
Motion Band	Programmable XXX
Mounting	Desk
Load Power Supply Limits	8-350 ohm cells, 16 - 1000 ohm
Instrument Environmental Specifications:	
Operating Temperature	-10° to 40° C
Operating Humidity	Non-condensing
Storage Temperature	-20° to 60° C

Instrument Power Requirements:	
Power	17 VAC +/- 10 % 230 VAC +/- 10%, 50-60 112 +/- 2 Hz
Grounding	RG 3.0 Ohms to Earth Ground (Resistance to ground)
Ticket Printer Specifications:	
Type of Printer	Network
Electrical Requirements:	
Volts	1 17 / 230 VAC selectable
Full Load Amperes	10 A
Isolation Transformer Voltage KVA Ratings	1 KV
Conduit Size	Up to 50

B.4 General Pit Construction

This section describes pit design, construction and weighbridge installation techniques. These instructions are a brief overview and supplemental to the dimensions shown in the plans. Listed below is a guideline for design and installation.

B.4.1 Pit Construction Notes

1. All concrete shall be Grade A. All concrete work shall be performed according to section 501 of the Standard Specifications. All concrete is to be a minimum of 4,000 PSI @ 28 days.
2. Design foundation pit according to industry standards. Reinforcing bars shall be equal ASTM A615, grade 40 or 60. Bend bard cold to conform with shop drawing details. Remove scaled, loose flaky rust, dirt, and other coating that would impair bonding. Spaces bars properly and tie securely in position before placing concrete. Tack welding to keep reinforcing in place is not permitted.
3. Suitable conduit for low-voltage conductor-shielded cable must pass through the pit wall at any point above the pier tops that is convenient. Conduit must extend beyond the pit wall a minimum of 2". For conduit runs up to 50' in length, use 3/4,' conduit. Avoid running conduit next to high voltage lines. Provide #10 copper ground lead at instrument location. Connect to 10' copper-clad round rod driven in moist earth. If AC is required in the pit, it shall not run more than 24' in parallel to any cell cable.
4. Inside dimensions must be maintained.
5. Pit wails and footing depths as indicated on plans are the minimum recommended where normal soil conditions prevail.
6. All scales require ground rods through the floor of the scale.
7. Angle iron and coping are to be attached to the top wall form.
8. Bumper and checking plates to be placed in their proper location on the inside of the form so they will be flush with the face of the wall. Bolt heads are to be in the wall projecting as indicated on the shop drawings.
9. Excavation, foundation forms, rebar, and concrete shall be furnished by the contractor.
10. 2000 P.S.F. minimum soil bearing capacity is required. The design shall be adequate for a highway surcharge of 300 P.S.F. adjacent to pit walls.
11. Work from center lines as shown on the shop drawings when erecting forms and placing foundation bolts.
12. Concrete platform slabs may be factory-poured or field-poured concrete.

13. It is recommended that the weighbridge be assembled and blocked in the pit before load cells are installed.
14. The scale pit wall surfaces and floor shall be treated with a protective surface treatment conforming to standard spec 502. The contractor shall ensure the protective surface treatment applied is on WisDOT's Approved Products List. Do not apply traditional concrete curing compound to the platform to ensure proper adhesion and penetration of the protective surface treatment.

B.5 Static Scale Electronics

Furnish and install one electronic instrument to drive the above specified scale. All equipment to be installed shall be new (unused) and consist of parts desired to act as a unit by a manufacturer experienced in design, construction, and manufacture of electronic components, and operation of equipment for the purpose required.

Design the scale instrument and all peripheral devices should be designed to function as a unit. The equipment shall have the following specifications:

B.5.1 HARDWARE SPECIFICATIONS

1. Static scale indicator
2. Microprocessor based item(s) for
    a. Scale read out
    b. Control and data handling functions
3. The scale instrumentation shall be compact and approved by the engineer. Manufacturer shall provide proof that the instruments have been in use successfully for at least two years.
4. Provide microprocessor-based digital instrument with Ethernet weight output to the static scale PC and the monitor for totalizing and printer controls.
5. Connection shall provide diagnostics of static scale load cells (load cell raw counts) to the static scale PC or a remote PC.
6. Provide with software diagnostics to facilitate fault finding.
7. Provide a certificate of conformance from the NIST Handbook 44, latest adopted edition.
8. The static scale instruments shall include:
    a. Must be able to power all scale platforms
    b. All instrument setup functions and calibration sequences are programmable through the keyboard/display. No at-scale adjustments required for these functions.
    c. Minimum of 15 updates per second
    d. One display showing individual axle weights and the summation of the individual weights
    e. Shall be suitable for desktop or set-in mounting, level or at angle
    f. Display the raw counts of each individual load cell without disconnecting any of the load cells from the system
    g. Perform all static scale instrument set-up functions via static scale web browser web pages. Download to instrument via Ethernet connection.
    h. Selectable increments size from 20 to 50,000.
    i. Display up to 1 part in 10,000
    j. Internal resolution 1 part in 1,000,000
    k. Setup functions stored in nonvolatile RAM memory
    l. Adjustable digital filtering
    m. Adjustable automatic zero maintenance
    n. Serial ASCII output port configuration for connection to computer. Baud rate to be selectable from 300 to 9600
    o. Motion detection should be selectable from ±0.5, ±1.0, ±2.0, ±3.0 increments

p. Display verification test

q. Display height at 0.5 inches with wide angle view

r. Static scale instruments shall meet the current specifications of the NIST Handbook 44, current adopted edition

s. The instrument shall be UL/CSA listed

t. Provide one button printing of weight ticket or axle accumulation

B.6 STATIC SCALE OPERATION SPECIFICATIONS

1. The scale instrument shall be capable of assigning each load cell with its own unique identification number and shall be capable of displaying the weight reading of each individual load cell through the instrument without disconnecting any of the load cells from the system.
2. The scale instrument shall communicate with each individual load cell.
3. The scale instrument shall be capable of being programmed and calibrated in both pounds and kilograms.
4. The display is to be a full color graphic, alphanumeric LED back-lit display with the capability to prompt the operator through all operations with true alpha characters. Segmented LED alphanumeric displays are not acceptable.
5. The scale instrument shall communicate static scale weights to the Scale Manager on the central Weigh Station computer to display weights on the computer system screen, and to allow the accurate weighing of the truck on the static scale.
6. The scale instrument shall have program to accumulate multiple axle and axle groups and print 8.5 x 11 weight tickets that is independent of the WIM system. This program should work as a backup in case the Station system is not working.
7. The instrument is to have the capability to run multiple scales as a standard unit. Adding extra boards at a later date is to be considered not meeting specifications. The instrument is to have self-diagnostics built in that allow the technician to view all load cell outputs simultaneously.
8. Simultaneous viewing of load cell output allows for fast easy analysis of the scale operating system. Viewing cell outputs one at a time is not acceptable.
9. The system shall have the ability to be 100% calibrated from within the scale house. Corrections or calibration adjustments at the scale through summing boxes are not acceptable.
10. Surge Voltage Protection on the system shall be optically isolated at each load cell, and transformer coupled from the instrument.
11. Scale is to have the ability to be analyzed via remote software.
12. The scale instrument is to have the ability to be programmed via remote software.
13. Remote software diagnostics will allow simultaneous viewing of all load cells in counts, and actual weight that each individual load cell is sensing. Viewing of cells one at a time is not acceptable.
14. Remote software service will be capable of displaying load cell zero calibration counts, current zero counts and actual mV/V output of each cell simultaneously. A printed report of this information is possible from the remote software.
15. Remote software service will be capable of performing a self-test on all communications ports and report the current setup.
16. Original calibration values shall have the capability to be retrieved and stored via remote software.
17. Original configuration values shall have the capability to be retrieved and stored via remote software.
18. For non-commercial applications, scales shall have the capability to be set up and calibrated via modem.

B.7 TICKET PRINTER REQUIREMENTS

Provide the following:

1. Provide one color laser-type printer
2. Minimum print speed of 12 pages per minute
3. Minimum print quality of 600 dpi
4. Minimum 8 Mb of memory

B.8 SCOREBOARD SIGN REQUIREMENTS

Four displays will be supplied. One to display the axle weights on each of the three weigh pads and one to display the GVW. Scoreboards shall be able to be turned off and on from the manual override console. Each display will meet the following specifications:

Display	Six digits, >/= 5 inches high
Viewing Distance	Up to 160 feet
Maximum cable length	1000 feet (20 mA 50 feet (RS232C)
Power	AC: 100~240VAC 50/60 Hz
Enclosure	IP56 Rated
Input	RS232/485/20mA CL
Digital Color	Fluorescent yellow or red
Lighting	LED
Temperature Range	-40F to 120F (-40C to 50C)
Humidity	0% to 99%, non-condensing

B.9 SCALE CERTIFICATION

After all the equipment has been installed and construction completed on the static scale system, run tests to ensure that all equipment operates as specified therein the contract documents. These tests shall be witnessed or conducted by the engineer within one (1) week of notification that the system is ready for testing. Certify the scale platform modules according to requirements per National Institute of Standards and Technology (NIST) Handbook 44, Wisconsin State Statutes Chapter 98, and Department of Agriculture Trade and Consumer Protection Chapter 92.

B.9 PAYMENT SCHEDULE

1.	Payment upon safe and secure delivery of all equipment at a storage location approved by the engineer	20%
2.	Complete installation of the entire SYSTEM	30%
3.	Completion of Scale Certification	20%
4.	Completion of the COT to the satisfaction of the engineer	30%

C Warranty

The Static Scale System vendor shall warrant and maintain all subsystems and system components as supplied and installed for five years from the date of acceptance by the engineer. This warranty and associated maintenance work are defined and covered under a separate bid item, Static Scale System Warranty Maintenance.

D Measurement

The department will measure Static Scale System as each individual unit in place and acceptably completed according to the contract.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.201	Static Scale System	EACH

Payment is full compensation for designing, furnishing and installing all materials for the static scale and pit; coordinating and making all utility hook-ups; making the system operational; testing; providing required training and warranties; and for furnishing all labor, supervision, equipment, tools, and incidentals necessary to complete the work.

62. Virtual Weigh Station System, Item SPV.0060.202.

A General

Furnish and install one Virtual Weigh Station (VWS) located on USH 12. This proposed Virtual Weigh Station System will provide coverage of the bypass route for the Hudson SWEF, and therefore shall provide information regarding commercial vehicles bypassing the station.

The Virtual Weigh Station System shall include various components that interact together. The components shall include the following:

- Weigh-in-motion (WIM) quartz sensors
- Axle and loop detection
- Overview image video capture
- WIM computer system
- On-site communication system
- Portable static wheel load scales

The scope of work is to supply and install the following:

- WIM quartz sensors, axle sensing, loops, WIM electronics, and cabinets
- Overview image camera installation including support structures
- AUR system installation including support structures
- LPR system installation including support structures
- New communications conduit and wiring for all equipment
- Electrical power wiring and conduit
- High-speed Internet service and connection
- Monitoring capability and equipment at Hudson SWEF
- Haenni Wheel Load Scales WL 101 portable static wheel load scales (14)
- Portable manual test stand for portable scale calibration

The objective of the department is to have a fully operational Virtual Weigh Station System, capable of accurately and automatically screening vehicles (required classes including tandem axles) in motion for enforcement purposes. Based on the weights obtained from the WIM screening, the system shall automatically notify the Hudson SWEF of CMV violators using the bypass route to avoid the Hudson SWEF.

The purpose of this project is not for the research and development of a system which might perform the objectives as described above. Therefore, the contractor shall be required to furnish documentation which demonstrates to the satisfaction of the department that all equipment proposed for use in the Virtual Weigh Station WIM Systems is of standard manufacture; that the manufacturer has had similar equipment available for purchase for not less than 10 years; and has a proven acceptable performance history while in use under conditions similar to those for the intended use.

B System Components

1. Virtual Weigh Station System Operational Overview

The Virtual Weigh Station System shall be located on USH 12, east of Sono Junction, WI between Ross Road and Clint's Trail in St. Croix County. This location shall provide coverage of commercial vehicle traffic on USH 12 and shall relay that information to the Hudson Weigh Station and to State Patrol inspectors on their laptop computers.

All vehicles approaching the Virtual Weigh Station System shall produce a vehicle record containing an overview image, various weights, and speed, as well as classification information. The Virtual Weigh Station System shall determine whether each vehicle is weight compliant based on its allowable weights as set by the weigh station operator.

The Virtual Weigh Station System shall trigger an overview image camera system to capture an image of each vehicle as it passes the WIM Scales and will link each image with the appropriate WIM vehicle record. The system shall provide an audible alert to make on the officer's laptop if a violator is detected.

Based on the parameters set forth by the user, images of commercial vehicles can be collected and stored by the System Electronics and relayed to the weigh station for all violating commercial vehicles or for all vehicles. The user can also identify the selection criteria for a violating commercial vehicle, i.e. overweight, over length, speeding, etc.

The combined data (image and vehicle record) will be accessible to any computer with secure network access to view the captured images and vehicle records of the suspected violating vehicles. The system shall be password protected.

The system shall allow State Patrol officers to select a vehicle and view a detailed view of the record. In this view the system shall show a larger image of the vehicle with zoom in capabilities to better view of the vehicle details.

The system shall also allow State Patrol officers to enter weights for vehicles when they weigh them statically and print a ticket.

The system shall allow historical searching of violating vehicles from its web pages by date range. The results should be sortable by vehicle id, license plate number, weight violation, speed, lane, class, travel direction, and date and time.

2. Virtual Weigh Station WIM System Functional Requirements

2.1. VWIM Quartz Sensors

The accuracy of the WIM system shall meet or exceed ASTM E1318 "Standard Specifications for Highway Weigh-in-Motion (WIM) Systems performance requirements for a Type III system. The WIM accuracy on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be:

1. Single axle weights + 15% (95% of trucks)
2. Tandem weights + 10% (95% of trucks)
3. Gross weights + 6% (95% of trucks)
4. Axle spacing + 6 inches or 5% (68% of axles), whichever is greater

Blanket grind the existing concrete pavement in the mainline drive lane beginning 200 feet prior to the WIM scale location and ending 100 feet after the WIM scale location, for a total of 300 feet, with a minimum 36-inch blanket grinder to ensure that the roadway meets the requirements of Section 6 of ASTM E1318 prior to installation of the WIM system.

The WIM quartz sensors shall have the following characteristics:

- Quartz sensors shall be capable of accurately measuring gross vehicle weight, wheel load, axle load, axle group load, speed, and axle spacing when traveling at speeds of 5 to 75 mph.
- The quartz sensors shall be capable of being reground up to 0.4 inch with no loss of functionality in the event of roadway deformations and move resulting in a quartz sensor unit protruding above the surrounding pavement surface.
- The quartz sensors shall have uniform and consistent sensitivity without experiencing any signal drift or phantom axles.

- Shall operate without degradation in ambient air temperature ranges of -20°F to +120°F and in relative humidity ranging from 10% to 95% non-condensing
- Quartz sensor performance shall be insensitive to temperature changes (i.e., less than 1% for a temperature range of 90°F). Sensing element shall be encapsulated in an aluminum die cast housing providing a vibration proof, frost-resistant, and watertight carrier unit prior to shipment.
- Be capable of being installed directly into a cut out channel in the roadway pavement using a manufacturer recommended epoxy material that encapsulates each quartz sensor unit.
- The height of the quartz sensor shall not exceed 44mm to minimize pavement depth cut in roadway.

The contractor shall deploy a minimum of six quartz sensors at the virtual weigh station.

2.2. Loop Detectors

Each detector loop shall have a minimum loop area of 6-foot x 6-foot. Detector loops shall conform to WisDOT standard specifications.

Loop wire shall be 1 conductor, 14 AWG, IMSA 51-5. Loop leads shall be 2 conductor, 14 gauge, IMSA 50-2 cable.

Loops shall not be cut directly into the existing roadway and loop sawcuts will not be exposed to the roadway surface. In situations where the roadway is PCC and is not continuously reinforced, the appropriate PCC section of roadway will be removed, loops will be installed, and the appropriate PCC section will be replaced. This removal/replacement of the PCC and associated activities such as sawing shall be incidental to the Virtual Weigh Station bid item.

2.3. VWIM Electronics

Locate the System Electronics near the WIM scales in a protective roadside cabinet. The System Electronics shall be responsible for creating truck data and formatting the truck data for a web server to enable an enforcement officer to remotely view the vehicle records via wireless Ethernet. The WIM interface and data collection computer shall be a stand-alone system with the capability to collect and interpret the signals from the WIM Scale.

The virtual WIM system electronics shall contain the interface and signal conditioning for the inroad sensors and camera, a process computer, and an integral power supply. Provide all material necessary for setup and operation of the system, including all coeds and cabling. Provide the system with the required software pre-loaded so that it will automatically execute when the system is powered up.

The electronics shall be modular in design to facilitate easy maintenance, troubleshooting and in-field servicing. The computer, power supply and the interface electronics shall meet the following requirements.

The electronics shall include interfaces to the following components:

1. WIM Scales
2. Axle Sensing
3. Loops
4. Off-scale Detection
5. Camera System
6. Communications System

The roadside electronics shall provide a facility for viewing vehicle records and sensor diagnostics directly without any ancillary equipment.

All components of the electronic system, including inductive loop detectors, shall contain electrical protection to prevent damage from electrical surges, spikes, and lightning.

The system shall be of a durable, industrial design and construction, and enable continuous operation, with automated start-up in the event of a power outage.

The System Electronics shall provide the following functions:

1. Perform WIM operation.
2. Weigh all vehicles traveling over WIM scales.
3. Classify all vehicles traveling on all instrumented lanes of the highway.
4. Perform weight compliance analysis on vehicles according to department or agency regulations.
5. Perform sorter operation according to decisions based on weight compliance analysis, other violations (speeding, improper maneuver, sudden speed change, etc.).
6. Insert sequence numbers for vehicle records for tracking purposes.
7. Capture images for all commercial vehicles.
8. Filter out all non-interesting images and format for Web server.
9. Perform data collection, data storage, file management and report generation functions for collected vehicle information.

The system shall include a data extraction system to allow data to be retrieved in the field.

Provide a virtual weigh station with a roadside cabinet to house the System Electronics, the WIM computer and its peripherals and the overview camera equipment.

The roadside cabinet shall be weatherproof aluminum, lined and insulated and installed with a fan and heater. All cutouts and openings shall be vermin proofed. The roadside cabinet shall be placed outside the clear zone of the adjacent roadway.

2.4. Camera System

The Camera System shall consist of the following system components:

1. Color and Black/White video camera
2. Illuminator system
3. Video capture system

The overview image system shall monitor traffic flow on the roadway at the Virtual WIM site. It shall capture still images of trucks having violations for identification and enforcement purposes. The images shall be displayed on an operator interface located in the Sparta SWEF. Each vehicle record number shall be displayed with the vehicle image.

Provide and install one camera for the WIM System on a pole located near the virtual weigh station location. The camera shall provide overview images of both lanes for passing commercial vehicles, detailing their cab and side. Color images shall be provided for daylight use, and black/white images shall be provided for night use. The camera images shall be crisp and clear 24 hours a day and in all lighting conditions.

2.5. Communications

Data from the virtual weigh station system shall be communicated to the Hudson SWEF via high-speed Internet connection. The system shall allow the operator to connect remotely to access the vehicle data.

2.6. Portable Static Wheel Load Scales

Furnish 14 Haenni Wheel Load Scales WL 101 portable static wheel load scales.

Each unit shall be capable of being calibrated with the portable manual test stand described below. All weighing and measuring devices are required by State law to have a NTEP Certificate. Any piece of equipment purchased for the purposes of calibrating/testing wheel load scales must have a NTEP certificate of conformance.

2.7. Portable Manual Test Stand For Portable Scale Calibration

Furnish one unit meeting the following specifications. The unit shall be portable, capable of testing and calibrating portable static wheel load scales. The unit shall have an accuracy of 0.10% calibrated to ASTM specification E-74 with capacity 20,000 lbs. x 1 lb. graduations. The range shall be zero to full capacity with travel of 8-inches.

The unit shall be aluminum, 6000 Series. The unit shall have a minimum 33-inch x 21-inch test surface area. The overall unit weight shall be less than 300 lbs. with carrying/lifting handles.

The unit load cell shall be steel with a capacity of 25,000 lbs. The accuracy shall have nonlinearity, hysteresis and nonrepeatability @ ± 0.05% R.O.

The unit hydraulic system pump shall be 2-speed manual hand operation, 10,000 psi. The cylinder shall have a 30-ton single action capability and a 10,000 psi pressure gauge.

The indicator resolution shall have 10,000 displayed graduations and 1,000,000 internal graduations. The NIST Classification shall meet or exceed HB-44 class III/IIIL at 10,000 divisions. It shall be battery operated using rechargeable NiCad batteries, 12-120 VDC/VAC. The display shall be LCD, 6-digits.

The aluminum loading block shall have a minimum size of 10-inch (± 0.25-inch) x 17-inch (± 0.25-inch) x 1.75-inch. The rubber loading pad shall have a minimum size of 10-inch (± 0.25-inch) x 17-inch (± 0.25 inch) x 0.5-inch (± 0.125-inch) with 40 to 70 Shore A rating.

3. Site Acceptance Test

After all the equipment and software have been installed at the site, the contractor shall run tests to ensure that all equipment shall operate as specified therein contract documents. These tests shall be witnessed or conducted by the department within one week of the manufacturer notifying the department that the system is ready for testing.

The camera systems shall be tested at the site to verify that the images taken at daytime and nighttime are clear and integrated properly with the vehicle record from the systems. The contractor shall collect data observed by the department and provide the results of the images taken for the duration of the testing during day and nighttime operation. Success will be determined by images that are non-blurred, crisp, properly integrated, and correctly read with the vehicle data received by the systems.

The contractor shall perform the in-motion calibration tests of WIM subsystem using test trucks after installation is completed and prior to the beginning of the burn-in period. The requirements for the test truck verification shall be as follows:

Identification
Correctly identify and weigh by individual/tandem axle:

- Class 5 single axle straight trucks
- Class 6 quad axle dump trucks
- Class 9 vehicles

Loading
Test vehicles shall be loaded to:

- Class 5 – 32,000 lbs
- Class 6 – 90-95% of legal loading limit
- Class 9 – 90-95% of legal loading limit

Runs/Speed
Each class shall perform a minimum of five runs each at low, average, and high speed (15 total) based on the roadway speed limit. One run shall be run left or right of center for each class at the average speed.

The contractor shall provide the engineer one week's notice of the in-motion calibration tests as well as the calibration weights.

- The engineer shall check the accuracy performance by printing an accuracy report from an electronic database which is created and stored on the static scale computer.
- The report for WIM accuracy must be printed from the static scale computer by the engineer and met weekly during the APT period.
- WIM accuracy on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be as follows:
    - Single axle weights + 15% (95% of trucks)
    - Tandem weights + 10% (95% of trucks)
    - Gross weights + 6% (95% of trucks)
    - Axle spacing + 6 inches (68% of axles), whichever is greater

The contractor shall provide to the engineer proof that they are ready to start the COT by submitting one week's worth of data that passes the Continuous Operating Test (COT) requirements. This will serve as the final verification of the Site Acceptance Test.

4. Continuous Operating Test (COT)

Following successful completion of the Site Acceptance Test, a Continuous Operating Test shall be conducted for a period of 12 weeks. The contractor shall submit a detailed test plan to the department for approval no later than 90 days after notice to proceed. Within 2 weeks of receiving notice from the engineer verifying the Site Acceptance Test was successful, the contractor must begin the COT. Once the COT is initiated, the WIM sorting system must pass the COT within 16 weeks of the initiation date. In no case will the COT be extended beyond 16 weeks. To successfully pass the COT, the Virtual Weigh Station shall:

1. Operate for a period of 12 weeks excluding “off-line” time within the 16-week threshold under normal traffic conditions with a minimum of four (4) weeks occurring during the months of December – March.
2. Accrue less than four strikes.
3. Have the final four weeks completed uninterrupted by a strike or off-line time.

It is expected that there will be some operational issues during the COT. The engineer will notify (by phone and email) the contractor if the VWIM system is experiencing operation issues. The following table will be used to address operational issues during the COT:

	Definition	Examples	Response Time*	Support Effort	Potential Strike**
Severity 1 – Critical	An issue that causes an urgent, critical impact affecting safety. Direct business impact with no workaround available.	Complete failure of traffic control system and no workaround is available.	2 Business Hours	Contractor will work 24/7 to develop a solution or workaround. Status updates will be provided to customer every 2 hours while work is progressing.	Yes, if not resolved by noon of the 2nd workday.
Severity 2 – Major	Significant loss of functionality or performance, with no workaround available.	Issue affecting multiple cameras/ sensors, preventing normal operations.	4 Business Hours	Contractor will work during business hours as a high priority to develop a solution or workaround. Status updates will be provided to customer as determined by case.	Yes, if not resolved by noon of the 2nd workday.
Severity 3 – Moderate	Issue that impairs use of the service, but is low impact to the business, or can be avoided with a workaround.	Failure in non-critical or redundant component.	8 Business Hours	Contractor will make a best effort to work on the problem during business hours to develop a solution or workaround.	Maybe***
Severity 4 – Minor	Enhancement requests or issues that result in no impact to normal operations.	Question regarding usage of system.	2 Business Days	Contractor will make reasonable efforts to resolve the request or issue at or prior to the next Scheduled Service.	No

* Response time is the maximum time to perform an initial assessment and assign staff to the issue.

** Times are measured at the Hudson SWEF.

***If contractor provides a workaround solution that restores the use of service before noon of the second day a strike will not be issued but the system may accrue some off-line time.

The system will be deemed “off-line” when:

1. The same component/equipment has failed on two previous occasions
2. More than one reboot of the system is required in a day
3. A severity 1 or severity 2 issue occurs. Off-line time may be assessed to a severity 3 issue on a case-by-case basis.

The engineer will notify the contractor when the system is off-line. The system will remain off-line until the contractor formally requests the system be brought back online. The system can be reinstated to online when the system operates as it did during the Site Acceptance Test and the performance report passes for all measurement categories.

While the system is off-line, the COT will be paused, and off-line days will be accumulated while the 16 weeks continue to accrue. Both COT and off-line time are counted in full days based on the status of the system for the majority of work hours with 12:00 Noon Central Standard Time as the midpoint. If the system is operational for the majority of the day, then it will count as a COT day, otherwise it will count as an off-line day.

The system will be assessed a strike when:

1. An operational issue (Severity 1, 2, or 3) that is not resolved within the timeframes laid out in the table above.
2. For each consecutive 7-day period that the system is deemed off-line, unless corrective action is performed, and the contractor is awaiting parts (must be agreed to by the engineer and the department).
3. The two-week average of the WIM accuracy report does not meet the performance thresholds as laid out below.

^ Note: The department will endeavor to maintain staffing at SWEF a minimum number of hours to ensure that 20 qualifying vehicles are compliance checked (portable scales) per two-week window. If 20 qualifying vehicles are not compliance checked in that two weeks, then those results will roll over to the following two-week window and the combined 4-week period will be evaluated for accuracy.

The contractor will be permitted remote access to the system. The engineer shall be notified prior to accessing the system and making any changes. The notification should include the reason for requesting access and what work/changes will be being performed during the access period.

The contractor shall provide to the engineer bi-weekly accuracy reports from an electronic database which is created and stored on the Weigh Station Computer. This database shall be created by continuous electronic recording of vehicles from the vehicle stream, which are loaded to within 75% (60,000 lbs.) of the legal allowable limit. The actual stable static weights (submitted by inspectors) and WIM weights shall be stored in this common database to determine VWIM scale accuracy compliance. The contractor shall also provide the option for the engineer to be able to print the report for themselves. The report shall contain:

- Automated WIM accuracy reporting on all vehicles loaded above 60,000 pounds and traveling between the speeds of 5 to 85 miles per hour shall be as follows:
    - Single axle weights + 15% (95% of trucks)
    - Tandem weights + 10% (95% of trucks)
    - Gross weights + 6% (95% of trucks)
- The contractor shall coordinate with State Patrol staff to manually measure two vehicles per month to be included in the report to verify the axle spacing accuracy:
    - Axle spacing + 6 inches (68% of axles), whichever is greater
- The LPR and USDOT images and OCR reads shall be captured, and a report generated showing how each image was read and total read rate percentages for readable plates including jurisdiction and numbers. The images will be provided for department verification. The read rates must meet or exceed 77%. In the event of read rates not meeting 77%, an identification rate (identification rate = # of correctly ID’d vehicles / total vehicles) of the vehicles may be submitted. The identification rate must meet or exceed 85%.

The engineer and contractor shall meet bi-weekly during the COT period to discuss the report results and determine in any corrective action is necessary. It is the contractor's responsibility to provide results with all calculations completed for the department's verification against accuracy requirements. Vehicles that are flagged as off-scale can be removed from the results, but the department/engineer have final discretion over removing vehicles due to this issue.

The VWIM Contractor must leave the site prior to the start of the COT and may only return if a problem is encountered or accompanied by the engineer.

The COT shall demonstrate to the satisfaction of the engineer that the virtual weigh-in-motion enforcement system has been constructed and consistently meet the performance requirements of the plans and of these Special Provisions.

The COT shall be the basis for acceptance or rejection of the system as a result of demonstrated performance. If the system is rejected and there have been more than three strikes and re-starts of the COT, the department may then exercise its rights as provided in section 108 of the standard specifications. Following such negotiations, if the same are unsuccessful, the department may execute the performance bond. Notwithstanding the foregoing, the contractor will retain/be entitled to receive all amounts paid or payable to the contractor according to the following payment schedule, agreed-to by the parties:

PAYMENT

1. Payment upon safe and secure delivery of all equipment at a storage location approved by the engineer 20%
2. Complete installation of the entire SYSTEM 30%
3. Completion of Site Acceptance Test 20%
4. Completion of the COT to the satisfaction of the engineer 30%

The department will issue a Certificate of Final Acceptance upon successful completion of the Continuous Operating Test.

The WIM acceptance procedure for the Virtual Weigh Station system will be based off of officers printing the database comparison of virtual WIM and portable static scale weights and the WIM accuracy meeting project specifications.

C Warranty

The Virtual Weigh Station System vendor shall warrant and maintain all subsystems and system components as supplied and installed for five years from the date of acceptance by the engineer. This warranty and associated maintenance work are defined and covered under a separate bid item, Virtual Weigh Station System Warranty Maintenance.

D Measurement

The department will measure Virtual Weigh Station System as each individual unit, in place and acceptably completed according to the contract.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.202	Virtual Weigh Station System	EACH

Payment is full compensation for furnishing and installing all materials; coordinating and making all utility hook-ups; performing all pavement grinding; and for furnishing all labor, supervision, equipment, calibrating and testing, training, tools and incidentals necessary to complete the contracted work. Materials and equipment included in the Virtual Weigh Station System are WIMs and sensors, concrete control pad, cameras, System Electronics (including all interface cards), WIM cabinet, Uninterrupted Power Supply, cabling, conduit, junction boxes, software, software licenses, Portable Static Wheel Load Scales, Portable Manual Test Stand.

63. Weigh-In-Motion System Warranty Maintenance, Item SPV.0060.203.

A Description

Provide warranty and maintenance service for the weigh-in-motion scale system for a period of five years. This system includes weigh-in-motion sensors, cameras, system components and ancillary equipment. Provide routine maintenance on all major systems, system components and ancillary equipment at 6-month intervals. Provide emergency repair services on an as-required basis.

A.1 Warranty Bond

The contractor shall provide a warranty bond for the Weigh-In-Motion System Warranty Maintenance. The bond will be in effect for the entire five-year warranty period beginning when the Weigh-In-Motion Scale System is completed, operational and accepted. The bonding company must have an AM Best rating of "A-" or better and the contractor will provide proof of a five year bond commitment before execution of the contract.

The warranty bond amount will be for $75,000. The bond will ensure the proper and prompt completion of required warranty work following completion of the contract work, including payments for furnishing all labor, equipment, and materials used according to this specification.

The contract bond, which remains in effect for one year beyond the completion of the project, will also include warranty work as described in this article. For the remaining four-year warranty period, provide documentation that the warranty bond will be provided in a single term four-year warranty bond.

Failure of the contractor or its surety to issue the warranty bond will be considered a default and will result in forfeiture of the face amount of the bond to the department.

All warranty work will be as prescribed in this article. At the end of the warranty period, the contractor will be relieved of the responsibility to perform further warranty work, provided all previous warranty work has been completed.

Maintain insurance, in the course of performing warranty work, as specified in standard spec 107.26 throughout the five-year warranty period.

B (Vacant)

C Methods

The contractor shall warrant all subsystems and system components as supplied for five years from the date of issuance of the certificate of final acceptance of WIM System by the engineer.

The warranty shall cover all WIM system components, hardware and software, included in the contract for any defects in material and workmanship. This shall include:

1. All loops and WIM sensors on site.
2. Interface operations and system electronics.
3. WIM cables, connectors, terminal strips and back-up batteries.
4. New notification signs and structures.
5. Communication systems.
6. All enforcement cameras and equipment.
7. Mainline sorting systems.
8. OPEN/CLOSED signs.
9. Ramp Lane Control systems.
10. Electrical power wiring and conduit.
11. Weigh Station computer system:
    a. Scale Manager
    b. Vehicle Display
    c. Station PC
    d. Override Console
12. Printer

The warranty agreement shall include all:

1. Emergency repair service.
2. Routine maintenance service at 6-month intervals.
3. Mobilization, parts, labor, and shipping.
4. Equipment updates, upgrades, modifications, and recalls.
5. System interface and electronics updates, upgrades, modifications, and recalls.
6. Traffic control.
7. Training for major system updates or upgrades.
8. Operator refresher courses.

The weigh-in-motion system shall be warranted by the contractor, in writing, against defects in or from material, workmanship, lightning, and to perform as required by these technical special provisions, giving proper and continuous service under all conditions required and specified, or which may reasonably be inferred, for a period of five years from the date of acceptance. The written contractor's warranty shall be furnished to the engineer by the contractor at the time the equipment performance supporting data is submitted. The new components of the complete system shall be warranted by the manufacturer, in writing, against defects in or from material, workmanship, lightning, rodents and perform as required by these technical special provisions for the specified period or as described above from the date of final acceptance of the project.

C.1 Scheduled Maintenance Services

The scheduled maintenance service shall include the following:

1. Signal checks and testing measures on all loops.
2. Verify proper operation of loops from Virtual Graphics interface in building.
3. Visually inspect WIM sensors from shoulder for cracks and unusual damage.
4. Visually inspect roadway around WIM sensors for deterioration or issues that could impact the sensors.
5. Check and record WIM sensor reading on each sensor in roadside cabinet.
6. Visual inspection and cleaning of system cabinets and electronics.
7. Ensure each roadside cabinet has rodent protection in place and is pest free.
8. Ensure wires are secure and conduit is in place.
9. Ensure battery backups are operating.
10. Cabinet mechanical condition inspection.
11. Clean or replace each roadside cabinet air filter.
12. Heating, ventilation, and air conditioning check.
13. Verify drawings are located in cabinet.
14. Verify proper power, ground, and lightning protection.
15. Structural integrity check of all new poles and structures.
16. Test all message signs and signals are operating.
17. Inspection and verification of computer communication systems.
18. Camera inspection, testing and maintenance, including cleaning of camera lenses.
19. Parts, labor, and shipping.
20. Mobilization and traffic control necessary to perform the maintenance services.
21. Perform WIM accuracy tests and adjust as required to comply with standards.
22. Provide WIM accuracy test print outs to WisDOT.

A report shall accompany the scheduled maintenance service and shall be submitted to the department. The report shall include:

1. Pass/Fail grading of all loops and sensors.
2. A checklist of all components checked as listed above, as well as the location of the components and comments on their general state.
3. A checklist and commentary detailing whether each component (as listed above) met standards or required repairs.

C.2 Emergency Repair Services

Emergency repair services shall be completed on an as-required basis. The maximum response time for emergency repair services shall not exceed 48 hours after written receipt of notice by fax, phone, or email. The vendor shall initiate on-site repairs within 3 business days of notification. Some components of the system are not readily available and require lead time for delivery before being installed. These will be handled on a case-by-case basis. Emergency repair services shall include all parts, labor, shipping, mobilization, and traffic control necessary to perform the work.

C.3 Operator Refresher Courses

In conjunction with the scheduled maintenance services, the Vendor shall provide Operator Refresher Courses on the operation of the entire WIM system upon request. The courses shall have a maximum duration of four hours and shall be scheduled before or after the annual maintenance service. The course attendees shall be determined by the department.

D Measurement

The department will measure Weigh-In-Motion System Warranty Maintenance 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.0060.203	Weigh-In-Motion System Warranty Maintenance	EACH

Payment is full compensation for providing the warranty bond, all warranty maintenance service and emergency repair service for a period of five years and shall include all labor, tools, parts, shipping, mobilization, traffic control and incidentals necessary to perform the maintenance service.

64. Static Scale System Warranty Maintenance, Item SPV.0060.204.

A Description

Provide warranty and maintenance service for the Static Scale System for a period of five years. Provide routine maintenance on all major systems, system components and ancillary equipment at annual intervals. Provide emergency repair services on an as-required basis.

The static scale equipment shall be warranted by the manufacturer, in writing, against defective in or from material, workmanship, lightning, and to perform as required by these technical special provisions, giving proper and continuous service under all conditions required and specified, or which may reasonably be inferred, for a period of five years from the date of final acceptance. The manufacturer’s routine maintenance schedule shall be stated. The written manufacturer’s warranty shall be furnished to the department by the contractor at the time the equipment performance supporting data is submitted. The warranties shall also state they are subject to transfer to the department.

The static scale equipment weighing instruments, load cells, weigh bridge, deck and hardware shall be warranted by the manufacturer, in writing, against defects in or from material, workmanship, lightning, and perform as required by these technical special provisions for the period of five years or as described above from the date of final acceptance of the project.

A.1 Warranty Bond

The contractor shall provide a warranty bond for the Static Scale System Warranty Maintenance. The bond will be in effect for the entire five-year warranty period beginning when the Static Scale System is completed, operational and finally accepted. The bonding company must have an AM Best rating of "A-" or better and the contractor will provide proof of a five-year bond commitment before execution of the

contract. This warranty bond is separate from any other bonds required for this project, such as the contract bond for performance and payment.

The warranty bond amount will be for $25,000. The bond will ensure the proper and prompt completion of required warranty work following completion of the contract work, including payments for furnishing all labor, equipment, and materials used according to this specification.

The contract bond, which remains in effect for one year beyond the date of final acceptance of the project, will also include warranty work as described in this article. For the remaining four (4) year warranty period, provide documentation that the warranty bond will be provided in a single term four-year warranty bond.

Failure of the contractor or its surety to issue the warranty bond will be considered a default and will result in forfeiture of the face amount of the bond to the department.

All warranty work will be as prescribed in this article. At the end of the warranty period, the contractor will be relieved of the responsibility to perform further warranty work, provided all previous warranty work has been completed.

Maintain insurance, in the course of performing warranty work, as specified in standard spec 107.26 throughout the five-year warranty period.

B (Vacant)

C Methods

C.1 Maintenance Services

Scheduled maintenance services shall be performed annually. The scheduled maintenance service shall include the following:

1. Visual inspection of the static scale system
2. Calibration of the scale
3. Lubrication of load cells and bumpers (new and existing)
4. Power washing of the scale deck and pit with 2500 psi minimum pressure washer and disposal of debris
5. Parts, labor and shipping
6. Mobilization and traffic control necessary to perform the maintenance services All scale materials shall become the property of the contractor.

A report shall accompany the scheduled maintenance service and shall be submitted to the department. The report shall include:

1. Calibration process and results.
2. Work completed.
3. Evaluation of the static scale system.
4. Other comments.

C.2 Emergency Repair Services

Emergency repair services shall be completed on an as-required basis. The maximum response time for emergency repair services shall not exceed 48 hours after written receipt of notice by email or fax. The vendor shall initiate on-site repairs within three calendar days of notification. Emergency repair services shall include all parts, labor, shipping, mobilization and traffic control necessary to perform the work.

D Measurement

The department will measure Static Scale System Warranty Maintenance as each individual, unit in place and acceptably completed according to the contract.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.204	Static Scale System Warranty Maintenance	EACH

Payment is full compensation for providing the warranty bond, all warranty maintenance service and emergency repair service for a period of five years and shall include all labor, tools, parts, shipping, mobilization, traffic control and incidentals necessary to perform the maintenance service.

65. Virtual Weigh Station System Warranty Maintenance, Item SPV.0060.205.

A Description

Provide warranty and maintenance service for the weigh-in-motion scale system for a period of five years. This system includes weigh-in-motion sensors, cameras, system components and ancillary equipment. Provide routine maintenance on all major systems, system components and ancillary equipment at 6-month intervals. Provide emergency repair services on an as-required basis.

A.1 Warranty Bond

The contractor shall provide a warranty bond for the Virtual Weigh Station System Warranty Maintenance. The bond will be in effect for the entire five-year warranty period beginning when the Virtual Weigh Station is completed, operational and accepted. The bonding company must have an AM Best rating of "A-" or better and the contractor will provide proof of a five year bond commitment before execution of the contract.

The warranty bond amount will be for $25,000. The bond will ensure the proper and prompt completion of required warranty work following completion of the contract work, including payments for furnishing all labor, equipment, and materials used according to this specification.

The contract bond, which remains in effect for one year beyond the completion of the project, will also include warranty work as described in this article. For the remaining four-year warranty period, provide documentation that the warranty bond will be provided in a single term four-year warranty bond.

Failure of the contractor or its surety to issue the warranty bond will be considered a default and will result in forfeiture of the face amount of the bond to the department.

All warranty work will be as prescribed in this article. At the end of the warranty period, the contractor will be relieved of the responsibility to perform further warranty work, provided all previous warranty work has been completed.

Maintain insurance, in the course of performing warranty work, as specified in standard spec 107.26 throughout the five-year warranty period.

B (Vacant)

C Methods

The contractor shall warrant all subsystems and system components as supplied for five years from the date of issuance of the certificate of final acceptance of VWIM System by the engineer.

The warranty shall cover all WIM system components, hardware and software, included in the contract for any defects in material and workmanship. This shall include:

1. All loops and WIM sensors on site.
2. Interface operations and system electronics.
3. WIM cables, connectors, terminal strips and back-up batteries.
4. New notification signs and structures.
5. Communication systems.
6. All enforcement cameras and equipment.
7. Electrical power wiring and conduit.

The warranty agreement shall include all:

1. Emergency repair service.
2. Routine maintenance service at 6-month intervals.
3. Mobilization, parts, labor, and shipping.
4. Equipment updates, upgrades, modifications, and recalls.

5. System interface and electronics updates, upgrades, modifications, and recalls.
6. Traffic control.
7. Training for major system updates or upgrades.
8. Operator refresher courses.

The virtual weigh-in-motion system shall be warranted by the contractor, in writing, against defects in or from material, workmanship, lightning, and to perform as required by these technical special provisions, giving proper and continuous service under all conditions required and specified, or which may reasonably be inferred, for a period of five years from the date of acceptance. The written contractor's warranty shall be furnished to the engineer by the contractor at the time the equipment performance supporting data is submitted. The new components of the complete system shall be warranted by the manufacturer, in writing, against defects in or from material, workmanship, lightning, rodents and perform as required by these technical special provisions for the specified period or as described above from the date of final acceptance of the project.

C.1 Scheduled Maintenance Services

The scheduled maintenance service shall include the following:

1. Signal checks and testing measures on all loops.
2. Visually inspect WIM sensors from shoulder for cracks and unusual damage.
3. Visually inspect roadway around WIM sensors for deterioration or issues that could impact the sensors.
4. Check and record WIM sensor reading on each sensor in roadside cabinet.
5. Visual inspection and cleaning of system cabinets and electronics.
6. Ensure each roadside cabinet has rodent protection in place and is pest free.
7. Ensure wires are secure and conduit is in place.
8. Ensure battery backups are operating.
9. Cabinet mechanical condition inspection.
10. Clean or replace each roadside cabinet air filter.
11. Heating, ventilation, and air conditioning check.
12. Verify drawings are located in cabinet.
13. Verify proper power, ground, and lightning protection.
14. Structural integrity check of all new poles and structures.
15. Inspection and verification of computer communication systems.
16. Camera inspection, testing and maintenance, including cleaning of camera lenses.
17. Parts, labor, and shipping.
18. Mobilization and traffic control necessary to perform the maintenance services.
19. Perform WIM accuracy tests and adjust as required to comply with standards.
20. Provide WIM accuracy test print outs to WisDOT.

A report shall accompany the scheduled maintenance service and shall be submitted to the department. The report shall include:

1. Pass/Fail grading of all loops and sensors.
2. A checklist of all components checked as listed above, as well as the location of the components and comments on their general state.
3. A checklist and commentary detailing whether each component (as listed above) met standards or required repairs.

C.2 Emergency Repair Services

Emergency repair services shall be completed on an as-required basis. The maximum response time for emergency repair services shall not exceed 48 hours after written receipt of notice by fax, phone, or email. The vendor shall initiate on-site repairs within 3 business days of notification. Some components of the system are not readily available and require lead time for delivery before being installed. These will be handled on a case-by-case basis. Emergency repair services shall include all parts, labor, shipping, mobilization, and traffic control necessary to perform the work.

D Measurement

The department will measure Virtual Weigh Station System Warranty Maintenance as each individual unit, in place and acceptably completed according to the contract.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.206	Virtual Weigh Station System Warranty Maintenance	EACH

Payment is full compensation for providing the warranty bond, all warranty maintenance service and emergency repair service for a period of five years and shall include all labor, tools, parts, shipping, mobilization, traffic control and incidentals necessary to perform the maintenance service.

66. Removing Weight Scale and Pit, Item SPV.0060.206.

A Description

Remove and dispose of existing truck weight scale and break down and remove the scale pit according to the pertinent requirements of standard spec 204 and as hereinafter provided.

B (Vacant)

C Construction

All scale materials shall become the property of the contractor.

D Measurement

The department will measure Removing Weight Scale and Pit as each individual unit, in place and 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.0060.206	Removing Weight Scale and Pit	EACH

Payment is full compensation for removing and disposing of the existing truck weight scale; and breaking down and removing the scale pit.

67. Communications Tower, Item SPV.0060.300.

A Description

This special provision describes all work by contractor to provide and install the tower and other associated equipment and materials for the SWEF communications tower site within the work limits as noted in the drawings as produced by Edge Consulting Engineers, Inc. (pages 139-163). The work includes the tower, equipment shelter, fence, ice bridge, lightning protection and grounding systems, antennas, coaxial cables, waveguides and other items as noted in the drawings. The work shall be according to the applicable drawings and the following specifications included with this special provision.

Electrical service work including meter installation and conduit/wiring from the meter to exterior conduit stub at the equipment shelter are included in other bid items.

Fiber optic service connections to the equipment shelter including underground conduits, fiber optic cabling, communications vaults, termination, and patch panels are included in other bid items.

Earthwork, grading, geotextile fabrics and surfacing aggregates for the tower site compound area and access driveway are included in other bid items.

Providing and installing the emergency generator and LP fuel system at the tower site is included in other bid items (SPV.0060.106).

B Materials

Refer to following specification sections for materials information related to this special provision.

C Construction

Refer to following specification sections for construction and installation information related to this special provision.

D Measurement

The department will measure Communications Tower, completed according to the contract and accepted, as a single complete unit of work.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0060.300	Communications Tower	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.

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Communications Tower, Item SPV.0060.300

SECTION 03 30 00 – Cast-In-Place Concrete

PART 1 – GENERAL

SCOPE

Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes. The work under this section consists of providing all work, materials, labor equipment and supervision necessary to provide cast in-place concrete as required in these specifications and the drawings.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

33 81 00 – Communication Towers

REFERENCES

Incorporated Guides and References

American Concrete Institute (ACI):

ACI 302.1R – Guide for Concrete Floor and Slab Construction.

ACI 304R – Guide for Measuring, Mixing, Transporting and Placing Concrete.

ACI 304.2R - Placing Concrete by Pumping Methods.

ACI 305R - Hot Weather Concreting.

ACI 309R – Guide for the Consolidation of Concrete.

ACI 347 – Guide to Formwork for Concrete.

ACI SP-66 – ACI Detailing Manual.

Specifications

American Concrete Institute (ACI):

ACI 117 - Specifications for Tolerances for Concrete Construction and Materials.

ACI 301 - Specifications for Structural Concrete.

ACI 306.1 – Specification for Cold Weather Concreting.

ACI 308.1 – Specification for Curing Concrete.

ACI 315 - Details and Detailing of Concrete Reinforcement.

ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

ASTM International (ASTM):

ASTM A615 – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.

ASTM A704 – Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

ASTM A706 – Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.

ASTM C33 – Standard Specification for Concrete Aggregates.

ASTM C94 – Standard Specification for Ready-Mixed Concrete.

ASTM C150 – Standard Specification for Portland Cement.

ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.

ASTM C260 – Standard Specification for Air-Entraining Admixtures for Concrete.

ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

ASTM C494 – Standard Specification for Chemical Admixtures for Concrete.

ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete.

ASTM C989 – Standard Specification for Slag Cement for Use in Concrete and Mortars.

ASTM C1059 – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.

ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete.

ASTM C1602 – Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

ASTM E164 3 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

ASTM E1745 – Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

DEFINITIONS

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

W/C Ratio: The ratio by weight of water to cementitious materials.

Cured Concrete: The concrete strength at 28 days.

Dry Concrete: The measure of concrete at 80% relative humidity at 40% of the concrete slab-on-grade depth.

Self-Consolidating Concrete (SCC): a highly workable concrete that can flow through densely reinforced or complex structural elements under its own weight and adequately fill voids without segregation or excessive bleeding without the need for vibration.

Passing Ability: The ability of SCC to flow through openings such as the spaces between reinforcing bars without segregation or aggregate blocking.

J-Ring Test: Test used to determine the passing ability of SCC, or the degree to which the passage of concrete through the bars of the J-Ring apparatus is restricted.

J-Ring Flow: The distance of lateral flow of concrete using J-Ring in combination with a slump cone.

Slump Flow: Test method used to measure the unconfined flow and stability of SCC using a slump cone (upright or inverted)

Slump Flow Spread: The numerical value in inches of flow and stability of SCC using a slump cone (upright or inverted).

Slump Flow Spread: The numerical value in inches of flow determined as the average diameter of the circular deposit of SCC at the conclusion of the slump flow test.

T50 Value: Time (in seconds) the edge of the concrete mass takes to reach 50 cm (20 inches) diameter from the time the mold is first raised in the slump flow test.

Stability: The ability of a concrete mixture to resist segregation of the paste from the aggregates.

Static Segregation (Segregation Factor): Segregation of the mortar from the coarse aggregate that occurs after placement while the concrete is still in the plastic state.

Visual Stability Index (VSI) Rating: An assessment of the homogeneity of concrete based on the visual inspection of the concrete sample at the end of the slump flow test.

SUBMITTALS

Product Data: For each type of product.

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

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

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

Cementitious materials.

Admixtures.

Form materials and form-release agents.

Steel reinforcement and accessories.

Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

Aggregates.

QUALITY ASSURANCE

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

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

Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

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

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

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

Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M.

Concrete In-Situ Relative Humidity and pH:

ASTM F2170-11 – Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs using In-Situ Probes.

ASTM F710-11 – Standard Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.

Digital “Reader” and calibrated relative humidity sensors

Factory-calibrated “Smart Sensors” using Touch-n-Sense TM technology or similar testing equipment.

National Insitute of Standards for Testing (NIST) – traceable factory calibration.

Wide range pH paper, and distilled or de-ionized water.

DELIVERY, STORAGE, AND HANDLING

Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage. Avoid damaging coatings on steel reinforcement.

FIELD CONDITIONS

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

When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.

Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.

Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

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

Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is contractor's option.

Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

FORM-FACING MATERIALS

Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces.

Furnish in largest practicable sizes to minimize number of joints.

Plywood, metal, or other approved panel materials.

Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

High-density overlay, Class 1 or better.

Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.

Structural 1, B-B or better; mill oiled and edge sealed.

B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

Overlaid Finnish birch plywood.

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

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

Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

Void Forms: Biodegradable paper surface, treated for moisture resistance, structurally sufficient to support weight of plastic concrete and other superimposed loads.

Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

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

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

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

STEEL REINFORCEMENT

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

Steel Bar Mats: ASTM A 184/A 184M, fabricated from ASTM A 615/A 615M, Grade 60, deformed bars, assembled with clips.

Plain-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, plain, fabricated from as-drawn steel wire into flat sheets.

Deformed-Steel Welded-Wire Reinforcement: ASTM A 1064/A 1064M, flat sheet.

REINFORCEMENT ACCESSORIES

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

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

CONCRETE MATERIALS

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

Cementitious Materials:

Portland Cement: ASTM C 150/C 150M, Type I gray.

Fly Ash: ASTM C 618, Class C.

Slag Cement: ASTM C 989/C 989M, Grade 100 or 120.

Normal-Weight Aggregates: ASTM C 33/C 33M coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

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

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

ADMIXTURES

Admixtures to be used in the concrete mixture shall be submitted for approval as part of the mixture design. No other admixtures will be allowed except those listed without the architect's approval.

Air-Entraining Admixture: ASTM C 260/C 260M.

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

Water-Reducing Admixture: ASTM C 494/C 494M, Type A.

Retarding Admixture: ASTM C 494/C 494M, Type B.

Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.

Viscosity-Modifying Admixture: ASTM C 494/C 494M, Type S.

High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.

High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.

Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

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

VAPOR RETARDERS

Sheet Vapor Retarder: Polyethylene sheet, ASTM D 4397, not less than 10 mils thick.

CURING MATERIALS

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

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

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

Water: Potable.

RELATED MATERIALS

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

Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

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

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

CONCRETE MIXTURES, GENERAL

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

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

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

Combined Fly Ash or Pozzolans, Slag Cement, and Silica Fume: 50 percent with fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

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

Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.

Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

CONCRETE MIXTURE SCHEDULE

Class	Type of Construction	Min. Comp Strength @ 28 Days (PSI)	Slump Before addn. of HRWR (in. +/- 1 in.)	Max. Agg. Size (in.)	Air Water Cement Ratio	Entrain-ment % +/- 1½%	Notes
2a	Exterior slab-on-grade	4000	3	0.75	0.44	6.0	(2)(4)
2b	Exterior Site concrete	4000	3	0.75	0.44	6.0	(2)(4)(6)
9	Miscellaneous non-scheduled concrete	4000	5	0.75	0.59	6.0	(2)
10	Utility Concrete	4000	3	0.75	0.48	6.0	(2)(3)

Notes:

(1) Use a maximum of 50% replacement of portland cement with ground granulated blast-furnace slag and fly ash at a 1:1 ratio, up to 350 pounds per cubic yard. If fly ash is used alone, limit the maximum re-placement to 25%.

(2) Use a maximum of 30% replacement of portland cement with ground granulated blast-furnace slag and fly ash at a 1:1 ratio, up to 350 pounds per cubic yard, with a maximum 25% fly ash. If fly ash is used alone, limit the maximum replacement to 25%.

(3) Use High-Range, Water-Reducing Admixture in mixture.

(4) High-Range, Water-Reducing Admixture may be used in mixture.

(5) Maximum equilibrium dry weight of lightweight aggregate mix: 115 pounds per cubic foot, as determined by section 9.5 of ASTM C 567.

(6) Coordinate with site/civil and landscape concrete elements.

FABRICATING REINFORCEMENT

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

CONCRETE MIXING

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

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

PART 3 - EXECUTION

FORMWORK INSTALLATION

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

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

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

Class A, 1/8 inch for smooth-formed finished surfaces.

Class B, 1/4 inch for rough-formed finished surfaces.

Construct forms tight enough to prevent loss of concrete mortar.

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

Install keyways, reglets, recesses, and the like, for easy removal.

Do not use rust-stained steel form-facing material.

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

Chamfer exterior corners and edges of permanently exposed concrete.

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

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

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

EMBEDDED ITEM INSTALLATION

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

Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC 303.

Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

Install dovetail anchor slots in concrete structures as indicated.

REMOVING AND REUSING FORMS

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

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

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

STEEL REINFORCEMENT INSTALLATION

General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

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

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

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

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

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

JOINTS

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

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

> Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
>
> Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
>
> Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
>
> Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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

> Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes.
>
> Eliminate groover tool marks on concrete surfaces.
>
> Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

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

Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

CONCRETE PLACEMENT

Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.

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

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

Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.

Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.

Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

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

Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.

Maintain reinforcement in position on chairs during concrete placement.

Screed slab surfaces with a straightedge and strike off to correct elevations.

Slope surfaces uniformly to drains where required.

Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

FINISHING FORMED SURFACES

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

Apply to concrete surfaces not exposed to public view.

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

Apply to concrete surfaces exposed to public view.

Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.

Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

FINISHING FLOORS AND SLABS

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

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

Apply float finish to surfaces to receive trowel finish.

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

Apply a trowel finish to surfaces exposed to view.

Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

Finish and measure surface, so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.

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

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

MISCELLANEOUS CONCRETE ITEM INSTALLATION

Foundations:

Coordinate sizes and locations of concrete bases with actual equipment provided.

Construct concrete bases 6 inches high unless otherwise indicated, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated or unless required for seismic anchor support.

Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.

For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.

Prior to pouring concrete, place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

Cast anchor-bolt insert into bases. Install anchor bolts to elevations required for proper attachment to supported equipment.

CONCRETE PROTECTING AND CURING

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

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

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

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

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

Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

Maintain continuity of coating and repair damage during curing period.

CONCRETE SURFACE REPAIRS

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

Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

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

Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar matches surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.

Compact mortar in place and strike off slightly higher than surrounding surface.

Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by architect.

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

Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.

After concrete has cured at least 14 days, correct high areas by grinding.

Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.

Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.

Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

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

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

FIELD QUALITY CONTROL

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

Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172/C 172M shall be performed according to the following requirements:

Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof. For tower foundations, obtain sample from the tower legs/piers in addition to the mat.

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

Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.

Air Content: ASTM C 231/C 231M, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

Unit Weight: ASTM C 567/C 567M, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

Compression Test Specimens: ASTM C 31/C 31M.

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

Compressive-Strength Tests: ASTM C 39/C 39M;

Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days, min.

A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.

Test results shall be reported in writing to architect, concrete manufacturer, and contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by architect.

Additional testing and inspecting, at contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00

SECTION 13 34 23 – Precast Concrete Communication Shelters

PART 1 – GENERAL

SCOPE

The work under this section includes requirements for the manufacture and installation of prefabricated precast concrete communication shelters as detailed in the plans and specified below.

RELATED WORK AND PROVISIONS

Applicable provisions of Divisions 1 and 26 shall govern all work under this section.

Section 13 30 00 – Communication Tower

Section 13 30 10 – Coax and Waveguides

DESCRIPTION OF SYSTEM

Precast Concrete Communications Shelters are required at one (1) tower site. Shelter sizes (nominal) shall be as follows:

- Hudson, Wisconsin: (1) - 12’ x 24’

Refer to the drawings for layout and configuration of each shelter.

Shelters shall be of a similar layout and design, however “mirrored” configurations may be required.

All shelters shall be produced and constructed by the same manufacturer.

EQUIPMENT AND MATERIALS FURNISHED BY OTHERS

None.

WORK BY OTHERS

Owner will install all equipment racks and radio equipment within the racks.

Owner will make final connection of prepared coax lines within the equipment building to radio equipment.

Owner will install alarm wiring from monitored devices within equipment shelter to R66 block.

SHELTER MANUFACTURER

The equipment shelter manufacturer shall have been engaged in the production of pre-cast concrete shelters for the telecommunications industry for a minimum of ten years.

Pre-approved manufacturers include:

1. Cellxion – Bossier City, LA
2. Fibrebond – Minden, LA
3. Old Castle Precast – Hartford City, IN
4. VFP – Roanoke, Virginia
5. Thermo Bond – Elk Point, South Dakota
6. Other manufacturers may be allowed at the discretion of the owner and A/E.

SHELTER DESCRIPTION

Each communication shelter shall be a prefabricated precast concrete steel reinforced structure. No other type of construction material is permitted. The building exterior shall be the nominal dimensions as noted in the plans with a minimum of 1 ½” roof overhang on all sides. The roof shall be a cap type to provide a drip point for rain water to drip clear of the shelter wall. The finished inside clear height shall be at least 9'-0”.

Roof shall be solid concrete and have a center ridge to provide water runoff with a min. thickness of 5” at the eave and 6” at the ridge.

Walls shall be 4” min. solid concrete with an exposed aggregate exterior finish. Exposed aggregate shall be sealed. No sandwich type construction permitted.

Concrete floor shall support the design loads and specialized equipment.

Shelters shall be sealed and waterproofed at the factory.

Shelters shall be designed to be handled and off-loaded with standard pickups at the base of the shelter. Roof pick points for handling the structure are not permitted.

MINIMUM DESIGN REQUIREMENTS

The building shall be designed to meet the following minimum loading:

1. Roof Live Load 90 PSF
2. Floor Live Load 200 PSF
3. Floor Dead Load 75 PSF
4. Wall Wind Load 150 MPH
5. Earthquake Zone 4
6. Ballistic tested for UL 752 (HPR – 30.06 – Point Blank Range)
7. Roof Ice impact loading 40 lbs at 225’

In addition to the requirements set forth in these specifications, this structure will also meet or exceed, to the extent applicable, but not limited to, the requirement of the latest documents as follows:

1. ANSI/NFPA-70 and NFPA-78
2. MIL-I-45208
3. ASTM-E-84
4. ANSI-58
5. MIL-188-124A
6. PS1-74999
7. All applicable equipment is U.L. listed.

The building, once mounted, shall be able to withstand wind loadings of 120 MPH without moving, turning over or damage.

ELECTRICAL DESIGN AND INSTALLATION

All electrical systems shall be designed and installed according to the National Electric Code (NEC), latest edition and applicable local codes for the jurisdiction in which the shelter is to be installed.

All electrical and grounding systems shall be installed by a state licensed electrician.

Electrical system shall be operational on 120/240VAC, single Phase.

DESIGN CERTIFICATION

Shelters shall be professionally engineered to meet state and local building code requirements for the location in which it is to be delivered. Design calculations signed and sealed by a registered professional engineer stating the building system meets design load requirements shall be available upon request.

Shelters shall be approved, inspected, and labeled by an independent third-party agency. Inspections must be completed, and labels applied prior to delivery to the site.

Shelters shall be designed to meet the requirements of the following:

1. American National Standards (A.N.S.) "Building Code Requirement for Minimum Design Loads in Buildings and Other Structures."
2. American Concrete Institute (A.C.I.-318R-05) "Building Code Requirements for Reinforced Concrete."
3. Concrete Reinforcing Institute "Manual of Standard Practice."
4. State and Local Jurisdiction current Building Codes

SUBMITTALS

Refer also to Section GC - General Conditions of the Contract.

Submit shelter manufacturer's pre-production (shop) drawings of supplied equipment shelters. Shop drawings to include the following:

1. Title sheet with plan index, code summary, design parameters, physical properties and finish schedule.
2. Interior and exterior elevations noting all equipment, devices and relevant dimensions.
3. Interior floor and ceiling plans noting all equipment, devices and relevant dimensions.
4. Electrical plan with one line diagram, panel board layouts, lighting layout, motor and lighting fixture schedules, wiring schematics, conduit and receptacle layout and all associated details.
5. Cable tray layout including details for installation.
6. Grounding Plan.
7. Alarm Schematic.
8. Foundation Plan.
9. Shelter cross section, construction details and connection details.
10. Drawings signed and sealed by a Registered Professional Engineer licensed in the State of shelter delivery. Engineer to certify the building design and construction meets the minimum requirements specified herein along with all requirements of the State Building Code.

Submit manufacturer’s cut sheets of devices, equipment and other items installed as part of the equipment shelter package. Minimum items requiring submittal include the following:

1. Electric service disconnects/safety switches.
2. Electric panel boards.
3. Electrical wiring devices.
4. Lights – Interior/Exterior.
5. Smoke detectors.
6. Surge protection devices (SPDs).
7. HVAC units and controllers.
8. Doors and door hardware.
9. Cable tray.
10. Wave guide entry ports.
11. Alarm blocks.
12. Ground bars.
13. Coaxial Surge Protector Trapeze.
14. Grounding halo supports.

All submittals must receive approval prior to equipment shelter manufacture.

Provide one electronic (pdf) copy of all submittals.

WARRANTY

Shelters shall be warrantied from water intrusion into the structure for a period of 10 years from the date of project substantial completion.

All shelter electrical, HVAC and mechanical components shall be warrantied for period of one year from the date of project substantial completion.

Warranties shall be full service and include onsite repair work and/or replacement of defective components.

PART 2 - PRODUCTS

MATERIALS

General:

The materials furnished shall include a precast concrete structure, fasteners, anchors, sealants, doors, cable tray, electrical, HVAC, and all other parts/equipment necessary for a complete building system as detailed in the plans and specifications.

Concrete:

Steel-Reinforced (ASTMA615 Grade 60 and ASTMA-185 Welded Wire Fabric), 5,000 PSI minimum, 28 Day Compressive Strength, Air-Entrained (ASTM C260).

Electrical:

Electrical equipment and labor shall comply with the most recent edition of the National Electrical Code, Local Jurisdiction, and applicable Division 26 specifications.

Exterior:

The exterior wall finish shall be an exposed aggregate with an earth tone brown color. The exterior finish shall be sealed with an approved compound designed for this application.

Doors, awnings, ventilation hoods and other exterior steel surfaces shall be primed and painted the same color with rust inhibitor paint.

Roof surface shall be trowel and sealed with a liquid membrane coating. Roof edges are to be smooth without chips or irregular surface.

Interior:

Concrete walls and ceiling shall be covered with White Nu-Poly FRP over 3/8” OSB. Wood framing studs are permitted when 3/4” OSB is used.

Concrete floor shall be rotary trowel to smooth and flat surface. The floor shall be sealed with epoxy built up coating, covered with commercial vinyl floor tile and include vinyl base cove installed around the perimeter.

Fire Resistant:

The exterior and interior walls shall have at least a two hour fireproof rating without affecting the structural properties of the building.

Insulation:

Energy calculations conforming to the International Energy Conservation Code (current revision with state amendments) shall be submitted with the completed design documents. The shelter shall have the following minimum insulation values:

Exterior walls: R-19

Ceiling: R-22

Doors:

Insulated painted 18 GA galvanized steel door and 16 GA painted galvanized steel frame, cast-in.

Hardware to include NRP stainless steel hinges, stepped threshold, door sweep, anti-pick guard, door bumper, drip cap, weather canopy, weather stripping, Door stop T latch and hydraulic door closer.

Size: See plans

Door Hardware:

Electronic pushbutton door lock system with manual key-in-lever override.

Key cores to be removeable/interchangeable.

Finish: Satin Chrome

Make/Model: E-Plex 5000 series as manufactured by dormakaba, or equivalent.

Electrical System:

Utility Power: 120/240 VAC single phase, 60hz, 200Amp

Service Disconnect (SD): 200A Fusible

Automatic Transfer Switch (ATS): See Emergency Generator Communications Tower, SPV.0060.105

Distribution Panel (PP1): 200A (42) Circuit with 200A main breaker and branch breakers as required

Surge Protection Devices (SPDs):

a. SPD1:
    1) Type 1, 200KA Surge Capacity, EMI/RFI Filtering, Form C Dry Contacts
    2) Mersen Surge Trap XT Series, Transtector IMAX Series, or equiv.
b. SPD2:
    1) Type 2, 200KA Surge Capacity, Form C Dry Contacts
    2) Mersen Surge Trap XT Series, Transtector IMAX Series, or equiv.
c. Provide 60A 2P disconnects
d. Surge protection devices shall include alarm contacts

Receptacles and Circuits: 120V and 240V per drawings

All wiring will be installed in surface mounted conduit or wire ways and will be in full compliance with ANSI/NFPA-70; The National Electric Code, Latest Revision.

All conduit runs shall utilize compression type conduit fittings to maintain ground bond between conduit runs and device boxes.

All receptacles and devices shall be labeled with the circuit/breaker number which controls each device. The label shall be mounted directly adjacent to the receptacle.

Lighting:

Interior: 4ft single bulb LED fixture with wrap around protective lens

a. 4600 lumens
b. 4000 CCT
c. 35-watt
d. Interior light system to be operational via manual switch and occupancy sensors.

Exterior: LED wall pack

a. 4000 lumens
b. 4000 CCT
c. 30-watt

d. Motion sensor

e. Photo-cell

f. Exterior light system to be operational via manual switch, timer and photocell.

Emergency: Twin bulb LED with battery backup. EXIT sign located over each doorway.

Smoke Detectors:

There shall be a smoke detector installed in each room.

The smoke detectors shall include dry alarm contacts.

The smoke detectors shall be operated on the mains power with battery backup.

Alarms:

Unless otherwise specified, all alarm contacts shall be normally closed, SPST, common ground and wired to the alarm R66 punch blocks located on the alarm panel. The contact closures on the relays shall be capable of sinking 100 ma at –48 volts dc.

Provide (1) punch block

Provide conduits from all devices with dry contacts to R66 punch block even when alarm wiring is completed by others. Devices requiring alarm wiring conduits include:

Door Alarm contact

Smoke Alarm

HVAC Controller

ATS

SPDs

Tower Lighting Controller

Dehydrator

All alarm contacts requiring wiring shall be wired from each device back to the alarm punch block within conduit. The alarms to be wired to the R66 punch block include the following:

a. Shelter: None.

a. Generator: See Emergency Generator Communications Tower, SPV.0060.105

b. Automatic Transfer Switch (ATS): See Emergency Generator Communications Tower, SPV.0060.105

HVAC:

The HVAC system shall include Two (2) lead-lag controlled wall mount air conditioning units

a. 3.0 Ton (35,200 BTUH)

b. 230V, 1P, 60 Hz

c. Efficiency shall provide 11.0 EER minimum cooling ratio

d. Lead lag controller: Bard MC4002-A

e. Economizer

f. Low ambient air kit to allow compressor to run down to 0 degrees F.

g. 5KW heat strip

Cable Tray:

1. 12”, 18”, 24” or other size overhead cable ladder per drawings
2. 1 ½” stringers
3. 9” rung spacing
4. Zinc dichromate finish
5. Finished installed height: Per drawings

Wave Guide Entry Port:

16 hole or other size port waveguide/coax entry port panels (see plans). 4” diameter port openings with cushions and caps sized for installed transmission lines.

Grounding:

Interior ground halo: #2 AWG stranded insulated copper conductor installed on all four walls of equipment room located approximately 6-inches below ceiling level. Ground halo shall be mounted on 3-inch standoffs. Maintain gaps in halos as noted in the plans.

Neutral – Ground Bond: Install #2 AWG stranded insulated conductor from service disconnect (SD) grounding terminal to MGB.

Provide one #2 AWG stranded insulated copper conductor from the following items to the Master Ground Bar:

a. Coaxial Surge Protector Trapeze
b. Cable Tray System
c. Each Equipment Rack

All metallic items and boxes inside the shelter shall be individually bonded to the halo using #6 AWG stranded insulated copper conductors. All bond wires jumpers shall be oriented with direction flowing toward the MGB.

Provide #6 AWG stranded insulated copper ground bond jumpers between sections of cable tray and cable tray splices.

Ground bond connections shall be mechanical type (unless otherwise noted in the drawings) utilizing 2-hole lugs with stainless steel hardware. Paint shall be scraped from boxes and devices being connected to ensure good electrical continuity. Install anti-oxidant compound between lug and connection point. Use copper anti-oxidant for copper to copper connections.

All conduit runs shall utilize compression type conduit fittings to maintain ground continuity between sections of conduit and connected boxes and devices.

Ground Bars: Provide ground bars as noted in the drawings. All ground bars shall be solid copper.

a. 24”x4”x1/4” providing 44 two-hole grounding lugs, (Site Pro Part No. MG42488K or equivalent).
b. Interior Master Ground Bar (MGB): Bare Copper.
c. Exterior Ground Bar: Tinned Copper.
d. Use PANI Organization system for ground lead connections to MGB.

Coaxial surge protector trapeze: SitePro1 model: ATK306U or equiv.

Miscellaneous:

a. Telco board.

b. Service manual wall pocket.

c. Fire extinguishers: One 10 lb class BC Carbon Dioxide.

d. First aid kit.

e. Tie down plates and hardware.

PART 3 - EXECUTION

EXAMINATION

Confirm access to site is sufficient for shelter delivery and crane operation.

Verify site installed conduits align with shelter penetrations.

PREPARATION

Allow shelter foundation to adequately cure prior to installing shelter. Provide concrete break strength reports to document concrete has achieved design strength requirements prior to installation.

Provide crane of suitable size for lifting and placing shelter.

INSTALLATION

Install shelter per manufacturer's recommendations including shims, canopies and tie downs.

Ground shelter per drawings and specifications.

Connect electrical, communication and other conduits stubs and wiring to shelter.

Field install any other equipment and devices not furnished in the prefabricated structure which are required as part of the project.

Install coax and waveguides from antennas and dishes mounted on towers to interior side of equipment shelter per the drawings and specifications.

CLEANING

Periodically clean shelter throughout construction process.

Perform final cleaning at the time of substantial completion to remove excess construction materials, debris and dirt tracked in from worksite.

END OF SECTION 13 34 23

SECTION 31 23 16.13 – Trenching

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to complete trenching for utilities and other work, as required in these specifications, on the drawings and as otherwise deemed necessary to complete the work.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

REFERENCE STANDARDS

American Society for Testing and Materials (ASTM):

D422 Standard Test Method for Particle Size Analysis of Soils

D4318 Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils

D698 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort

D1557 Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort

D2922 Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods

D3017 Standard Test Methods for Water Content of Soil and Rock in Place by Nuclear Methods

E329 Standard Specifications for Agencies Engaged in Construction Inspection, Testing, or Special Inspection

QUALITY ASSURANCE

The contractor shall conduct sampling, testing, and analysis as required by this section and elsewhere in the Contract Documents either by retaining the services of an independent construction materials testing consultant or with internal certified testers. The materials testing personnel shall meet the requirements of ASTM E329.

The contractor's construction materials testing personnel shall complete material testing as outlined in Table 31 23 16.13-1:

Table 31 23 16.13-1

Material	Test Required	Test/Sample Frequency
Bedding/Initial Cover	D2922 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test / 500 lf trench
All Fill	D2922 Standard Test Method for Density of Soil and Soil Aggregate in Place by Nuclear Methods	1 test / 500 lf trench

SUBMITTALS

Provide grainsize analysis for all materials.

Provide manufacturers product information for geotextile fabric.

Provide written plan(s) for Support of Existing Utilities for excavations that will expose multiple large utilities at the same time or expose utility or building structures including tunnels, box conduits, manholes and pits. Show anticipated loads and verification that proposed supports are adequate.

Provide copies of all material field testing reports completed for the project to the AE within 48 hours of completing the individual tests. Along with each individual test result, provide a running spreadsheet of all individual test results.

PERMITS/FEES

Contractor shall be responsible for obtaining all permits necessary to complete trenching work. Contractor shall pay all fees associated with obtaining permits. These include, but are not limited to, permits to work within right-of-way.

PART 2 - PRODUCTS

GEOTEXTILE FABRIC

Woven or non-woven fabric shall meet the requirements of the WisDOT SSSHC Section 645.2.1 and 645.2.2, Geotextile Fabric Type SAS.

CRUSHED STONE CHIPS

Pipe 18" Diameter or Less:

Clean material meeting the requirements of "3/8" Crushed Stone Chips" as defined in Section 8.43.2(a)1 of the SSSWC, except that the gradation shall be as shown herein. If used for pipe bedding, Crushed Stone Chips shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1/2 inch	100%
3/8 inch	85 – 100%
No. 4	10 – 30%
No. 8	0 – 10%
No. 16	0 – 5%

Pipe Over 18" Diameter:

Clean material meeting the requirements of "3/4" Crushed Stone Chips" as defined in Section 8.43.2(a)2 of the SSSWC, except that the gradation shall be as shown herein. If used for pipe bedding, Crushed Stone Chips shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1 inch	100%
3/4 inch	90 – 100%
3/8 inch	20 – 55%
No. 4	0 – 10%
No. 8	0 – 5%

CRUSHED STONE SCREENINGS

Crushed stone shall be free of organic material, concrete, asphalt and other debris. Material shall meet the requirements of "Crushed Stone Screenings" as defined in Section 8.43.2(b) of the SSSWC. If used for pipe bedding, Crushed Stone Screenings shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1/2 inch	100%
No. 4	75 – 100%
No. 100	10 – 25%

BEDDING SAND

Sand shall meet the requirements of “Bedding Sand” as defined in Section 8.43.2(c) of the SSSWC. If used for pipe bedding, Bedding Sand shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
1 inch	100%
No. 16	45 – 80%
Material finer Than No. 200	2 – 10%

UTILITY BEDDING SAND

Sand shall meet the requirements of “Bedding Sand” as defined in Section 8.43.2(c) of the SSSWC. If used for pipe bedding, Bedding Sand shall also be used for cover material.

Sieve Sizes	Percent Passing by Weight
No. 8	100%
No. 16	80-95%
No. 30	50-80%
No. 50	20-50%
No. 100	10-20%
Material finer than Than No. 200	1-10%

CRUSHED STONE

When crushed stone is required to affect soil stability or drainage it shall meet the gradation requirement below.

Sieve Sizes	Percent Passing by Weight
2-1/2 inch	100%
2-inch	90-100%
1-1/2 inch	35-70%
1-inch	0 – 15%
½ inch	0 – 5%

UTILITY COVER MATERIAL

Material that is to be used around and over the pipe and above the pipe bedding shall be termed utility cover material. The utility cover material for pipe shall be the same as the bedding material.

CONTROLLED BACKFILL

Granular material, meeting the following above all direct buried utilities:

Sieve Size	Percent Passing by Weight
1 inch	100
3/4 inch	85 - 100
3/8 inch	50 - 80
No. 4	35 - 60
No. 10	25 – 50
No. 40	15 - 30
No. 200	5 - 15

EARTH BACKFILL

Sand/gravel non-cohesive non-expansive, free of vegetable matter, clay, rubbish, rock larger than 2 inches, boulders, concrete, paving, masonry debris, waste, frozen materials, other inorganic and deleterious materials. Existing material meeting these requirements can be reused.

PART 3 - EXECUTION

PREPARATION

General Contractor shall excavate and backfill the following utilities according to this section:

-Direct buried power and signal conduits

-Building services for underground utilities listed above.

Review drawings and prepare work plan and schedule. Coordinate any necessary interruptions in utility service with Construction Representative, according to other specification sections.

Test pits, potholes or other means used to verify the location of existing underground facilities that are shown on the plans are considered incidental to utility installation.

Remove topsoil from work area. Saw cut and remove pavement from the work area. Remove excavated materials throughout the day. Deliver imported materials as needed throughout the day. Locate bedding, backfill and spoil piles according to all governing safety requirements, and do not interfere with public travel, adjacent landowners or other construction activities.

The same trench may not obstruct more than one street at one time without an approved traffic control plan and posted detour.

CONNECTIONS TO EXISTING UTILITIES

Connect to existing utilities according to the requirements of other pertinent specification sections.

DRAINAGE PROTECTION

Prevent surface drainage from entering utility excavations and trenches. Shape area to direct water away from excavation or trench with diversions such as berms, or ditches. If drainage must cross the excavation or trench, use culverts or other structure to minimize water entering the excavation or trench.

EXCAVATION

Excavate to elevations and dimensions necessary to complete construction. Excavations shall be sufficiently deep to provide for bedding beneath pipes and structures and as otherwise required to complete the work as shown. Excavations shall be sufficiently wide to provide for compaction equipment along the side of the pipe and the sidewall of trench or inside wall of trench box, shield or shoring.

The contractor shall provide all trench soil retention, trench boxes, sheeting and/or bracing needed to protect the work, existing property, utilities, pavement, and existing improvements, and to provide safe working conditions in the trench. Removal of any trench soil retention, sheeting and/or bracing from the trench shall not disturb pipe bedding and cover on new or existing utilities. Sheeting and bracing shall be removed unless specific permission to leave it in place is given by the Project Representative.

Contractor shall not excavate soil or impact the area of influence for structure foundations or footings. Notify Project Representative and A/E immediately if foundations or footings are undermined, cracked, damaged or appear unstable.

Unless noted on the drawings, the contractor shall remove all vegetation along the full width of the trench before beginning excavation. Vegetation and soil containing organic material, rock or boulders larger than 6 inches in diameter shall not be used for trench backfill. Unless otherwise specified, surplus material shall be the property of the contractor, and shall be disposed of at contractor's cost.

Trench excavation shall be backfilled when the contractor is not working in the trench. If trench cannot be backfilled due to progression of work, fence shall be installed and extend the full length of open trench on all sides.

UNSTABLE TRENCH BOTTOM

Notify Construction Representative if trench bottom consists of unstable soil, organic material, debris or other undesirable material. When this condition arises, the excavation shall be carried to such depth as directed by the A/E. Undercut backfill shall be shall be installed and mechanically compacted to replace the excavated materials to trench bottom subgrade.

SUPPORT OF EXISTING UTILITIES

Contractor shall support all tunnels, conduits, sewers, structures, piping, wiring and cables that are exposed due to trenching and excavations. Support systems shall maintain current horizontal alignment, prevent vertical deflection and stabilize exposed piping, tunnel, duct package or conduit crossing the trench or running lengthwise in or along the trench.

INSULATION FOR EXISTING UTILITIES

Contractor shall provide temporary insulation over exposed utilities to prevent damage/corrosion, wasted energy and or freezing.

BEDDING AND UTILITY COVER MATERIAL

Excavate trench to depth and alignment of proposed utility lines and grades, allowing for required amount of bedding material. Excavation shall be reasonably free of water prior to placement of bedding material. Bedding material shall be shaped to conform to bell of pipe, fittings and structures.

If unstable soils are adjacent to bedding and cover material in trench wrap bedding and utility cover material in geotextile fabric. Where sheet piling/shoring is abandoned between unstable soil and trench wall geotextile fabric may be omitted.

Bed pipes and place utility cover material for the utility and pipe type being installed according to detail drawings and the depth and compaction requirements specified in table 31 23 16.13-2. After placing pipe, support during placement and compaction of initial utility cover material.

Compaction of utility cover material for pipe and fittings shall be accomplished using hand tools and vibratory plate or tamping type walk behind compactors.

BACKFILL AND COMPACTION

Backfilling shall not begin until excavation is cleaned of trash and debris.

After initial cover material is placed and compacted, backfill and compact trenches using the material specified in Table 31 23 16.13 – 2. Take care to minimize settlement and avoid damage to new and existing structures, pipes, utility lines and other features during backfill placement and compaction. Place backfill simultaneously on all sides of structures. Moisture condition backfill material as necessary to achieve density required for given use. Do not place material on frozen surfaces or use frozen material.

Backfill trenches from the top of utility cover material to subgrade below pavements, base course, and topsoil as required by the drawings. Where final restoration will be delayed backfill trench to match existing grade and maintain surface drainage patterns. Wedge around structures that extend above existing grade with compacted soil or pavement to match the existing surface.

It is the responsibility of the contractor to provide all necessary compaction equipment and other grading equipment that may be required to obtain the specified density. Vibratory plate or tamping type walk behind compactors will be required whenever backfill is placed adjacent to structures, pipes, utility lines and other features.

Flooding or jetting of backfill material for compaction purposes is not allowed.

Table 31 23 16.13-2

Location	Required Material	Maximum Compacted Lift Thickness	Minimum Proctor Compaction	Minimum Relative Density (a)
Bedding Material Beneath Utility Structures	Crushed Stone Chips or Crushed Stone	12”	95% Modified	70%
Bedding Materials Beneath Utilities	Crushed Stone Chips, Crushed Stone Screenings, or Bedding Sand(as required in Division 33)	6”	95% Modified	70%
Utility Cover – Areas Over Bedding Materials to 12” Over Utilities	Crushed Stone Chips, Crushed Stone Screenings, or Bedding Sand (as required in Division 33)	6”	95% Modified	70%
Areas Between Topsoil and Utility Cover	Earth Backfill	12”	90% Modified	50%
Areas Between Utility Cover and Crushed Aggregate Base Course Beneath Existing or Proposed Pavement (Roads, Drives, Walks)	Controlled Backfill	12”	95% Modified	60%
Areas with 10’ of an Existing or Proposed Building or Structure Footing or Slab	Controlled Backfill	12”	95% Modified	60%
Turf Areas	Earth Backfill	12”	88% Modified	50%

(a) Minimum relative density as determined by ASTM D-4253-00 for coarse-grained soils with less than 15% by mass passing the No. 200 sieve. Applicable only when minimum proctor compaction cannot be achieved.

GRADING

Grade areas disturbed during trench excavation and backfilling and adjacent areas as necessary to establish new grades shown on plans as soon as practicable after backfilling. If new grades are not shown on plans, grade areas to tie into the surrounding area without abrupt changes in elevations or slopes and provide drainage away from structures.

New grades are designed to produce desired configuration of site and do not represent a balance between cut and fill.

Grades for earthwork shall not deviate more than 1 inch from plan elevations unless otherwise directed by Construction Representative.

GRADING AROUND TREES

Limit excavation, fill or grading near trees or other vegetation to the extent possible. No excavation, trenching or backfilling shall occur within the fenced tree protection zone of existing trees without authorization from DFD Project Representative. If tree roots are encountered during trenching cut roots cleanly and squarely.

CLEAN UP

Remove excess bedding, backfill and spoil material from the site as soon as possible after backfilling is complete, but no later than 1 calendar day after backfilling is complete.

Thoroughly clean all drainage ways, roads, parking lots sidewalks and paved surfaces and remove and dispose all debris and mud.

END OF SECTION 31 23.16.13

SECTION 32 31 13 – Chain Link Fences and Gates

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide a fully functioning fence and gate installation as provided for in these specifications and on the drawings.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

REFERENCE

Unless otherwise specified in these specifications or otherwise shown on the drawings, conform all work under this section to Section 616 of the Wisconsin Department of Transportation, Standard Specifications for Highway and Structure Construction, current edition.

OWNER FURNISHED MATERIALS

None.

PROVISIONS FOR FUTURE WORK

None.

RECORD DRAWINGS

Maintain record drawings of all fencing installations and points of connection made as part of this project and for future connection on original drawings prepared by the installing contractor/subcontractor. Include copies of record drawings with the Operating and Maintenance instructions.

PART 2 - PRODUCTS

GENERAL

All materials furnished shall be new materials unless otherwise specified. Salvaged materials may be used only when specified.

FENCE HEIGHT

The height of the fence shall be as shown on the drawings. The designated height of the fence shall be the fabric height.

REQUIRED ARMS, RAILS, AND TENSION WIRES

Provide rampart arm, top rail/tension wire, intermediate rail, and bottom rail/tension wire according to the drawings.

REQUIRED COATINGS

All steel items used shall be galvanized, aluminum or zinc aluminum alloy coated.

FABRIC

Provide 9 gauge galvanized coated, two (2) inch mesh fabric, with barbed selvage on bottom and knuckled salvage on top, conforming to ASTM A-392 Class 1.

FABRIC FASTENERS

Provide fabric fasteners of steel wire clips and tie wires galvanized according to ASTM A-641, Class III, or aluminum coated in conformance with fence fabric specifications.

Provide fasteners for posts, top and intermediate rails, bottom rails, top tension wires and braces of 9 gauge steel or 0.179 inch diameter aluminum tie wires.

Provide fasteners for bottom tension wire of not smaller than 12 gauge or 0.149 inch diameter aluminum tie wires.

POST, RAIL AND FRAMING MATERIALS

Framing (Steel): ASTM F1083 Schedule 40 galvanized steel pipe, welded construction, minimum yield strength of 25 ksi; coating conforming to ASTM F1043 Type A on pipe exterior and interior.

Line Posts: 2 1/2 inch OD Sch 40 galvanized steel pipe.

Corner and Terminal Posts: 3 inch OD Sch 40 galvanized steel pipe.

Gate Posts: 4 inch OD Sch 40 galvanized steel pipe.

Top and Brace Rail: 1 5/8 inch OD Sch 40 galvanized steel pipe, plain end, sleeve coupled.

Gate Frame: 2 inch OD Sch 40 galvanized steel pipe for welded fittings and truss rod fabrication.

GATES

Provide additional horizontal and vertical members as necessary to assure proper gate operation and attachment to fabric and hardware.

Provide diagonal braces made of crossed adjustable length 3/8 inch diameter truss rods on non-welded gate frames and on welded frames where corner rigidity is not sufficient to prevent sag.

Gate frames shall be covered with the same fabric as the fence.

Weld or assemble gate frames with malleable or pressed steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges. Attach to frame at 15 inches o.c. all sides. Provide caps for all gate framework ends.

GATE HARDWARE

Provide heavy duty hinges of malleable iron, pressed or forged steel, non-lift-off type, adjusted to permit 180 degree gate opening. Provide two hinges for each leaf.

Provide heavy duty forked type or plunger bar type latches for all single leaf gates. Provide center stop and keeper for all double leaf gates. Provide spring latch for all sliding gates. Provide padlock eye as an integral part of all latches.

Provide lock system and locks as specified on the drawings.

POST TOPS

Provide cast or malleable iron ornamental tops on all posts except 3.5" x 3.5" roll formed sections. Tops shall have an opening for the top rail to pass through.

Post tops shall be fitted with a 45 degree extension arm for supporting three strands of barbed wire and with an opening for the top rail or tension wire. Extension arms shall be capable of supporting a 200 pound downward pull at the outermost end of the arm.

BARBED WIRE

Provide three strand 12 1/2 gauge minimum galvanized steel barbed wire with 14 gauge minimum four point barbs.

Galvanized wire shall conform to ASTM A-121, Class III.

TENSION WIRE

Provide 7 gauge tension wire conforming to the fence fabric used, complete with end clamps.

STRETCHER BARS

Provide stretcher bars of one piece lengths equal to the full fabric height with a minimum cross section of 3/16" x 3/4". Provide one stretcher bar for each gate and end post and two for each corner and pull post, except roll form posts with integral loops.

GROUND RODS

Provide ground rods according to plans.

PART 3 - EXECUTION

SITE WORK

Prior to fence construction remove and dispose of all trees, brush, logs, stumps and other debris for a width of at least 12 inches each side of the proposed fence alignment.

CONCRETE FOOTINGS

Excavate holes for footings to neat dimensions in firm ground to ensure the post will be centered. Remove rock or other obstructions encountered to the required depth. Use forms in unstable soil and allow them to remain in place for at least 24 hours after concrete is poured. Backfill, after forms are removed, with suitable material thoroughly compacted in place in layers to prevent settlement.

Fence post footings shall be of the size and type as shown on the drawings.

Line posts may be driven posts. All other posts must be set in concrete.

POSTS AND BRACES

Set posts in a vertical position at the required location and alignment. Set tops at the required elevation to provide a smooth profile at the top rail or tension wire without abrupt changes and in conformity with the general contour and which meets the approval of the engineer.

Place an end post at each end of each run of fence. Place a corner post whenever a break of 30 degrees or more occurs in the horizontal alignment. Set an intersection post in line with an intersecting chain link fence and brace it to the adjacent posts of the intersecting fence.

Place an intermediate braced post where the vertical alignment changes by more than 5 degrees, or a change in fence grade of more than 9 percent occurs.

Place an intermediate braced post at 660' intervals for fence with a top rail and at 1,000' intervals for fence with a top tension wire on all long runs of fence. Set an intermediate brace post at the approximate midpoint when runs of fence are less than 1,320' but more than 660' for fence with top rail, or less than 2,000' but more than 1,000' for fence with top tension wire.

POST BRACING ASSEMBLY

Post bracing assemblies consist of one or more brace rails and a 3/8 inch truss rod as hereafter specified. Provide brace rails the same size as the top rail. Provide truss rods with an adjustable take-up adapter.

Install a single bracing assembly at each gate and end post location.

Install a double bracing assembly at each corner post and all intermediate braced posts.

Provide the bracing assembly with one horizontal brace rail and one diagonal truss rod on all fences which have a top rail. Locate the horizontal brace rail according to the manufacturer's specifications.

Provide the bracing assembly with one horizontal brace rail and one diagonal brace rail and one diagonal truss rod on all fences which do not have a top rail. Locate the horizontal rail according to the manufacturer's specifications.

STRETCHER BARS

Provide one stretcher bar for each gate and end post and two for each corner and pull post, except roll form posts with integral loops. Attach to posts with heavy duty pressed steel or malleable iron bands spaced at 15 inches o.c.

GROUND RODS

Install ground rods as specified on drawings.

FABRIC

Install, stretch, and anchor tension wires to each end, corner, gate and brace post and properly attach to each line post before the fabric is placed. Pass top tension wire through the post top rail opening. Install top, intermediate and bottom rails at proper locations.

Attach the end of the fabric to the end, corner, gate or brace posts (except roll form posts with integral loops) by means of a stretcher bar threaded through the end loops of the fabric and stretched to remove all slack with proper stretching equipment. Secure the stretched fabric to posts, rails and tension wires with specified fabric fasteners. Install fabric fasteners on all posts at not greater than 14 inches o.c. and on rails and bottom tension wires at not more than 24 inches o.c. Where a top tension wire is installed, fasten to the fabric at not more than 18 inches o.c.

Repeat stretching operations at approximately every 100' for each run of fence.

Make splices in fabric by interweaving a wire picket through each end loop of each piece of fabric. Each splice shall be subject to the engineer’s approval.

GRADE CLEARANCE

For line and property fences provide a clearance of 3 inches.

GATES

Install gates plumb and level and adjust for smooth operation as intended, without binding or hanging up.

BARBED WIRE

Install barbed wire properly fastened to the rampart arms.

CLEANUP

After chain link fence construction is completed clean up all storage and work areas. Replace or repair as required all landscape features damaged or disturbed under this contract.

END OF SECTION 32 31 13

SECTION 33 79 00 – Tower Grounding and Lightning Protection

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing and installing grounding and lightning protection for communication towers, antennas, coaxial cables, waveguides and tower site compound as detailed in the plans and specified below.

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 31 23 16.13 - Trenching

Section 33 81 00 – Communication Towers

Section 33 82 00 – Coax and Waveguides

Section 33 83 00 – Antennas

REFERENCES

NFPA 70, National Electric Code

NFPA 780, Standard for the Installation of Lightning Protection Systems.

UL 96A, Installation Requirements for Lightning Protection Systems.

Motorola R56 Standard – Standards and Guidelines for Communication Sites

IEEE Std. 1692-2011, Guide for the Protection of Communication Installations from Lightning Effects

IEEE Std.1100, IEEE Recommended Practice for Powering and Grounding Electronic Equipment.

DESIGN INTENT AND MINIMUM REQUIREMENTS

All grounding and lightning protection systems installed shall meet or exceed the requirements of the Motorola R56 Standards, latest revision. In cases where these plans and specifications exceed the requirements of the R56 standards, these plans and specifications shall be followed. In cases where these plans and specifications are in conflict with the R56 standard, contact engineer for desired resolution.

PERFORMANCE REQUIREMENTS

Tower Site Grounding System Resistance: 3 ohms maximum at tower ground test well.

Use suitable test instrument to measure resistance to ground of system. Perform testing according to test instrument manufacturer's recommendations. Perform fall-of-potential test according to ANSI/ IEEE 81 on tower ground test well.

Testing of grounding system resistance is to be witnessed by the Construction Representative.

Provide test report of grounding system overall resistance in final O&M manuals and noted on record documents.

EQUIPMENT AND MATERIALS FURNISHED BY OTHERS

None.

WORK BY OTHERS

None.

SUBMITTALS

Submit manufacturer's cut sheets for all grounding and lightning protection system materials to be used on the project to the engineer for approval prior to installation.

Items requiring submittal include:

- Grounding conductors
- Air Terminals
- Ground rods
- Chemical ground rods/plates
- Ground bars
- Coax and waveguide ground kits
- Deterrent wire grounding clamps
- Gate jumpers

Submit test reports of ground system performance to engineer prior to backfilling of site ground system.

PROJECT RECORD DOCUMENTS

Record locations of all electrical and telecommunications grounding electrodes, busbars and grounding conductors as installed including recorded ground resistance test results.

Contractor to take digital photos of all installed below grade connections. Provide photos with record drawings

PART 2 - PRODUCTS

GROUNDING CONDUCTORS

Ground system conductors shall be stranded or solid, tinned or untinned, copper conductors of the size and type noted on the drawings. Aluminum conductors are not permitted.

AIR TERMINALS

Air terminals shall be constructed of copper clad steel and shall extend a minimum of two feet above the highest appurtenance on the tower.

Air terminals shall be directly connected to mast pipes or bonded to tower steel with a #2 stranded insulated copper conductor using UL approved mechanical connectors

Air terminals may be mounted on mast pipes to reach required height. Mast pipes (when used) shall be directly connected to tower steel or bonded to tower steel with a #2 stranded insulated copper conductor using UL approved mechanical connectors.

ANTENNA GROUND BARS

Copper bus bars shall be sized appropriately to accommodate the number of connecting lines. Minimum copper bar size shall be ¼” x 4” x 6” providing 10 two-hole grounding lugs, (Site Pro Part No. MG40609 or equivalent).

Provide a #2 AWG stranded insulated ground lead which connects the ground bar to tower steel using a UL listed mechanical connector as detailed in the drawings.

LOWER TOWER GROUND BAR

Tinned copper bus bar shall be sized appropriately to accommodate the number of connecting lines. Minimum copper bar size shall be ¼” x 4” x 24” providing 44 two-hole grounding lugs, (Site Pro Part No. MG42488K or equivalent).

Provide non-conductive insulators between bus bar and tower structure.

INTERIOR/EXTERIOR SHELTER GROUND BARS

Copper bus bar shall be sized appropriately to accommodate the number of connecting lines. Minimum copper bar size shall be ¼” x 4” x 24” providing 44 two-hole grounding lugs, (Site Pro Part No. MG42488K or equivalent).

Exterior ground bars shall be tinned.

Provide non-conductive insulators between bus bar and tower/building structure.

COAX AND WAVEGUIDE GROUND KITS

Copper strap type ground with integral #6 ground lead with 3/8-inch two-hole lug, butyl wrap and electrical tape specially fabricated for use for coax and waveguide grounding (Site Pro Series SGT, UGT or equivalent).

GROUND RODS

Ground Rods: Refer to drawings for requirements.

Rods shall be driven to depth noted in the drawings. Connect each ground rod to the below grade ground system using #2 AWG solid tinned copper ground conductors. Utilize exothermic connections between ground rod and conductor.

Provide the number of rods and space as indicated on the drawings, generally no greater than 20 feet on center along path of ground ring.

GROUND PLATES

Provide 18”x18” square x 0.032-inch thick solid copper grounding plates as noted on drawings.

CHEMICAL ENHANCED GROUND RODS

Provide chemical enhanced ground rod (as manufactured by Harger, or equivalent) composed of a copper tube that contains specialized hygroscopic electrolytic salts that help lower soil resistivity.

Chemical enhanced ground rods shall be UL Listed and designed to last in excess of 35 years.

Chemical enhanced ground rods shall be of the length and orientation noted in the plans and be provided with test well cover and #2 solid tinned conductor for connection to site grounding system.

Install chemical enhanced ground rod per manufacturer’s recommendations with 4-inch minimum cover of ultra-low resistance carbon based (Ultra-fill) material on all sides.

MECHANICAL GROUNDING CONNECTORS

Mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of stainless steel and supplied as a part of the connector body and shall be of the two bolt type.

Paint and other non-conductive finishes shall be removed from items being connected to in order to provide a metal-to-metal connection.

Install anti-oxidant compound between mechanical connector body and connection point. Use copper anti-oxidant for copper to copper connections.

The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

COMPRESSION GROUNDING CONNECTORS

Compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99% by IACS standards.

The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.

Each connector shall be factory filled with an oxide-inhibiting compound.

EXOTHERMIC GROUNDING CONNECTORS

Exothermic welding system connection specifically used for in making electrical connections of copper to copper, copper to steel or copper to cast iron or copper to brass/bronze for grounding and cathodic applications as manufactured by Cadweld, or equivalent.

Exothermic welding system shall meet the applicable requirements of IEEE Std. 80 and IEEE Std. 837. Independent test data showing conformance to shall be readily available.

Electronic igniter must meet applicable requirements for electromagnetic compatibility. An independent test report including results of radiated emission, electrostatic discharge and radiated immunity shall be readily available.

Manufacturer shall be ISO9001:2000 certified.

PART 3 - EXECUTION

PREPARATION

Coordinate work with Electrical Contractor.

Coordinate fence ground lead locations with fencing contractor.

Verify that final backfill and compaction has been completed before driving rod electrodes.

GENERAL

Install Products according to the plans, details and manufacturer's instructions.

Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.

Ground connection surfaces shall be properly cleaned and prepared to provide metal to metal contact. All connections shall be made so that it is impossible to move.

TOWER FOUNDATION REINFORCING STEEL GROUNDING

Connect tower reinforcing steel to tower ground ring with one #2 solid bare tinned copper conductor(s) as detailed in the drawings.

BELOW GRADE TOWER SITE GROUND SYSTEM

Excavate ground trenches at the locations and required depths as noted in the plans.

Install ground rods, ground plates, conductors and other below grade devices as detailed in the plans.

Connect all devices using exothermic type connections to below grade ground system.

Measure site ground system performance prior to backfilling and prior to interconnection to utility power ground system using Fall of Potential testing procedure. Report results to engineer.

Notify engineer for inspection of ground system and connections prior to backfilling. Provide 72-hour minimum advanced notice.

Record locations of all below grade connections.

Record digital photos of all completed below grade connections.

Backfill and compact trenches per the plans and specifications.

Install inspection/test wells per the plans and specifications.

Grounding plates shall be utilized in lieu of ground rods at locations where ground rods cannot be installed (i.e., over tower foundation or bedrock). Install ground plates at standard ground trench depth.

GROUND BARS

Install ground bars at the locations shown and as detailed in the plans.

GROUND KITS

Install ground kits on all coax and waveguide at the locations shown and as detailed in the plans.

Ground kits shall be installed on each coax/waveguide a minimum of three times (antenna level, base of the tower and building coax port entry). For coax/waveguide runs above a tower height of 200 feet, an additional ground kit shall be installed at the mid-point of the coax/waveguide line run.

ABOVE GRADE TOWER SITE GROUND SYSTEM

Connect fence posts, fence fabric, gates, ice bridge posts, tower and ground bar leads to the below grade ground system as detailed in the plans.

QUALITY CONTROL

Inspect grounding and bonding system conductors and connections for tightness and proper installation.

Use suitable test instrument to measure resistance to ground of overall system prior to backfilling. Perform testing according to test instrument manufacturer's recommendations using the fall-of-potential method. Resistance shall meet or exceed a 3 ohm maximum resistance plateau. Provide written results of resistance measurements to the engineer.

END OF SECTION 33 79 00

SECTION 33 81 00 – Communication Towers

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing and erecting communication towers, antenna mounts and transmission line ice bridges as detailed in the plans and specified below.

RELATED WORK

Applicable provisions of Division 1 govern work under this section.

Section 03 30 00 – Cast-In-Place Concrete

Section 33 79 00 – Tower Grounding and Lightning Protection

Section 33 82 00 – Coax and Waveguides

Section 33 83 00 – Antennas

REFERENCES

Abbreviations of standards or organizations referenced in this specification are as follows:

ACI	American Concrete Institute
AISC	Manual of the American Institute of Steel Construction
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
CS	Commercial Standards, Products Standards Sections, Office of Eng. Standards Service, NBS
EPA	Environmental Protection Agency
EIA	Electronic Industries Association
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FS	Federal Specifications, Superintendent of Documents, U.S. Government Printing Office
UL	Underwriters Laboratories Inc.
IEEE	Institute of Electrical and Electronics Engineers
NBS	National Bureau of Standards
NEC	National Electric Code
NEMA	National Electrical Manufacturers Association
SSPC	Steel Structures Painting Council
TIA	Telecommunications Industry Association

DESCRIPTION OF SYSTEM

Communication Towers are required at one tower site(s). Tower heights and types shall be as follows:

Hudson, Wisconsin: (1) – 300 foot tall self-support

Refer to the drawings for layout, configuration and loading of each tower.

All towers shall be produced and constructed by the same manufacturer.

DESIGN

The tower shall be designed, fabricated and erected according to TIA-222- Revision G Standards, including latest revisions. Wind speeds and ice thicknesses shall follow ASCE 7-16 Standards as allowed per TIA Committee. The tower shall comply with EIA Specifications for twist and sway as they relate to the tower and antenna support brackets.

The following design parameters shall be used for each tower location as follows:

Hudson, Wisconsin:

- Structure Classification “Class 3”
- Exposure Category “C”
- Topographic Category “1” (Flat/Rolling)
- 116 mph basic wind speed with 0” of radial ice
- 50 mph basic wind speed with 1.50-inch radial ice
- 60 mph basic wind speed for deflection calculations

The loading criteria to be used for tower and foundation design is as follows:

Tower Structure, Mounts and Accessories:

1. Antennas: Quantity, size, location and orientation as specified in the drawings.
2. Coax, Waveguides and Transmission Line Ladders: Placement on the tower as specified in the drawings.
3. Climbing Ladder: Placement on the tower as specified in the drawings.
4. Other appurtenances: As specified in the drawings.
5. All mounts shall be designed to remain vertical under design wind conditions. Design of antenna mounts is the responsibility of the supplier. The mount design shall meet general dimensions as noted in the drawings.
6. All mounts shall be designed to support servicing of antennas by tower climbers (up to 200 lbs) under prescribed antenna loads using service wind conditions.
7. Tower structure shall be designed such that no member is stressed to more than 80% of its design capacity under the modeled loading criteria for the limiting design case (basic wind, radial ice, deflection) and to account for future loading.
8. Tower structure shall be designed such that all specified antenna mounts and other appurtenances (proposed and future) properly connect to the tower structure without issue and do not cause excessive deflection or failure of the tower member being connected to.

Tower Foundation:

1. The tower base reactions calculated for the modeled loading criteria for the limiting design case shall be increased by a minimum of 25% to account for future loading.
2. Tower anchor bolts shall be designed such that grout is not required below tower base plates and around anchor bolts. This requirement is to allow drainage and air flow beneath the base plates.
3. The tower foundations shall be designed based on the soil conditions and recommendations provided in the subsurface soil exploration report for the project. The soil design parameters specified in Section 7.0 “High Mast Lighting, Sign Structure & Tower Foundation Recommendations” for boring HM-1 shall be utilized in foundation design (conservative approach).

The design, fabrication and erection shall conform to the requirements of the Federal Communications Commission, Federal Aviation Administration, the National Electrical Code, International Building Code and State Building Code. Any known conflicts between these specifications or drawings, and codes, as well as any suspected error in these specifications or plans shall be brought to the attention of the engineer.

Tower Design, Tower Foundation design, and Fabrication and Erection drawings shall be certified by a Registered Professional Engineer licensed in the state of tower construction.

The contractor is responsible for ensuring the proposed tower design is compatible with the site layout and general parameters specified in the bid documents. Any proposed changes to layout shall be pre-approved by the engineer prior to implementing. All costs associated with such changes shall be the responsibility of the contractor.

FALL ZONE RADIUS DESIGN

When required, the tower structure shall be designed to collapse within a specified “fall zone radius” distance from the tower center. The tower design engineer shall submit a letter certifying that the tower has been designed to meet this criteria. The letter shall be signed and sealed by the design engineer. Fall zone radius requirements for this project are as follows:

Hudson, Wisconsin: No requirement

QUALITY ASSURANCE

Where equipment, accessories, or materials are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated in the contract documents, the contractor is responsible for all costs involved in integrating the equipment or accessories into the system and for obtaining the intended performance from the system into which these items are placed.

All ground and aerial work shall be performed by persons equipped and qualified to do so. The contractor shall furnish, upon contract award, evidence of adequate bonding and insurance to hold the State harmless in completion of the contract issued for this work.

The contractor shall be experienced in the installation and alignment of microwave parabolic antennas. Contractor shall furnish, upon request, a list of at least three references where microwave parabolic antennas were successfully installed and aligned.

The contractor shall visit the tower site to verify the site-specific data and drawings. Any expense and delay due to lack of information shall be the contractor’s responsibility.

QUALIFICATIONS

Tower and Tower Accessory Manufacturer: Company specializing in manufacturing Products specified in this section with minimum 10 years documented experience.

Tower Erector: Company specializing in performing work of this section with minimum of 5 years documented experience.

PROTECTION OF EXISTING WORK AND FACILITIES

Verify the locations of, and protect, any signs, paved surfaces, buildings, structures, landscaping, streetlights, utilities and all other such facilities that may be encountered or interfered with during the progress of the work. Take all measures necessary to safeguard all existing work and facilities which are outside the limits of the work or items which are within the construction limits but are intended to remain.

CONSTRUCTION LIMITS

Construction Limits are indicated on the drawings. In the absence of such a designation on the drawings, confine work to the minimum area reasonably necessary to undertake the work. All area disturbed by excavation and grading, plus such additional areas as are disturbed by construction related activities including construction access and storage and installation of materials shall be considered the "Construction Area."

EQUIPMENT AND MATERIALS FURNISHED BY OTHERS

None.

WORK BY OTHERS

Owner will install alarm wiring from tower lighting controller to punch block within contractor provided conduits.

SUBMITTALS

Refer also to Section GC - General Conditions of the Contract.

Tower and Tower Foundation Design:

1. Submit engineering design and structural analysis package for tower and tower foundations.
2. Design and analysis shall be completed using structural analysis software generally accepted by the tower industry.
3. The design and analysis shall be according to the Design requirements of this specification.

4. Submitted package shall include sufficient information and detail to allow a third-party engineer to accurately model the tower and foundation system to verify the design and for future changes in loading per TIA-222-Revision G requirements as a “Rigorous Analysis”. This includes providing all member sizes, material types, connection details, weld information, bolt size and material strengths, geometry configuration, loading input parameters, factors of safety, design assumptions, calculations and results of each loading condition.
5. This package shall include a scaled drawing which shows the layout of the tower geometry, location of each appurtenance load applied to it and feed line placement on the tower.

Fabrication and Erection Drawings:

1. Submit fabrication and erection drawing package of all fabricated items associated with the tower package.
2. All submittals must receive full approval of the engineer prior to tower manufacture and erection.
3. Submitted package shall include engineering shop drawings for the fabrication, assembly and erection of all items. The drawings at a minimum shall include:
    a. Cover sheet showing project name, tower height, manufacturer’s name and model number
    b. Bill of materials for the tower and each attached component.
    c. Elevation and plan view showing tower orientation. Precise antenna/dish location and azimuths, light levels as required, waveguide and coax routing, plus any pertinent construction or erection notes.
    d. Tower section drawings showing all tower members, splice plates, ladder mounting details, antenna supports, entry/exit ports, hand holes and any other information needed to identify each portion of the tower. Show dimensions of all tower members including the location and size of each bolt and hole, materials types and other information to model the tower.
    e. Tower base foundation and associated concrete reinforcement details, plan and elevation views. Drawing shall include such information as reinforcement bar size, quantity and position, cubic yards of concrete, concrete placement of finishing requirements and other pertinent site specific information.
    f. Drawings of tower base plate details, anchor bolts, anchor bolt templates and associated hardware.
    g. Drawings of transmission line ice bridge assemblies and associated supports.
    h. Drawings of each antenna mount, climbing ladder, vertical transmission line ladder and other assemblies.
    i. Lighting system schematic drawing and material list, if applicable.
    j. Fall Radius Design Certification, if applicable.

WARRANTY

The tower and components supplied under this specification shall be warranted to be free of defects for a minimum period of 5 years from the date of substantial completion. In addition, all workmanship provided under this specification, shall be warranted to be free of defects for a minimum period of 5 years from the date of substantial completion. Defects in materials or workmanship during the warranty period and any materials and/or equipment damage because of defects, shall be repaired or replaced at no cost to the owner.

This warranty shall not be void by the owner’s use of other competent contractors to install antennas or transmission lines or perform other maintenance on the tower when the work is consistent with the initial design and intent.

Warranty service shall be provided and repairs completed within 24 hours following notification of contractor by owner that a failure covered by the warranty provisions has occurred. Contractor shall furnish owner with a telephone number at which contractor, or his representative, may be reached 24 hours a day, seven days a week, notification of in-warranty failures.

OPERATING AND MAINTENANCE INSTRUCTIONS

Assemble material in an operating and maintenance manual, using and index at the front of each volume and tabs for each system or type of equipment installed. In addition to the data indicated in the General Requirements, include the following information:

Copies of all approved shop drawings

1. Manufacturer's wiring diagrams for electrically powered equipment.
2. Records of tests performed to certify compliance with system requirements.
3. Parts lists for manufactured equipment.
4. Warranties and/or guarantees.
5. Additional information as indicated in the technical specification sections.

RECORD DRAWINGS

Maintain record drawings of all as-built system installations and points of connection made as part of this project. Include copies of record drawings with the Operating and Maintenance instructions.

PART 2 - PRODUCTS

MATERIALS - GENERAL

All structural materials, fabricated parts and associated assemblies shall be galvanized according to ASTM A-123 (Hot-Dip).

All mounting hardware shall be either galvanized or stainless steel.

Tower structure and appurtenances shall be designed and fabricated so that erection may be accomplished using bolt connections with no field welding required.

SELF-SUPPORT TOWERS

Self-support towers shall be a free standing three leg tapered towers constructed of galvanized steel.

Tower sections shall utilize bolted connections, no field wielding is permitted.

Each base section tower leg shall be provided with a grounding tab for connection of ground leads.

TOWER FOUNDATIONS

Self-support tower foundations shall be either a spread footing (mat) type, individual pad and pier at each tower leg, or drilled pier (caisson) foundation at each tower leg consisting of reinforced concrete.

CLIMBING LADDER/SAFETY CLIMBS

Self-support towers shall be equipped with a permanent continuous exterior climbing ladder from the base of the tower to the top and/or step bolts. Refer to drawings for location of exterior climbing ladders.

Self-support towers shall also be equipped with construction step bolts on each tower leg from the base of the tower to a point where the tower face width is less than 15 feet wide.

Tower shall be equipped with a continuous permanent safety climb cable device coordinated with the climbing ladder which meets OSHA and ANSI requirements for a climbing safety device.

Provide one compatible climbing harness along with safety climb device for each tower.

VERTICAL TRANSMISSION LINE LADDERS

Provide vertical transmission line (coax/waveguide) ladders of the size, quantity and style as noted in the drawings.

ANTENNA MOUNTS

All antenna mounts shall connect to tower with mechanical compression type brackets as detailed in the plans. The use of chain mounts is not acceptable.

Mounts shall include brackets to orient the assembly vertically when mounted on tapered sections of the tower.

Each mount shall be designed and adequately braced back to tower structure to minimize deflections of the antenna such that pole type antenna assemblies do not strike one another or the tower structure under the design wind conditions. In addition, antennas shall return to vertical after experiencing design wind conditions. Design of antenna mounts is the responsibility of the manufacturer. The mount design shall meet general dimensions noted in the plans. If determined that a suitable design is not achievable per the general dimensions, the engineer shall be notified prior to manufacture and installation.

1. Dish Mounts
    a. Dish mounts shall be leg type mounts and be adequately connected or otherwise braced to prevent dish movement.
    b. Provide vertical separation distances suitable for each dish to be installed.
    c. Dish mounts shall be provided with mast pipes for mounting of dish antennas
2. Stand-off Mounts
    a. Stand-off mounts shall utilize truss style extension and be adequately connected or otherwise braced with tieback arms to prevent antenna movement.
    b. Provide horizontal stand-off separation distances as noted in the plans.
    c. Stand-off mounts shall be designed for connection of one antenna on each mount.
    d. Stand-off mounts shall be provided with mast pipes for mounting of antennas, when necessary.
3. V-Arm Truss Frame Mounts
    a. V-Arm Truss Frame mounts shall include two truss type elements that connect to one tower leg and a face portion for mounting of antennas.
    b. Face portion of mount shall be of the size indicated in the plans (6’ typ.)
    c. Mounts shall provide required stand-off distance from the tower as indicated in the drawings (6’ typ.).
    d. Mounts shall include a mast pipes for connection of antennas.
    e. Mounts shall include a min. of two stiff arm supports for to prevent movement of the mount assembly.

ICE SHIELDS

Microwave dish antennas shall be provided with ice shields of appropriate size when required in the drawings. Ice shields shall connect to tower with mechanical compression type brackets as detailed in the drawings.

TRANSMISSION LINE ICE BRIDGE

Provide self-supporting transmission line ice bridge(s) supported by galvanized steel pipes between tower and building coax port entries as detailed in the plans.

All of the vertical pipe supports shall be schedule 40 galvanized steel pipe of the diameter specified in the drawings. Extend vertical supports above the top of transmission line ice fall protection as detailed in the plans. Provide pipe cap on top of vertical supports.

Ice bridge shall be 24-inch-wide grip strut type bridge with vertical extended double T-line hanging brackets. Transmission line support system shall provide 30 holes of line capacity using double stack snap-in clips. Install support brackets 3 feet on-center, or as recommended by the manufacturer.

TOWER GROUNDING

Self-Support Tower: Provide a minimum of three (2 inch x 2 inch x ¼ inch thick) steel ground tabs (one on each leg) welded to the tower base legs for use in attachment of ground conductors.

Ground tower according to the plans and specification section 33 79 00 Site Grounding and Lightning Protection.

OBSTRUCTION LIGHTING

All tower lighting equipment shall be furnished according to current FAA and FCC standards. Specifically, lighting systems shall be according to FAA Federal Aviation Advisory Circular 70/7460-1 L, Obstruction Marking and Lighting including subsequent revisions and updates.

Towers to be lighted with “E”-Series lighting kit (E-+1). Lighting system to include two L-864/L-865 Flashing Dual Red/White Medium Intensity Beacons (Top) and three L-810 Red Obstructions lights (Mid height) configured to flash in sync with L-864.

The lighting system shall be specifically manufactured to work in a communication RF environment. The lighting system shall not radiate, nor conduct through power lines, electromagnetic energy which will interfere with owner’s broadcast or point-to-point radio equipment.

Lighting systems to be completely LED based. LED lights shall include in-fared emitters as required by current FAA standards.

Acceptable manufacturers/products include: International Tower Lighting, LLC (ITL), Model: ILS-3600-0IR – No substitutes.

Warranty: The lighting system shall carry a 5-year manufacturer’s warranty on all components comprising the system.

Dual Strobe/Beacon Lights:

1. Strobe lights shall be medium intensity dual red/white FAA type L-864/L-865 with LED light engine(s)/Flash Head(s).
2. Beacon Lights shall be LED RED FAA type L-864 with LED light engine(s).
3. Light to be housed in a cast aluminum- powder coated housing.
4. The light shall be a single-level design utilizing a single level containing both red and white LED’s.
5. The light lens shall be a polycarbonate material coated with Red Spot #UTV200V3 to preclude yellowing of the lens after exposure to UV rays from the sun.
6. Power supply cable shall interface with color coded DIN terminal blocks in the light engine and control enclosure.
7. Each light engine mounted shall be installed on a leg mounted beacon mounting bracket. The contractor shall verify the light engine is mounted in such a way that a good electrical ground connection is made between the powder coated light engine and the tower structure. If not provided by the tower manufacturer, hot dipped galvanized brackets shall be specified and provided by the lighting system distributor.

Obstruction Lights:

1. Obstruction lights shall be FAA type L-810 with LED light engine(s).
2. Obstruction Light fixture base/housing shall be constructed of cast aluminum and shall be powder coated for additional protection.
3. Lens shall be smooth polycarbonate or glass with diffuser ridges.
4. Lights shall be mounted using the side or bottom entrance with a conduit nipple U bolted to the ¼” mounting plate so as to allow infinite adjustment of the light fixture (level and plumb).
5. Provide ice shields integrated with mounting brackets for all obstruction lights

Wiring, Interconnection Cable and Conduit:

1. All tower light wiring shall comply with national, state and local electrical codes.
2. The beacon power supply/controller to light engine multi-conductor cable and obstruction light power cable shall be manufactured to fully comply with the above referenced FAA standards and manufacturers requirements including full FAA temperature ratings.

Integrated Beacon Power Supply/Light System Controller:

1. All interconnections shall be provided by the distributor. The installer shall only need to provide power wiring, flash head wiring, PEC wiring and alarm wiring to the preassembled system. The complete system shall be fully tested prior to shipment- including all alarm functions.

2. The lighting system controller shall include a photocell equipped with manual override and alarm conditions for the following:
    a. Beacon failure
    b. Strobe failure switch to night mode
    c. AC power failure
    d. Sidelight failure
    e. Photocell failure
    f. Controller Failure
3. The system shall provide for remote site monitoring of alarms by dry contacts. Ethernet connection capabilities shall be available as an option. If Ethernet connection is desired, all software and hardware shall be included. No third party payments for monthly use shall be required.
4. The system shall also provide an indication dry contact to indicate when the system is in day and night modes.
5. A component failure in one lighting instrument shall affect only that instrument and shall not result in failure of other instruments in the system.

Temporary Lighting During Construction: Provide temporary lighting system during construction when each lighting level is reached. If practical, permanent lights shall be installed and operated at each level as construction progresses.

Service Manuals: Provide two service manuals (in addition to operation/user manuals) for lighting system. Manuals shall provide sufficient detail to facilitate component level troubleshooting and repair.

PART 3 - EXECUTION

EXAMINATION

Verify existing conditions before starting work.

PREPARATION

Call Local Utility Line Information service at not less than three working days before performing Work. Request underground utilities to be located and marked within and surrounding construction areas.

Confirm that the owner has a valid FAA construction permit, if applicable, before commencing construction. Coordinate with owner for notification to FAA concerning construction schedule.

TOWER FOUNDATION

Install tower foundation according to tower manufacturer foundation design requirements and these specifications. Concrete, rebar and other material testing and quality assurance items shall conform to the respective sections of these specifications.

Ground foundation reinforcing steel per the drawings.

Tower foundation excavations, rebar placement and grounding shall be inspected by the engineer prior to concrete installation.

Anchor bolts shall be installed per design requirements including minimum thread protrusion.

TOWER ERECTION

Provide concrete compressive strength test results to the engineer which indicate conformance with the design requirements prior to tower erection.

Erect tower according to tower manufacturer design requirements and these specifications.

The tower shall be erected using bolted connections. No field welding is allowed.

All bolts shall have a minimum of two threads protruding beyond the nut and torque tested to meets installation requirements.

Install vertical transmission line ladders, antenna mounts, safety climb, air terminal and all other appurtenances according to tower manufacturer design requirements and these specifications.

Notify owner within 24 hours of tower construction reaching full height so owner can notify FAA regarding completed construction.

CLIMBING LADDER/SAFETY CLIMB

Install climbing ladder and safety climb device according to the manufacturers' requirements at the location on the tower noted in the drawings.

Confirm climbing harness is compatible with the provided system.

ANTENNA MOUNTS

Install antenna mounts according to manufacturer requirements, plans and these specifications.

ICE SHIELDS

Install ice shields according to manufacturer requirements, plans and these specifications.

ANTENNAS

Install antennas according to the plans and Section 33 83 00 - Antennas

VERTICAL TRANSMISSION LINE LADDERS

Place vertical transmission line ladders on the tower at the locations noted in the drawings.

Attach line ladder to the tower at 20 foot maximum spacing or as required by the manufacturer using J-bolt connectors. All coax and waveguide shall connect to transmission ladders with ¾-inch snap in hangers.

TRANSMISSION LINE ICE BRIDGE INSTALLATION

Install self-supporting transmission line ice bridge(s) between tower and building coax port entries according to the manufacturer requirements, drawings and these specifications.

COAX AND WAVEGUIDE

Install and test coax and waveguide between antennas and equipment building according to the plans and Section 33 82 00 – Coax and Waveguides

TOWER, ANTENNA AND WAVEGUIDE GROUNDING

Ground tower, antennas and waveguide and install lightning protection systems according to the plans and Section 33 79 00 – Site Grounding and Lightning Protection.

OBSTRUCTION LIGHTING

Install tower lighting according to the manufacturer's recommendations, FAA requirements and these specifications.

Wall mount lighting controller with equipment shelter at location noted in the drawings.

Connect lighting controller to dedicated electric circuit.

Route and install lighting cables and photo-cell as noted in the drawings.

Route lighting cables up tower along vertical transmission line ladder. Secure to lighting cable to vertical member of ladder using 2-3-4 tape method.

Provide a minimum of three service loops of excess cable at each junction box and light fixture. Secure service loops to underside of tower members using 2-3-4 tape method.

Route lighting cable from vertical transmission line ladder to light fixtures at tower legs along bottom side of tower members. Provide slack in cable to maintain clearance from tower member joints and other sharp edges. Utilize 2-3-4 tape method to secure lighting cable to tower members.

Ensure top tower light extends above all antennas and appurtenances of 7/8-inch diameter or more when only one top tower light is provided.

CORRECTION OF PUNCH LIST INSPECTION ITEMS

Following tower erection and antenna and line installation, A/E will perform a tower climb and punch list inspection of installed items. An inspection report will be issued with items to be addressed by contractor.

Contractor shall promptly correct all deficient items and provide photos of each item prior to and after correction. Photo documentation shall be sufficient and clear enough to allow the owner and A/E to see that all items have been adequately addressed. Photos shall be appropriately labeled to reference each punch list item being addressed.

CLEAN UP

The contractor shall be responsible for cleanup of the site of all refuse associated with this Contract. Contractor to remove all crates, reels and other refuse associated with the antennas and line shipping.

END OF SECTION 33 81 00

SECTION 33 82 00 – Coax and Waveguides

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to install coax and waveguides.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Related Sections:

Section 33 79 00 – Tower Grounding and Lightning Protection

Section 33 81 00 – Communication Towers

Section 33 83 23 – Antennas

EQUIPMENT AND MATERIALS FURNISHED BY OTHERS

Owner shall furnish all new coax and waveguide. Contractor shall be responsible to install these items as well as to provide and install all other required mounts, mounting hardware and accessories necessary to complete the project per the plans and specifications.

WORK BY OTHERS

Owner will make final connection of prepared coax lines to radio equipment within the equipment building.

SUBMITTALS

Submit product data for each type of coax and waveguide supplied.

Submit transmission line frequency return loss test reports for each installed coax/waveguide.

Submit written key for installed identification markings of each coax/waveguide.

QUALITY ASSURANCE

All installed coax and waveguides shall be “sweep” tested using frequency return loss testing, or other owner approved method, after complete installation to ensure the integrity of each line. Contractor shall submit, to engineer, reports of the test results for each line documenting each line passed testing.

PART 2 - PRODUCTS

COAX AND WAVEGUIDE

Provide coax and waveguide as listed in the drawings.

Provide associated hoist grips, snap-in supports, jumpers and connectors for complete installation from antenna to termination point inside of building.

1. Hoist grips: galvanized
2. Snap In Hangers: Stainless Steel
3. Fasteners: Use corrosion resistant fasteners which are manufactured for outdoor use specifically for the intended application.

PART 3 - EXECUTION

COAX AND WAVEGUIDE

Install coax lines and waveguides from antennas and dishes mounted on tower to interior side of equipment buildings according to the manufacturer’s recommendations, drawings and these specifications.

Connection of coax and waveguide to antennas and dishes shall be by the contractor.

All coax and waveguide runs shall be continuous from each antenna to equipment building. No splicing of lines is allowed.

Secure and adequately support coax and waveguides as necessary to prevent movement and contact with sharp edges of tower structure, mounts and other appurtenances.

Clearly mark all lines at each end with the termination elevation, azimuth, description, color code and/or as otherwise directed by owner.

All lines shall route up the tower structure on vertical transmission line ladders utilizing appropriately sized snap-in style mounting clips and cushions. Place lines on ladders in configuration shown on the drawings.

Provide and install hoist grips and hoist grip hangers for each transmission line.

Install ground kits on each transmission line at the locations identified in the drawings and grounding specifications. All ground kits shall be properly weatherproofed.

Route coax and waveguide along ice bridge hanger brackets. Secure to ice bridge hangers with appropriately sized snap-in style mounting clips and cushions per manufacturers recommendations.

Provide drip loop in line at base of the tower and prior to entry into shelter coax entry port.

Bends in coax and waveguide runs shall not exceed manufacturer’s specifications.

Route lines through building coax entry port. Provide and install weatherproof boots and cushions for each port opening on exterior.

Install surge protection device on each line within the equipment building and terminate as directed by owner. Install ground leads from surge protection device to interior Master Ground Bar.

Perform Quality Assurance “sweep tests” of all installed coax and waveguides. Provide documented results.

END OF SECTION 33 82 00

SECTION 33 83 00 – Antennas

PART 1 – GENERAL

SCOPE

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to install antennas and microwave dishes.

RELATED WORK

Applicable provisions of Division 1 govern work under this Section.

Related work specified elsewhere:

Section 33 81 00 – Communication Towers

Section 33 82 00 – Coax and Waveguides

Section 33 79 00 – Tower Grounding and Lightning Protection

EQUIPMENT AND MATERIALS FURNISHED BY OTHERS

Owner shall furnish all antennas and dishes for the project delivered to the site. Contractor shall be responsible to install these items as well as to provide and install all other required mounts, mounting hardware and accessories necessary to complete the project per the plans and specifications.

WORK BY OTHERS

None.

REMOTE DISH INSTALLATION

Remote microwave dish installation is required at one (1) location to complete the microwave path link from the tower site. The following remote microwave dishes shall be installed:

WDOT Baldwin Tower:

Tower coordinates: 44.971667, -92.319444

Tower Height & Type: 300’ Guyed

Dish: One SB6-W100 (6’ dia.) – Owner provided.

Install Centerline Height: 245’

Azimuth: 266.8 degrees

Mount: Leg Mount – Existing.

Ice Shield: Not Required.

Waveguide: One EP65 – Owner provided.

Accessories: Stiff arm, waveguide snap-ins, jumpers, ground kits, entry port boots – owner provided.

SUBMITTALS

Submit product data for each antenna supplied to engineer for approval prior to ordering.

PART 2 - PRODUCTS

ANTENNAS

Provide antennas as listed in the Drawings.

Provide all associated antenna mounts, mounting and bracing hardware and fasteners for secure installation and proper alignment.

PART 3 - EXECUTION

ANTENNAS

Install all antennas and microwave dishes on tower mounts installed at elevations and orientation noted on the drawings with required mounting hardware as required or recommended by the antenna manufacturer.

Microwave dish installation shall include installation and alignment of remote site dishes when required.

Secure and properly brace each antenna and microwave dish. Orient to azimuth and down tilt noted on the drawings.

Install coax and waveguides per Section 33 82 00 Coax and Waveguides.

Connect coax and waveguide runs to each antenna and microwave dish with required jumpers and connectors. Weatherproof each connection.

Record as-built location of each installed antenna and microwave dish.

Allow owner sufficient time to install radio equipment.

Re-mobilize to site to perform final alignment of antennas and/or microwave dishes at both send and receive locations. Contractor shall furnish personnel for each end of microwave path under alignment. Alignment shall be done once new equipment is installed and “online” at both locations and peaked up to the highest level. Coordinate alignment procedures with owner’s personnel.

Notify engineer when complete for inspection of installation. Provide 72 hour minimum advance notice.

END OF SECTION 33 83 00

68. Concrete Curb and Gutter 24-Inch Type A Special, Item SPV.0090.001; Concrete Curb and Gutter 24-Inch Type D Special, Item SPV.0090.002.

A Description

This special provision describes constructing curb and gutter at the locations shown in the plans, or as directed by the engineer.

B Materials

Furnish concrete that conforms to the requirements for concrete curb and gutter according to standard spec 601. Provide QMP for class II ancillary concrete as specified in standard spec 716.

C Construction

Construct according to the requirements of standard spec 601.

D Measurement

The department will measure Concrete Curb and Gutter 24-Inch (type) 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.0090.001	Concrete Curb and Gutter 24-Inch Type A Special	LF
SPV.0090.002	Concrete Curb and Gutter 24-Inch Type D Special	LF

Payment is full compensation according to standard spec 601.

69. Fiber Optic Tracer Wire 12AWG, Item SPV.0090.003.

A Description

This special provision describes furnishing and installing tracer wire for fiber optic conduit.

B Materials

Furnish 12 AWG copper wire according to standard spec 655.2.

C Construction

Install tracer wire in at least one conduit for each run. Connect the tracer wire using a wire nut at each pull box, manhole, or other access point. Alternatively, use a single wire through the access points.

D Measurement

The department will measure Fiber Optic Tracer Wire 12AWG 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.0090.003	Fiber Optic Tracer Wire 12AWG	LF

Payment is full compensation for furnishing and installing all materials.

70. Construction Staking Fence, Item SPV.0090.004.

A Description

This work shall consist of construction staking for fencing including posts.

B (Vacant)

C Construction

Construction stakes for fencing system shall be set and maintained as necessary to achieve the required accuracy and to satisfy the contractor’s method of operations. All post construction stakes shall be located to within 0.02 feet of the true horizontal position.

D Measurement

The department will measure Construction Staking Fence by linear feet, 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.0090.004	Construction Staking Fence	LF

Payment is full compensation for survey work necessary to locate and set all fence post construction stakes, and for relocating and resetting construction stakes.

71. Aluminum Landscape Edging Material, Item SPV.0090.005.

A Description

This special provision describes supplying and installing aluminum edging to separate planting beds areas from turf.

B Materials

Furnish 7/32” aluminum landscape edging, 4” tall, silver in color.

Furnish spikes/ stakes as necessary for installation.

C Construction

Install edging material where the plans show or where the engineer directs.

Install edging material so the top of the edging is ½” about top of mulch height.

Edging material shall be installed with the ends interlocking.

Installation of spikes/ stakes shall follow manufacturer’s recommendation as far as depth, frequency, and installation angle.

D Measurement

The department will measure Aluminum Landscape Edging Material 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.0090.005	Aluminum Landscape Edging Material	LF

Payment is full compensation for all materials related to the edging, excavation of adjacent soil, and installation.

72. Scale Approach Pavement Reinforcement, Item SPV.0180.001.

A Description

This special provision describes furnishing and installing continuous reinforcement for the scale approach concrete pavement.

B Materials

Furnish steel reinforcement and all other materials as shown in the plans, and according to standard spec 415.2.

C Construction

Install continuous reinforcement within the scale approach concrete pavement as shown in the plans, and according to standard spec 415.3.

D Measurement

The department will measure Scale Approach Pavement Reinforcement by the square yard, 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.0180.001	Scale Approach Pavement Reinforcement	SY

Payment is full compensation for furnishing and installing reinforcement and for coating.

73. Weed Barrier Fabric, Item SPV.0180.002.

A Description

This work shall consist of furnishing and installing the Weed Barrier Fabric within all landscape areas as shone on the plans.

B Materials

Landscape fabric shall be black polypropylene polyester blend, 28 mills, 3.33 ounces/sq. yard, Mullen burst strength: 250 lbs. Permeability is 28 gals/s.f./min. per fallen head method.

C Construction

Weed barrier Fabric shall be installed per manufacturer's specifications in all plant bed areas, tree wells, and as called out on the plans.

Overlap of the fabric shall be a minimum of 6" or the manufacturer's recommendations, whichever is greater.

The contractor shall finish grade the planting beds prior to installing the Weed Barrier Fabric.

The edges of the Weed Barrier Fabric shall be within 4" of the stem/trunk of the plant material on all sides.

The contractor can install the weed barrier before or after planting, but if installed prior to planting, shall cut the Weed Barrier Fabric with appropriately sized "x"s to allow for the planting holes per the standard details. The Weed Barrier Fabric will be folded back during planting operations and folded to the stem/ trunk upon completion. The practice of cutting the Weed Barrier Fabric the full size of the planting areas and then installing remnant patching will not be allowed.

If the Weed Barrier Fabric is installed after the trees and shrubs, all waste material shall be fully removed prior to installation.

Contractor shall secure Weed Barrier Fabric per manufacturer's recommendations. Weed barrier Fabric shall be in direct contact with soil.

Landscape fabric shall not be visible under stone mulch and all loose ends shall be cut off, tucked under, or otherwise covered with 4 inches of stone chips by the contractor.

D Measurement

The department will measure Weed Barrier Fabric by the square yard, acceptably completed. Measurement will be based on the area covered as indicated on the project plans. Required overlap will not be included within the measurement.

E Payment

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

ITEM NUMBER	DESCRIPTION	UNIT
SPV.0180.002	Weed Barrier Fabric	SY

Payment is full compensation for furnishing and installing the weed barrier fabric.

74. Base Aggregate Dense 3/4-Inch Washed, Item SPV.0195.001.

A Description

This special provision describes furnishing and placing ¾-Inch washed base course to be used for the communication tower pad.

B Materials

Use materials that conform to standard spec 305.2.2.1 for pertaining to Base Aggregate Dense ¾-Inch with the following revision to the gradation specification:

Sieve Size	Percent Passing by Weight
1-inch	100
3/4-inch	90-100
3/8-inch	20-55
No. 4	0-10
No. 8	0-5
No. 200	<=1.5

The testing requirements associated with base aggregate as identified in standard spec 701 are waived for this item.

C Construction

Install Traffic Control Base Course according to standard spec 301.3 and 305.3 that pertain to Base

Aggregate Dense 3/4-Inch.

D Measurement

The department will measure Base Aggregate Dense 3/4-Inch Washed by the ton, 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.0195.001	Base Aggregate Dense 3/4-Inch Washed	TON

Payment is full compensation for all work herein specified and including but not limited to providing and placing all materials and all incidentals necessary to complete the work in compliance with these specifications.

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 5 *(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 (preferred) OR to the DBE Office by email at: DBE_Alert@dot.wi.gov. Email naming convention: "Project #, Proposal #, Let date, Business Name, GFE"

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.

Naming conventions: eSubmit (preferred) follow instructions OR when emailing files, use the following language to identify your submission- “Project #, Proposal #, Let date, Business Name, GFE” Email: DBE_Alert@dot.wi.gov

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).

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) 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.

(2) 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.

(3) 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.

(4) 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.

(5) 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?

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

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.

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

If a DBE performs as a participant in a joint venture, the Department will only count 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, for DBE credit.

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.

c. 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.

<u>Prior to Bid Opening- this discussion should happen as early as possible (WisDOT advertisements are released 5 weeks prior to each Let)</u>

- Determine DBE subcontractor's interest in quoting
- 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.
- Assess their interest and experience in the road construction industry by asking questions such as:
  1. Have you competed for other WisDOT contracts? Ratio of competed/to wins
  2. Have you performed on any transportation industry contracts (locally or with other states)?
  3. What the largest contract you've completed?
  4. Have you worked in the industry: apprentice, journeyman, safety, inspection etc.?
  5. Does this project fit into your schedule? Are you working on any contracts now?
  6. Have you reviewed a copy of the plans? Are you comfortable performing within the scope and quantity considerations of this contract?
  7. What region do you work in? Home base?
  8. Which line items are you considering?
  9. Have you read/are you familiar with WisDOT Standard Specifications? Construction Material Manual?
  10. Do you understand where your work fits in the project schedule, project phases?

<u>Following Bid Opening- this discussion can happen at any time</u>

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 requirement

GFESAMPLE MEMORANDUM

TO: DBE FIRMS
FROM: POTENTIAL PRIME CONTRACTOR OR MAJOR SUBCONTRACTOR
SUBJECT: **REQUEST FOR DBE QUOTES**
LET DATE & TIME
DATE: MONTH DAY YEAR
CC: DBE OFFICE ENGINEER

Our company is considering bidding on the projects indicated on the next page, as a prime and/or a subcontractor for the Wisconsin Department of Transportation Month- date -year Letting. Page 2 lists the projects and work items that we may subcontract for this letting. We are interested in obtaining subcontractor quotes for these projects and work categories. Also note that we are willing to accept quotes in areas we may be planning to perform ourselves as required by federal rules.

Please review page 2, respond whether you plan to quote, highlight the projects and work items you are interested in performing and return it via fax or email within 3 days. Plans, specifications and addenda are available through WisDOT at the DBE Support Services office or at the Highway Construction Contract Information (HCCI) site at http://roadwaystandards.dot.wi.gov/hcci/

Your quote should include all of the costs required to complete the items you propose to perform including labor, equipment, material, and related bonding or insurance. The quote should note items that you are DBE certified to perform, tied items, and any special terms. Page 2, with the indicated projects and items you plan to quote, should be used as a cover sheet for your quote.

Please make every effort to have your quotes into our office by time deadline the prior to the letting date. ***Make sure the correct letting date, project ID and proposal number, unit price and extension are included in your quote.*** We prefer quotes be sent via SBN but prime's alternatives are acceptable. Our office hours are include hours and days.

Please call our office as soon as possible prior to the letting if you need information/clarification to prepare your quote at contact number.

If you wish to discuss or evaluate your quote in more detail, contact us after the contract is awarded. Status of the contract can be checked at WisDOT's HCCI site at http://roadwaystandards.dot.wi.gov/hcci/
All questions should be directed to:

Project Manager, John Doe, Phone:
(000) 123-4567
Email: Joe@joetheplumber.com
Fax: (000) 123- 4657

Sample Contractor Solicitation Letter Page 2

This sample is provided as a guide not a requirement

REQUEST FOR QUOTE

Prime's Name: _____

Letting Date: _____

Project ID: _____

Please check all that apply

- ☐ Yes, we will be quoting on the projects and 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 's Contact Person:	DBE Contractor Contact Person:
Phone:	Phone:
Fax:	Fax:
Email:	Email:

Please circle the jobs and items you will be quoting below

Proposal No.	1	2	3	4	5	6	7
County							

WORK DESCRIPTION:

Clearing and Grubbing	X		X	X		X	X
Dump Truck Hauling	X		X	X		X	X
Curb & Gutter/Sidewalk, Etc.	X		X	X		X	X
Erosion Control Items	X		X	X		X	X
Signs and Posts/Markers	X		X	X		X	X
Traffic Control		X	X	X		X	X
Electrical Work/Traffic Signals		X	X	X		X	
Pavement Marking		X	X	X	X	X	X
Sawing Pavement		X	X	X	X	X	X
QMP, Base	X	X		X	X	X	X
Pipe Underdrain	X			X			
Beam Guard				X	X	X	X
Concrete Staining							X
Trees/Shrubs	X						X

Again please make every effort to have your quotes into our office by time deadline prior to the letting date.

We prefer quotes be sent via SBN but prime's preferred alternatives are acceptable.

If there are further questions please direct them to the prime contractor's contact person at phone number.

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 is a part of the Bid Express® service that was created to ensure that small businesses have a centralized area to access information about upcoming projects. It can help small businesses learn more about opportunities, compete more effectively, network with other contractors and subcontractors, and win more jobs. **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.
    b. DBE firms can request a Bid Express Small Business Network Account at no cost by calling 414-438-458

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

	Active & Aggressive Category	Quality Category	Quantity Category	Scope & Intensity Category	Timing Category	Business Develop't Efforts	Total=
Solicitation Documentation							
Selected Work Items Documentation							
Documentation of Project Information provided to Interested DBEs							
Documentation of Negotiation with Interested DBEs							
Documentation of Sound Reason for Rejecting DBEs							
Documentation of Assistance to Interested DBEs- bonding, credit, insurance, equipment, supplies/materials							
Documentation of Outreach to Minority, Women, and Community organizations and other DBE Business Development Support							
Documentation of other GFE activities							
Overall Total=							

GFE EVALUATION RATING LEGEND – PHASE 1 – Initial Review

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
BUSINESS DEVELOPMENT INITIATIVES: Demonstrated by efforts to support business growth and health of DBEs

Rating Scale

- **Each qualifying activity is worth 5 points per Category**
  - **Pro Forma efforts= 0-50 points**
    Perfunctory effort characterized by routine or superficial activities
  - **Bona Fide= 55+ points**
    Genuine effort characterized by sincere and earnest activities

GFE EVALUATION – PHASE 2 – Team Review

DBE Office completes:

- Review of quote comparisons 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 by apparent low bidder

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 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.

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

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. **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 Representative's Signature & Date
	Participating DBE Firm Representative's Name (Print Name)
	Participating DBE Firm (Print Company Name)
	DBE Firm's Address:

# Owned Trucks	# Leased Trucks	# DBE-Owned Leased Trucks	# Non-DBE-Owned Leased Trucks

Official Form DT1506 can be found here: www.wisconsindot.gov/DBEcontracting

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: www.wisconsindot.gov/DBEcontracting

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.

ADDITIONAL SPECIAL PROVISIONS 5
FUEL COST ADJUSTMENT

A Description

Fuel Cost Adjustments will be applied to partial and final payments for work items categorized in Section B as a payment to the contractor or a credit to the department. ASP-5 shall not apply to any force account work.

B Categories of Work Items

The following items and Fuel Usage Factors shall be used to determine Fuel Cost Adjustments:

(1) Earthwork.		Unit	Gal. Fuel Per Unit
205.0100	Excavation Common	CY	0.23
205.0200	Excavation Rock	CY	0.39
205.0400	Excavation Marsh	CY	0.29
208.0100	Borrow	CY	0.23
208.1100	Select Borrow	CY	0.23
209.1100	Backfill Granular Grade 1	CY	0.23
209.1500	Backfill Granular Grade 1	Ton	0.115
209.2100	Backfill Granular Grade 2	CY	0.23
209.2500	Backfill Granular Grade 2	Ton	0.115
350.0102	Subbase	CY	0.28
350.0104	Subbase	Ton	0.14
350.0115	Subbase 6-Inch	SY	0.05
350.0120	Subbase 7-Inch	SY	0.05
350.0125	Subbase 8-Inch	SY	0.06
350.0130	Subbase 9-Inch	SY	0.07
350.0135	Subbase 10-Inch	SY	0.08
350.0140	Subbase 11-Inch	SY	0.09
350.0145	Subbase 12-Inch	SY	0.09

C Fuel Index

A Current Fuel Index (CFI) in dollars per gallon will be established by the Department of Transportation for each month. The CFI will be the price of No. 2 fuel oil, as reported in U.S. Oil Week, using the first issue dated that month. The CFI will be the average of prices quoted for Green Bay, Madison, Milwaukee and Minneapolis.

The base Fuel Index (BFI) for this contract is $5.00 per gallon.

D Computing the Fuel Cost Adjustment

The engineer will compute the ratio CFI/BFI each month. If the ratio falls between 0.85 and 1.15, inclusive, no fuel adjustment will be made for that month. If the ratio is less than 0.85 a credit to the department will be computed. If the ratio is greater than 1.15 additional payment to the contractor will be computed. Credit or additional payment will be computed as follows:

(1) The engineer will estimate the quantity of work done in that month under each of the contract items categorized in Section B.

(2) The engineer will compute the gallons of fuel used in that month for each of the contract items categorized in Section B by applying the unit fuel usage factors shown in Section B.

(3) The engineer will summarize the total gallons (Q) of fuel used in that month for the items categorized in Section B.

(4) The engineer will determine the Fuel Cost Adjustment credit or payment from the following formula:

$$FA = \left(\frac{CFI}{BFI} - 1\right) x\ Q\ x\ BFI$$

(plus is payment to contractor; minus is credit to the department)

Where	FA	=	Fuel Cost Adjustment (plus or minus)
	CFI	=	Current Fuel Index
	BFI	=	Base Fuel Index
	Q	=	Monthly total gallons of fuel

E Payment

A Fuel Cost Adjustment credit to the department will be deducted as a dollar amount each month from any sums due to the contractor. A Fuel Cost Adjustment payment to the contractor will be made as a dollar amount each month.

Upon completion of the work under the contract, any difference between the estimated quantities and the final quantities will be determined. An average CFI, calculated by averaging the CFI for all months that fuel cost adjustment was applied, will be applied to the quantity differences. The average CFI shall be applied in accordance with the procedure set forth in Section D.

Additional Special Provision 6
ASP 6 - Modifications to the standard specifications

Make the following revisions to the standard specifications:

415.3.16 Tolerance in Pavement Thickness

Replace the entire text with the following effective with the November 2021 letting:

415.3.16.1 General

(1) Construct the plan thickness or thicker. The department will accept pavement thickness based on the results of department-performed acceptance testing conforming to:

Magnetic Pulse Induction .....CMM 870: ASTM E3209 WTM
Probing .....CMM 870: WTP C-002
Preplacement Measurement .....CMM 870: WTP C-003

415.3.16.2 Pavement Units

415.3.16.2.1 Basic Units

(1) Basic unit is defined as a slip formed, single lane, with a minimum lane width of 10 feet, measured, from the pavement edge to the adjacent longitudinal joint; from one longitudinal joint to the next; or between pavement edges if there is no longitudinal joint.

415.3.16.2.2 Special Units

(2) Establish special units for areas of fillets, intersections, gaps, gores, shoulders, ramps, pavement lanes less than 10 feet wide and other areas not included in basic units.

415.3.16.3 Test Plate Locations

(1) Place department-furnished test plates. Within 5 business days after paving, enter the sequential number and associated position data into MRS available at:

http://www.atwoodsystems.com/

(2) Contractor will maintain plate location markings for 10 business days after paving.

415.3.16.4 Acceptance Testing

415.3.16.4.1 Basic Units

415.3.16.4.1.2 Magnetic Pulse Induction

(1) The department will measure thickness within 10 business days of paving. Upon completion of the project thickness testing, the department will provide the test results to the contractor within 5 business days.

(2) Department will establish a project reference plate at the start of each paving stage. Project reference plate will be measured before each day of testing. Department will notify the contractor of project reference plate locations before testing.

(3) If the random plate test result falls within 80 to 50 percent pay range specified in 415.5.2, the department will measure the second plate in that unit. The department will notify the contractor immediately if the average of the 6 readings falls within the 80 to 50 percent pay range.

(4) If an individual random plate test result is more than 1 inch thinner than contract plan thickness, the pavement is unacceptable. Department will determine limits of unacceptable pavement by performing the following:

- The engineer will test each consecutive plate stationed ahead and behind until the thickness test result is plan thickness or greater.
- The engineer will direct the contractor to core the hardened concrete to determine the extent of the unacceptable area. In each direction, the contractor shall take cores at points approximately 20 feet from the furthest out of specification plate towards the plate that is plan thickness of greater. Once a core is within 80 to 100 percent pay range, the coring is complete and the limits of unacceptable pavement extend from the stationing between the core test results of 80 to 100 percent payment, inclusive of all unacceptable core and plate test results.
- The contractor shall perform coring according to AASHTO T24. The department will evaluate the results according to AASHTO T148
- The contractor shall fill core holes with concrete or mortar.

415.3.16.4.2 Special Units

415.3.16.4.2.1 Magnetic Pulse Induction

(1) The department will measure thickness within 10 business days of paving. Upon completion of the project thickness testing, the department will provide the test results to the contractor within 5 business days.

(2) Department will establish a project reference plate at the start of each paving stage. Project reference plate will be measured before each day of testing. Department will notify the contractor of project reference plate locations before testing.

(3) If the random plate test result falls within 80 to 50 percent pay range specified in 415.5.2, the department will measure the second plate in that unit. The department will notify the contractor immediately if the average of the 6 readings falls within the 80 to 50 percent pay range.

(4) If an individual random plate test result is more than 1 inch thinner than contract plan thickness, the department will measure the second plate in that unit. If both plates are required to be measured, then all six thickness measurements will be averaged for that unit. If the average of the six measurements is more than 1 inch thinner than contract plan thickness, the pavement is unacceptable.

415.3.16.4.2.2 Probing

(1) The department will measure slip form special units during concrete placement. Upon completion of the project thickness testing, the department will provide the test results to the contractor within 5 business days.

(2) Department will probe 2 random locations within the special unit. The average of the two readings will be the reported measurement for the special unit.

415.3.16.4.2.3 Preplacement Measurement

(1) The department will measure non-slip form special units before concrete placement.

(2) Thickness corrections will be made to a conforming thickness by reshaping the base aggregate before the pavement is placed.

415.5.2 Adjusting Pay for Thickness

Replace the entire text with the following effective with the November 2021 letting:

(1) The department will adjust pay for pavement thickness under the Nonconforming Thickness Concrete Pavement administrative item as follows:

FOR PAVEMENT THINNER THAN PLAN THICKNESS BY:	PERCENT OF THE CONTRACT UNIT PRICE
> 1/4 inch but <= 1/2 inch	80
> 1/2 inch but <= 3/4 inch	60
> 3/4 inch but <= 1 inch	50

(2) When pavement of unacceptable final thickness is determined, as specified in 415.3.16.4, the department will direct the contractor to either:

1. Remove and replace unacceptable concrete pavement to the nearest joint with new concrete pavement of conforming thickness. The department will pay once for the area at the full contract price.
2. If the unacceptable pavement is less than 100 LF, the department may allow the concrete to remain in place without payment for the unacceptable area.

460.2.6 Recovered Asphaltic Binders

Replace paragraph two with the following effective with the November 2021 letting:

(2) The contractor may replace virgin binder with recovered binder up to the maximum percentage allowed under 460.2.5 without further testing. When the design percent asphalt binder replaced exceeds the allowable limits in 460.2.5, the contractor must:

- Document adjustments made to the mix design in the mix design submittal.
- Submit test results that indicate the mixture's asphaltic binder meets or exceeds the upper and lower temperature grade requirements the bid item designates.
    - If only one recycled asphaltic material source is used, furnish one of the following:
        - Test results from extracted and recovered binder from the resultant mixture.
        - Blending charts that indicate the resultant mixture's high and low temperature PG as an interpolation of the percent binder replaced between the virgin binder's and the recycled asphaltic material source binder's high and low temperature PG.
    - If two or more recycled asphaltic material sources are used, furnish test results from extracted and

recovered binder from the resultant mixture.

501.2.6 Water

Retitle with the following effective with the November 2021 letting:

501.2.6 Mixing Water

501.2.6.2 Requirements

Replace paragraph two with the following effective with the November 2021 letting:

(2) Water from other sources must comply with the following:

Acidity, maximum of 0.1N NaOH to neutralize 200 mL of water; CMM 870: WTP C-001	2 mL
Alkalinity, maximum of 0.1N HCL to neutralize 200 mL of water; CMM 870: WTP C-001	15 mL
Maximum sulphate ($S0_4$); CMM 870: WTP C-001	0.05 percent
Maximum chloride; CMM 870: WTP C-001	0.10 percent
Maximum total solids; CMM 870: WTP C-001	
Organic	0.04 percent
Inorganic	0.15 percent

501.3.2.2.2 Supplementary Cementitious Material

Replace the entire text with the following effective with the May 2022 letting:

(1) Replace 15 to 30 percent by weight of the total cementitious material content with approved SCMs for class I concrete as specified in 715.

(2) Replace a maximum of 30 percent by weight of the total cementitious material content with approved SCMs for class II and class III concrete as specified in 716.

(3) Limit Class F fly ash sources not on the APL to maximum 15 percent.

(4) Minimum SCM content may be waived by the engineer.

501.3.2.4.2 Air Entrainment

Replace paragraph two with the following effective with the November 2021 letting:

(2) Test fresh concrete air content according to AASHTO T152 or AASHTO TP118 at the contract-required frequency and as the engineer directs. Test concrete placed by pumping or belting at the point of discharge from the pump line or belt.

501.3.7.1 Slump

Replace paragraph one with the following effective with the November 2021 letting:

(1) Use a 1-inch to 4-inch slump for concrete used in structures or placed in forms, except as follows:

- Do not exceed a slump of 2 inches for grade E concrete.
- Increase slump as specified in 502.3.5.3 for concrete placed underwater.
- If BTS approves a concrete mixture using a superplasticizer, the contractor may increase slump for that mixture to a maximum of 9 inches without exceeding the maximum mix water allowed for that grade.

531.5 Payment

Replace paragraph two with the following effective with the November 2021 letting:

(2) Payment for Concrete Masonry Ancillary Structures Type NS is full compensation for providing concrete for non-standard sign structure foundations; and for anchor rod assemblies. The department will pay separately for excavating and backfilling drilled shafts under the Drilling Shafts bid items.

Replace paragraph five with the following effective with the November 2021 letting:

(5) Payment for the Foundation bid items is full compensation for providing concrete foundations; for anchor rod assemblies; for reinforcing steel; and for embedded conduit and electrical components. The department will pay separately for excavating and backfilling drilled shafts under the Drilling Shafts bid items.

642.2.2.1 General

Replace paragraph one with the following effective with the November 2021 letting:

(1) Provide each field office with two rooms, separated by an interior door with a padlock. Ensure that each room has a separate exterior door and its own air conditioner. Locate the office where a quality internet connection can be achieved. Ensure quality cell phone reception is achievable inside the field office.

701.3.1 General

Replace table 701-1 with the following effective with the November 2021 letting:

TABLE 701-1 TESTING AND CERTIFICATION STANDARDS

TEST	TEST STANDARD	MINIMUM REQUIRED CERTIFICATION (any one of the certifications listed for each test)
Random Sampling	CMM 830.9.2	Transportation Materials Sampling Technician (TMS) TMS Assistant Certified Technician (ACT-TMS) Aggregate Technician I (AGGTEC-I) AGGTEC-I Assistant Certified Technician (ACT-AGG) PCC Technician I (PCCTEC-I) PCCTEC-I Assistant Certified Technician (ACT-PCC) Grading Technician I (GRADINGTEC-I) Grading Assistant Certified Technician (ACT-GRADING)
Sampling Aggregates	AASHTO T2[1] [4]	TMS, ACT-TMS, AGGTECT-1, ACT-AGG
Percent passing the No. 200 sieve	AASHTO T11[1]	AGGTEC-I, ACT-AGG
Fine & coarse aggregate gradation	AASHTO T27[1]	
Aggregate moisture content	AASHTO T255[1]	
Fractured faces	ASTM D5821[1]	
Liquid limit	AASHTO T89	Aggregate Testing for Transportation Systems (ATTS) GRADINGTEC-I, or ACT-GRADING
Plasticity index	AASHTO T90[3]	
Sampling freshly mixed concrete	AASHTO R60	PCCTEC-1 ACT-PCC
Air content of fresh concrete	AASHTO T152[2] AASHTO TP118[5]	
Air void system of fresh concrete	AASHTO TP118[5]	
Concrete slump	AASHTO T119[2]	
Concrete temperature	ASTM C1064	
Making and curing concrete specimens	AASHTO T23	
Moist curing for concrete specimens	AASHTO M201	
Concrete compressive strength	AASHTO T22	Concrete Strength Tester (CST) CST Assistant Certified Technician (ACT-CST)
Concrete flexural strength	AASHTO T97	
Concrete surface resistivity[2]	AASHTO T358	
Voids in aggregate	AASHTO T19	PCCTEC-II
Profiling	__	PROFILER

[1] As modified in CMM 860.

[2] As modified in CMM 870.

[3] A plasticity check, if required under individual QMP specifications, may be performed by an AGGTEC-I in addition to the certifications listed for liquid limit and plasticity index tests.

[4] Plant personnel may operate equipment to obtain samples under the direct observation of a TMS or higher.

[5] Consolidate by rodding.

710.2 Small Quantities

Replace the entire text with the following effective with the November 2021 letting:

(1) The department defines small quantities as follows:

- As specified in 715.1.1.2 for class I concrete.
- Less than 50 cubic yards of class II ancillary concrete placed under a single bid item.

(2) For contracts with only small quantities of material subject to testing, modify the requirements of 710 as follows:

1. The contractor may submit an abbreviated quality control plan as allowed in 701.1.2.3.
2. Provide one of the following for aggregate process control:
    - Documented previous testing dated within 120 calendar days. Provide gradation test results to the engineer before placing material.
    - Non-random start-up gradation testing.

710.4 Concrete Mixes

Replace paragraph two with the following effective with the November 2021 letting:

(2) At least 7 business days before producing concrete, document that materials conform to 501 unless the engineer allows or individual QMP specifications provide otherwise. Include the following:

1. For mixes: quantities per cubic yard expressed as SSD weights and net water, water to cementitious material ratio, air content, and SAM number.
2. For cementitious materials and admixtures: type, brand, and source.
3. For aggregates: absorption, SSD bulk specific gravity, wear, soundness, freeze thaw test results if required, and air correction factor. Also include aggregate production records dated within 2 years if using those results in the design. Submit component aggregate gradations, aggregate proportions, and target combined blended aggregate gradations using the following:
    - DT2220 for combined aggregate gradations.
    - DT2221 for optimized aggregate gradations.
4. For optimized concrete mixtures:
    - Complete the worksheets within DT2221 according to the directions.
    - Ensure the optimized aggregate gradations and the optimized mix design conform to WisDOT specifications and pass the built-in tests within DT2221.
    - Verify slip-form mixture workability according to AASHTO TP137 and conformance to specifications through required trial batching.
    - Submit the completed DT2221 to the engineer electronically. Include the trial batch test results with the mix design submittal.

Replace paragraph four with the following effective with the November 2021 letting:

(4) Prepare and submit modifications to a concrete mix to the engineer for approval 3 business days before using that modified mix. Modifications requiring the engineer's approval include changes in:

1. Source of any material. For paving and barrier mixes, a source change for fly ash of the same class does not constitute a mix design change.
2. Quantities of cementitious materials.
3. Addition or deletion of admixtures. Minor admixture dosage adjustments required to maintain air content or slump do not require engineer review or approval.

710.5.5 Strength

Replace paragraph one with the following effective with the November 2021 letting:

(1) Cast all 6" x 12" cylinders or all 6" x 6" x 21" beams in a set from the same sample. Do not cast more than one set of specimens from a single truckload of concrete. Mark each specimen to identify the lot and sublot or location on the project it represents.

710.5.6 Aggregate Testing

Retitle and replace the entire text with the following effective with the November 2021 letting:

710.5.6 Aggregate Testing During Concrete Production

710.5.6.1 General

(1) The department will accept gradation based on the results of department-performed acceptance testing.

(2) The department and contractor will obtain samples using the same method. When belt sampling, contractor personnel shall obtain samples for the department under the direct observation of the department personnel. Contractor will define sampling method in the QMP or abbreviated QMP.

710.5.6.2 Contractor Control Charts

710.5.6.2.1 General

(1) Test aggregate gradations during concrete production except as allowed for small quantities under 710.2. Required contractor testing will be performed using non-random samples.

(2) Sample aggregates from either the conveyor belt or from the working face of the stockpiles.

(3) Sample aggregates within 2 business days before placement for each mix design. Include this gradation on the control charts.

(4) Report gradation test results and provide control charts to the engineer within 1 business day of obtaining the sample. Submit results to the engineer and electronically into MRS as specified in 701.1.2.7.

(5) Conduct aggregate testing at the minimum frequency shown based on the anticipated daily cumulative plant production for each mix design. The contractor's concrete production tests can be used for the same mix design on multiple contracts.

TABLE 710-1 CONTRACTOR GRADATION TESTING FREQUENCY - CLASS I

DAILY PLANT PRODUCTION RATE FOR WisDOT WORK	MINIMUM FREQUENCY
Gradation Report Before Placement	
1000 cubic yards or less	one test per day
more than 1000 cubic yards	two tests per day

TABLE 710-2 CONTRACTOR GRADATION TESTING FREQUENCY - CLASS II

MINIMUM FREQUENCY
Gradation Report Before Placement
One test per calendar week of production

710.5.6.2.2 Optimized Aggregate Gradation Control Charts

(1) Determine the complete gradation using a washed analysis for both fine and coarse aggregates. Report results for the following:

- 1 1/2", 1", 3/4", 1/2", 3/8", #4, #8, #16, #30, #50, #100, and #200 sieves.
- Sum of volumetric percentages retained on No. 8, No. 16, and No. 30 sieves.
- Sum of volumetric percentages retained on No. 30, No. 50, No. 100, and No. 200 sieves.

(2) Calculate blended aggregate gradations using the mix design batch percentages for the component aggregates. Ensure the blended aggregate gradation conforms to the volumetric percent retained of the optimized aggregate gradation limits specified in table 501-4.

(3) Throughout the contract, construct a 4-point running average of the volumetric percent retained for each sieve to determine if the blended aggregate gradation is within the tarantula curve limits specified in table 501-4.

710.5.6.2.3 Combined Aggregate Gradation Control Charts

(1) Determine the complete gradation using a washed analysis for both fine and coarse aggregates. Report results for the 1 1/2", 1", 3/4", 1/2", 3/8", #4, #8, #16, #30, #50, #100, and #200 sieves.

(2) Calculate blended aggregate gradations using the mix design batch percentages for the component aggregates. Ensure the blended aggregate gradation conforms to the percent passing by weight requirements of the combined aggregate gradation limits specified in table 501-4.

(3) Throughout the contract, construct a 4-point running average of the percent passing by weight for each sieve to determine if the blended aggregate gradation is within the combined aggregate gradation limits specified in table 501-4.

710.5.6.3 Department Acceptance Testing

(1) Department testing frequency is based on the quantity of each mix design placed under each individual WisDOT contract.

(2) The department will split each sample, test for acceptance, and retain the remainder for a minimum of 10 calendar days.

(3) The department will obtain the sample and deliver to regional testing lab in the same day. Department will report gradation test results to the contractor within 1 business day of being delivered to the lab. Department and contractor can agree to an alternative test result reporting timeframe; alternative timeframe is required to be documented in the QMP.

(4) Additional samples may be taken at the engineer's discretion due to change in condition.

TABLE 710-3 DEPARTMENT GRADATION TESTING FREQUENCY

CONCRETE CLASSIFICATION	MINIMUM DEPARTMENT FREQUENCY
Class I: Pavement	1 test per placement day for first 5 days of placement. If all samples are passing, reduced frequency is applied.
	Reduced frequency: 1 test per calendar week of placement
Class I: Structures	1 test per 250 CY placed - Minimum of 1 test per substructure - Minimum of 1 test per superstructure
Class I: Cast-in-Place Barrier	1 test per 500 CY placed
Class II	No minimum testing

710.5.7 Corrective Action

Replace the entire text with the following effective with the November 2021 letting:

710.5.7.1 Optimized Aggregate Gradations

(1) If the contractor's 4-point running average or a department test result of the volumetric percent retained exceeds the tarantula curve limits by less than or equal to 1.0 percent on a single sieve size, do the following:

1. Notify the other party immediately.
2. Perform corrective action documented in the QC plan or as the engineer approves.
3. Document and provide corrective action results to the engineer as soon as they are available.
4. Department will conduct two tests within the next business day after corrective action is complete.
5. If blended aggregate gradations are within the tarantula curve limits by the second department test:
   - Continue with concrete production.
   - Contractor will include a break in the 4-point running average.
   - For Class I: Pavements, department will discontinue reduced frequency testing and will test at a frequency of 1 test per placement day. Once 5 consecutive samples are passing at the 1 test per placement day frequency, the reduced frequency testing will be reapplied.
6. If blended aggregate gradations are not within the tarantula curve limits by the second department test:
   - Provide a new mix design with an increased cementitious content.
   - If the mix design already has a cementitious content of 565 or more pounds per cubic yard, provide a new mix design.
   - If the contract requires optimized aggregate gradations under 501.2.7.4.2.1(2), stop concrete production and submit a new mix design.

(2) If the contractor's 4-point running average or a department test result of the volumetric percent retained exceeds the tarantula curve limits by more than 1.0 percent on one or more sieves, stop concrete production and submit a new mix design.

(3) Department and contractor will sample and test aggregate of the new mix design at the frequency defined in 710.5.6.1.

710.5.7.2 Combined Aggregate Gradations

(1) If the contractor's 4-point running average or a department test result of the percent passing by weight exceeds the combined aggregate gradation limits by less than or equal to 1.0 percent on a single sieve size, do the following:

1. Notify the other party immediately.
2. Perform corrective action documented in the QC plan or as the engineer approves.
3. Document and provide corrective action results to the engineer as soon as they are available.
4. Department will conduct two tests within the next business day after corrective action is complete.
5. If blended aggregate gradations are within the combined aggregate gradation limits by the second department test:
   - Continue with concrete production.
   - Contractor will include a break in the 4-point running average.

- For Class I: Pavements, department will discontinue reduced frequency testing and will test at a frequency of 1 test per placement day. Once 5 consecutive samples are passing at the 1 test per placement day frequency, the reduced frequency testing will be reapplied.

6. If blended aggregate gradations are not within the combined aggregate gradation limits by the second department test, stop concrete production and submit a new mix design.

(2) If the contractor's 4-point running average or a department test result of the percent passing by weight exceeds the combined aggregate gradation limits by more than 1.0 percent on one or more sieves, stop concrete production and submit a new mix design.

(3) Department and contractor will sample and test aggregate of the new mix design at the frequency defined in 710.5.6.1.

715.3.1.1 General

Replace paragraphs three and four with the following effective with the November 2021 letting:

(3) Cast a set of 3 additional 6"x12" cylinders and test the concrete surface resistivity according to AASHTO T358. Perform this testing at least once per lot if total contract quantities are greater than or equal to the following:

- 20,000 square yards for pavements.
- 5,000 linear feet for barriers.
- 500 cubic yards for structure concrete.

Submit the resistivity to the nearest tenth into MRS for information only. Resistivity testing is not required for the following:

- Lot with less than 3 sublots.
- Concrete items classified as ancillary.
- Concrete placed under the following bid items:
  - Concrete Pavement Approach Slab
  - Concrete Masonry Culverts
  - Concrete Masonry Retaining Walls

(4) Test the air void system at least once per lot and enter the SAM number in MRS for information only. SAM testing is not required for the following:

- For lots with less than 3 sublots.
- High early strength (HES) concrete.
- Special high early strength (SHES) concrete.
- Concrete placed under the following bid items:
  - Concrete Pavement Approach Slab
  - Concrete Masonry Culverts
  - Concrete Masonry Retaining Walls
  - Steel Grid Floor Concrete Filled
  - Crash Cushions Permanent
  - Crash Cushions Permanent Low Maintenance
  - Crash Cushions Temporary

715.3.1.2.3 Lots by Cubic Yard

Replace the entire text with the following effective with the November 2021 letting:

(1) Define standard lots and sublots conforming to the following:

TABLE 715-1 CLASS I - LOT AND SUBLOT SIZES

CONCRETE CLASSIFICATION	LOT SIZE	SUBLOT SIZE	NUMBER OF SUBLOTS PER LOT
Class I: Pavement	1250 cubic yards	250 cubic yards	5
Class I: Structures	250 cubic yards	50 cubic yards	5
Class I: Cast-in-Place Barrier	500 cubic yards	100 cubic yards	5

(2) The contractor may include sublots less than or equal to 25 percent of the standard volume in the previous sublot. For partial sublots exceeding 25 percent of the standard volume, notify the engineer who will direct additional testing to represent that partial sublot.

(3) An undersized lot is eligible for incentive payment under 715.5 if the lot has 3 or more sublots for that lot.

715.3.2 Strength Evaluation

Replace the entire text with the following effective with the November 2021 letting:

715.3.2.1 General

(1) The department will make pay adjustments for strength on a lot-by-lot basis using the compressive strength of contractor QC cylinders or the flexural strength of contractor QC beams.

(2) Randomly select 2 QC specimens to test at 28 days for percent within limits (PWL). Compare the strengths of the 2 randomly selected QC specimens and determine the 28-day sublot average strength as follows:

- If the lower strength divided by the higher strength is 0.9 or more, average the 2 QC specimens.
- If the lower strength divided by the higher strength is less than 0.9, break one additional specimen and average the 2 higher strength specimens.

715.3.2.2 Removal and Replacement

715.3.2.2.1 Pavement

(1) If a sublot strength is less than 2500 psi in compressive strength or 500 psi in flexural strength, the department may direct the contractor to core that sublot to determine its structural adequacy and whether to direct removal.

(2) If the engineer directs coring, obtain three cores from the sublot in question. Have an HTCP-certified PCC technician I perform or observe core sampling according to AASHTO T24.

(3) Have an independent consultant test cores according to AASHTO T24.

(4) The department will assess concrete for removal and replacement based on a sublot-by-sublot analysis of core strength. Perform coring and testing, fill core holes with an engineer-approved non-shrink grout or concrete, and provide traffic control during coring.

(5) The sublot pavement is conforming if the compressive strengths of all cores from the sublot are 2500 psi or greater.

(6) The sublot pavement is nonconforming if the compressive strengths of any core from the sublot is less than 2500 psi. The department may direct removal and replacement or otherwise determine the final disposition of nonconforming material as specified in 106.5.

715.3.2.2.2 Structures and Cast-in-Place Barrier

(1) The department will evaluate the sublot for possible removal and replacement if the 28-day sublot average compressive strength is lower than f'c minus 500 psi. The value of f'c is the design stress the plans show. The department may assess further strength price reductions or require removal and replacement only after coring the sublot.

(2) The engineer may initially evaluate the sublot strength using a non-destructive method. Based on the results of non-destructive testing, the department may accept the sublot at the previously determined pay for the lot, or direct the contractor to core the sublot.

(3) If the engineer directs coring, obtain three cores from the sublot in question. Have an HTCP-certified PCC technician I perform or observe core sampling according to AASHTO T24. Determine core locations, subject to the engineer's approval, that do not interfere with structural steel.

(4) Have an independent consultant test cores according to AASHTO T24.

(5) The department will assess concrete for removal and replacement based on a sublot-by-sublot analysis of core strength. Perform coring and testing, fill core holes with an engineer-approved non-shrink grout or concrete, and provide traffic control during coring.

(6) If the 3-core average is greater than or equal to 85 percent of f'c, and no individual core is less than 75 percent of f'c, the engineer will accept the sublot at the previously determined pay for the lot. If the 3-core average is less than 85 percent of f'c, or an individual core is less than 75 percent of f'c, the engineer may require the contractor to remove and replace the sublot. The department may direct removal and replacement or otherwise determine the final disposition of nonconforming material as specified in 106.5.

715.3.3 Aggregate

Replace the entire text with the following effective with the November 2021 letting:

715.3.3.1 General

(1) Except as allowed for small quantities in 710.2, test aggregate conforming to 710.5.6.

715.3.3.2 Structures

(1) In addition to the aggregate testing required under 710.5.6, determine the fine and coarse aggregate moisture content for each sample.

(2) Calculate target batch weights for each mix when production of that mix begins. Whenever the moisture content of the fine or coarse aggregate changes by more than 0.5 percent, adjust the batch weights to maintain the design w/cm ratio.

716.2.1 Class II Concrete

Replace paragraph two with the following effective with the May 2022 letting:

(2) Perform random QC testing at the following frequencies:

1. Test air content, temperature, and slump a minimum of once per 100 cubic yards for each mix design and placement method.
2. Cast one set of 2 cylinders per 200 cubic yards for each mix design and placement method. Cast a minimum of one set of 2 cylinders per contract for each mix design and placement method. Random 28-day compressive strength cylinders are not required for HES or SHES concrete.
3. For deck overlays, perform tests and cast cylinders once per 50 cubic yards of grade E concrete placed.
4. For concrete base, one set of tests and one set of cylinders per 250 cubic yards.

The department will allow concrete startup test results for quantities under 50 cubic yards. Cast one set of 2 cylinders if using startup testing for acceptance.

ERRATA

460.2.2.3 Aggregate Gradation Master Range

Correct errata by adding US Standard equivalent sieve sizes.

(1) Ensure that the aggregate blend, including recycled material and mineral filler, conforms to the gradation requirements in table 460-1. The values listed are design limits; production values may exceed those limits.

TABLE 460-1 AGGREGATE GRADATION MASTER RANGE AND VMA REQUIREMENTS

SIEVE	PERCENT PASSING DESIGNATED SIEVES							
	NOMINAL SIZE							
	No. 1 (37.5 mm) (1 1/2 inch)	No. 2 (25.0 mm) (1 inch)	No.3 (19.0 mm) (3/4 inch)	No. 4 (12.5 mm) (1/2 inch)	No. 5 (9.5 mm) (3/8 inch)	No. 6 (4.75 mm) (3/16 inch)	SMA No. 4 (12.5 mm) (1/2 inch)	SMA No. 5 (9.5 mm) (3/8 inch)
50.0-mm (2-inch)	100							
37.5-mm (1 1/2-inch)	90 - 100	100						
25.0-mm (1-inch)	90 max	90 - 100	100					
19.0-mm (3/4-inch)	___	90 max	90 - 100	100			100	
12.5-mm (1/2-inch)	___	___	90 max	90 - 100	100		90 - 97	100
9.5-mm (3/8-inch)	___	___	___	90 max	90 - 100	100	58 - 80	90 - 100
4.75-mm (No. 4)	___	___	___	___	90 max	90 - 100	25 - 35	35 - 45
2.36-mm (No. 8)	15 - 41	19 - 45	23 - 49	28 - 58	32 - 67	90 max	15 - 25	18 - 28
1.18-mm (No. 16)	___	___	___	___	___	30 - 55	___	___
0.60-mm (No. 30)	___	___	___	___	___	___	18 max	18 max
0.075-mm (No. 200)	0 - 6.0	1.0 - 7.0	2.0 - 8.0	2.0 - 10.0	2.0 - 10.0	6.0 - 13.0	8.0 - 11.0	8.0 - 12.0
% VMA	11.0 min	12.0 min	13.0 min	14.0 min[1]	15.0 min[2]	16.0 - 17.5	16.0 min	17.0 min

[1] 14.5 for LT and MT mixes.

[2] 15.5 for LT and MT mixes.

715.5.1 General

Correct the bid item number for Incentive Compressive Strength Concrete Pavement.

(1) The department will pay incentive for compressive strength under the following bid items:

ITEM NUMBER	DESCRIPTION	UNIT
715.0502	Incentive Strength Concrete Structures	DOL
715.0603	Incentive Strength Concrete Barrier	DOL
715.0715	Incentive Flexural Strength Concrete Pavement	DOL
715.0720	Incentive Compressive Strength Concrete Pavement	DOL

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

Effective January 2019 Letting ASP 9

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

1. Form FHWA-1273 must be physically incorporated in each construction contract funded under Title 23 (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).

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.

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). 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 bid proposal or request for proposal 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).

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.

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. The term Federal-aid highway does not include roadways functionally classified as local roads or rural minor collectors.

II. NONDISCRIMINATION

The provisions of this section related to 23 CFR Part 230 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 60, 29 CFR 1625-1627, Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), Title VI of the Civil Rights Act of 1964, as amended, 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 60, and 29 CFR 1625-1627. The contracting agency and the FHWA have the authority and the responsibility to ensure compliance with Title 23 USC Section 140, the Rehabilitation Act of 1973, as amended (29 USC 794), and Title VI of the Civil Rights Act of 1964, as amended, 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 230, 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 (28 CFR 35, 29 CFR 1630, 29 CFR 1625-1627, 41 CFR 60 and 49 CFR 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 35 and 29 CFR 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.

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, 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 who 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.

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, national origin, age or disability. The following procedures shall be followed:

a. The contractor will conduct periodic inspections of project sites to insure 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. 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, 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, 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 there under. 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, 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 and 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. Assurance Required by 49 CFR 26.13(b):

a. The requirements of 49 CFR Part 26 and the State DOT's U.S. DOT-approved DBE program are incorporated by reference.

b. The contractor 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 contracting agency deems appropriate.

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 $10,000 or more.

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, 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). The requirements apply to all projects located within the right-of-way of a roadway that is functionally classified as Federal-aid highway. This excludes roadways functionally classified as local roads or rural minor collectors, which are exempt. Contracting agencies may elect to apply these requirements to other projects.

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

a. All laborers and mechanics employed or working upon the site of the work, 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 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.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph 1.d. 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 shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in 29 CFR 5.5(a)(4). 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 classification and wage rates conformed under paragraph 1.b. of this section) and the Davis-Bacon poster (WH–1321) shall 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.(1) The contracting officer shall 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 shall be classified in conformance with the wage determination. The contracting officer shall approve an additional classification and wage rate and fringe benefits therefore 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 utilized 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) 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 shall be sent by the contracting officer to the Administrator of the Wage and Hour Division, Employment Standards Administration, U.S. Department of Labor, Washington, DC 20210. 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.

(3) 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 shall refer the questions, including the views of all interested parties and the recommendation of the contracting officer, to the Wage and Hour Administrator for determination. The Wage and Hour 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.

(4) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs 1.b.(2) or 1.b.(3) of this section, shall 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.

c. 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 shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

d. 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, 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.

2. Withholding

The contracting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor, withhold or cause to be withheld from the contractor under this contract, or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the contracting agency may, 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.

3. Payrolls and basic records

a. Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, 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 section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) 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 section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall 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. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

b.(1) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the contracting agency. The payrolls submitted shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), except that full social security numbers and home addresses shall not be included on weekly transmittals. Instead the payrolls shall only need to include an individually identifying number for each employee (e.g. , the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH–347 is available for this purpose from the Wage and Hour Division Web site at http://www.dol.gov/esa/whd/forms/wh347instr.htm or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker, and shall provide them upon request to the contracting agency for transmission to the State DOT, the FHWA or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the contracting agency..

(2) Each payroll submitted shall be accompanied by a "Statement of Compliance," signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(i) That the payroll for the payroll period contains the information required to be provided under §5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under §5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(ii) That each laborer or mechanic (including each helper, apprentice, and trainee) employed 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 Regulations, 29 CFR part 3;

(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 of work performed, as specified in the applicable wage determination incorporated into the contract.

(3) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH–347 shall satisfy the requirement for submission of the "Statement of Compliance" required by paragraph 3.b.(2) of this section.

(4) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

c. The contractor or subcontractor shall make the records required under paragraph 3.a. of this section available for inspection, copying, or transcription by authorized representatives of the contracting agency, the State DOT, the FHWA, or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the FHWA may, after written notice to the contractor, the contracting agency or the State DOT, 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 may be grounds for debarment action pursuant to 29 CFR 5.12.

4. Apprentices and trainees

a. Apprentices (programs of the USDOL).

Apprentices will be permitted to work at less than the predetermined rate for the work they performed 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 Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice.

The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall 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 the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed.

Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall 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, fringes shall be paid in accordance with that determination.

In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

b. Trainees (programs of the USDOL).

Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration.

The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration.

Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed.

In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

c. Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

d. 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. 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 journeymen 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.

6. Subcontracts. The contractor or subcontractor shall insert Form FHWA-1273 in any subcontracts and also require the subcontractors to include Form FHWA-1273 in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 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.

9. Disputes concerning labor standards. 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 he or she) 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 section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

b. No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

c. The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

V. CONTRACT WORK HOURS AND SAFETY STANDARDS ACT

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 watchmen 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.

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. 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 watchmen and guards, employed in violation of the clause set forth in paragraph (1.) of this section, in the sum of $10 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.

3. Withholding for unpaid wages and liquidated damages. The FHWA or the contacting agency shall upon its own action or upon written request of an authorized representative of the Department of Labor withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or 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, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (2.) of this section.

4. Subcontracts. The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (1.) through (4.) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (1.) through (4.) of this section.

VI. SUBLETTING OR ASSIGNING THE CONTRACT

This provision is applicable to all Federal-aid construction contracts on the National Highway System.

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” 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:

(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.

2. 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. 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.

5. The 30% self-performance requirement of paragraph (1) is not applicable to design-build contracts; however, contracting agencies may establish their own self-performance requirements.

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 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.

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 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).

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 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 1, 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

This provision is applicable to all Federal-aid construction contracts and to all related subcontracts.

By submission of this bid/proposal or the execution of this contract, or subcontract, as appropriate, the bidder, proposer, Federal-aid construction contractor, or subcontractor, as appropriate, will be deemed to have stipulated as follows:

1. That any person who is or will be utilized in the performance of this contract is not prohibited from receiving an award due to a violation of Section 508 of the Clean Water Act or Section 306 of the Clean Air Act.
2. That the contractor agrees to include or cause to be included the requirements of paragraph (1) of this Section X in every subcontract, and further agrees to take such action as the contracting agency may direct as a means of enforcing such requirements.

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.

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.

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.

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.

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 and 1200. “First Tier Covered Transactions” refers to any covered transaction between a grantee or subgrantee 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 grantee or subgrantee 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.

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.

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. 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 Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

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. 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) 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;

(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; 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.

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

2. **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)

a. By signing and submitting this proposal, the prospective lower tier 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.

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 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 grantee or subgrantee 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 grantee or subgrantee 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.

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.

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 Excluded Parties List System website (https://www.epls.gov/), which is compiled by the General Services Administration.

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.

* * * * *

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion--Lower Tier Participants:

1. The prospective lower tier participant certifies, by submission of this proposal, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participating in covered transactions by any Federal department or agency.

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

* * * * *

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 20).

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.

ATTACHMENT A - EMPLOYMENT AND MATERIALS PREFERENCE FOR APPALACHIAN DEVELOPMENT HIGHWAY SYSTEM OR APPALACHIAN LOCAL ACCESS ROAD CONTRACTS

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).

SEPTEMBER 2002

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.

APRIL 2013

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.

Effective November 2020 letting

BUY AMERICA PROVISION

All steel and iron materials permanently incorporated in this project shall be domestic products and all manufacturing and coating processes for these materials from smelting forward in the manufacturing process 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 this 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. The contractor shall take actions and provide documentation conforming to CMM 2-28.5 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 steel, iron, and coating processes for steel or iron incorporated into the contract work conform to these "Buy America" provisions. Attach a list of exemptions and their associated costs to the certification form. Department form DT4567 is available at:

https://wisconsindot.gov/Documents/formdocs/dt4567.docx

Effective February 2016 letting

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.

Effective with December 2017 Letting

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. It is 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: WI20220010 06/17/2022

Superseded General Decision Number: WI20210010

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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	01/21/2022
2	02/04/2022
3	02/25/2022
4	03/11/2022
5	03/18/2022
6	04/29/2022
7	05/13/2022
8	06/17/2022

BRWI0001-002 06/01/2021

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.81	25.17

BRWI0002-002 06/01/2021

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.35	23.89

BRWI0002-005 06/01/2021

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	$ 37.73	24.15

BRWI0003-002 06/01/2021

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0004-002 06/01/2021

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.30	26.03

BRWI0006-002 06/01/2021

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes

BRICKLAYER.....$ 37.78 24.20

BRWI0007-002 06/01/2021

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.38	25.31

BRWI0008-002 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 42.38	24.64

BRWI0011-002 06/01/2021

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0019-002 06/01/2021

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.31	25.67

BRWI0034-002 06/01/2021

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

CARP0087-001 05/01/2016

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	$ 36.85	18.39

CARP0252-002 06/01/2016

ADAMS, BARRON, BAYFIELD (Eastern 2/3), BROWN, BUFFALO, BURNETT (E. of Hwy 48), CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE (except area bordering Michigan State Line), FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE (except N.E. corner), MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E.

of Hwys 29 & 65), POLK (E. of Hwys 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
CARPENTER		
CARPENTER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVER	$ 34.12	18.00

CARP0252-010 06/01/2016

ASHLAND COUNTY

	Rates	Fringes
Carpenters		
Carpenter	$ 33.56	18.00
Millwright	$ 35.08	18.35
Pile Driver	$ 34.12	18.00

CARP0264-003 06/01/2016

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WAUKESHA, AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER	$ 35.78	22.11

CARP0361-004 05/01/2018

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 36.15	20.43

CARP2337-001 06/01/2016

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON

ZONE B: KENOSHA & RACINE

	Rates	Fringes
PILEDRIVERMAN		
Zone A	$ 31.03	22.69
Zone B	$ 31.03	22.69

ELEC0014-002 12/26/2021

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:	$ 37.83	21.89

ELEC0014-007 05/30/2021

REMAINING COUNTIES

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 28.50	15.92

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 06/01/2021

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 43.16	30%+12.70

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 05/30/2021

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:	$ 36.22	26%+11.24

ELEC0430-002 06/01/2021

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 43.45	24.89

ELEC0494-005 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 44.39	25.67

ELEC0494-006 06/01/2021

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 37.91	22.74

ELEC0494-013 06/01/2021

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.....$ 22.39 18.80
Technician.....$ 32.49 20.26

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 06/01/2021

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:	$ 35.66	29.50%+10.00

ELEC0890-003 06/01/2021

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 39.00	25.95%+11.17

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

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* ENGI0139-005 06/01/2022

	Rates	Fringes
Power Equipment Operator		

Group 1	$ 49.01	23.55
Group 2	$ 48.51	23.55
Group 3	$ 48.01	23.55
Group 4	$ 47.17	23.55
Group 5	$ 43.39	23.55
Group 6	$ 38.24	23.55

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.

IRON0008-002 06/01/2021

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2021

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 40.57	28.40

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

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* IRON0383-001 06/05/2022

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	$ 39.00	28.58

IRON0498-005 06/01/2021

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 41.37	44.41

IRON0512-008 06/03/2019

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 37.60	29.40

IRON0512-021 05/03/2021

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 35.09	31.80

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* LABO0113-002 06/01/2022

MILWAUKEE AND WAUKESHA COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 32.65	23.09
Group 2	$ 32.80	23.09
Group 3	$ 33.00	23.09
Group 4	$ 33.15	23.09
Group 5	$ 33.30	23.09
Group 6	$ 29.14	23.09

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

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* LABO0113-003 06/01/2022

OZAUKEE AND WASHINGTON COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.90	23.09
Group 2	$ 32.00	23.09
Group 3	$ 32.05	23.09

Group 4	$ 32.25	23.09
Group 5	$ 32.10	23.09
Group 6	$ 28.99	23.09

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

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* LABO0113-011 06/01/2022

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.71	23.09
Group 2	$ 31.86	23.09
Group 3	$ 32.06	23.09
Group 4	$ 32.03	23.09
Group 5	$ 32.36	23.09
Group 6	$ 28.85	23.09

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

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* LABO0140-002 06/01/2022

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	$ 32.20	18.68
Group 2	$ 33.82	17.95
Group 3	$ 33.87	17.95
Group 4	$ 34.07	17.95
Group 5	$ 33.92	17.95
Group 6	$ 30.35	17.95

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 06/01/2020

DANE COUNTY

	Rates	Fringes
LABORER		
Group 1	$ 34.00	17.95
Group 2	$ 34.10	17.95
Group 3	$ 34.15	17.95
Group 4	$ 34.35	17.95
Group 5	$ 34.20	17.95
Group 6	$ 30.35	17.95

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 05/01/2022

ASHLAND, BAYFIELD, BURNETT, AND DOUGLAS COUNTIES

	Rates	Fringes
Painters:		
New:		
Brush, Roller	$ 33.99	22.70
Spray, Sandblast, Steel	$ 34.59	22.70
Repaint:		
Brush, Roller	$ 33.09	22.70
Spray, Sandblast, Steel	$ 32.49	22.70

PAIN0108-002 06/01/2021

RACINE COUNTY

	Rates	Fringes
Painters:		
Brush, Roller	$ 36.08	20.36
Spray & Sandblast	$ 37.52	23.27

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 06/01/2021

JEFFERSON, MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Painters:		
Bridge	$ 36.70	24.50
Brush	$ 35.95	24.50
Spray & Sandblast	$ 36.70	24.50

PAIN0802-002 06/01/2021

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, LAFAYETTE, RICHLAND, ROCK, AND SAUK COUNTIES

	Rates	Fringes
PAINTER		
Brush	$ 29.98	18.78

PREMIUM PAY:
Structural Steel, Spray, Bridges = $1.00 additional per hour.

PAIN0802-003 06/01/2021

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	$ 29.98	18.78

PAIN0934-001 06/01/2021

KENOSHA AND WALWORTH COUNTIES

	Rates	Fringes
Painters:		
Brush	$ 36.52	23.27
Spray	$ 37.52	23.27
Structural Steel	$ 36.67	23.27

PAIN1011-002 06/06/2021

FLORENCE COUNTY

	Rates	Fringes
Painters:	$ 26.71	14.38

PLAS0599-010 06/01/2021

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area 1	$ 42.06	20.87
Area 2 (BAC)	$ 37.73	23.80
Area 3	$ 38.74	22.46
Area 4	$ 38.59	22.66
Area 5	$ 38.16	22.98
Area 6	$ 34.94	26.36

AREA DESCRIPTIONS

AREA 1: BAYFIELD, DOUGLAS, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA 2: 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

AREA 3: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA 4: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA 5: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA 6: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	23.81
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 32.72	23.81
WELL DRILLER	$ 16.52	3.70

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) (ii)).

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 DECISIO"

"General Decision Number: WI20220013 06/17/2022

Superseded General Decision Number: WI20210013

State: Wisconsin

Construction Type: Building

Counties: Pierce and St Croix 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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	01/21/2022
2	02/04/2022
3	02/11/2022
4	02/25/2022
5	03/11/2022
6	03/18/2022
7	06/17/2022

ASBE0205-006 01/01/2002

	Rates	Fringes
Asbestos Removal worker/hazardous material handler Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not	$ 23.06	5.25

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

BRWI0019-001 06/01/2021

	Rates	Fringes
Bricklayer & Tile Setter	$ 36.31	25.67

CARP0087-002 05/01/2016

ST CROIX COUNTY (West of Hwy 65)

	Rates	Fringes
Carpenter; piledriver; soft floor layer	$ 31.69	17.71

CARP0252-004 06/01/2016

PIERCE AND ST CROIX (East of Hwy 65) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work; Excluding Batt Insulation)		
CARPENTER & SOFT FLOOR LAYER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVERMAN	$ 34.12	18.00

ELEC0014-004 12/26/2021

	Rates	Fringes
ELECTRICIAN	$ 37.83	21.89

ELEC0014-005 05/30/2021

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 28.50	15.92

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).

ELEV0009-003 01/01/2020

	Rates	Fringes
ELEVATOR MECHANIC	$ 51.55	34.765

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

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* ENGI0139-002 06/01/2022

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 49.01	23.55
Group 2	$ 48.51	23.55
Group 3	$ 48.01	23.55
Group 4	$ 41.17	23.55
Group 5	$ 43.39	23.55
Group 6	$ 38.24	23.55

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; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,000 lbs & over; Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; Over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete Pumps 46 meter & under; Grout Pumps; Rotec Type Machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Maaerial Haulers

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large; Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Compressors, under 400 CFM; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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IRON0512-007 05/03/2021

	Rates	Fringes
IRONWORKER	$ 39.35	31.80

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* LABO0268-002 06/06/2022

	Rates	Fringes
Laborer, General	$ 32.20	18.68
Laborer: Asbestos/hazardous material remover		

(Preparation, Removal and
Encapsulation of Hazardous
Materials from Non-Mechanical
Systems).....$ 31.15 18.68

NOTE: Mason Tender $.25 over general laborer.

PAIN0259-001 05/01/2008

	Rates	Fringes
DRYWALL FINISHER/TAPER	$ 24.61	12.15
PAINTER	$ 24.11	12.15

PAIN1324-004 02/28/2022

	Rates	Fringes
GLAZIER	$ 38.62	9.78

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* PLUM0434-001 05/29/2022

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 45.84	21.68

SFWI0669-002 04/01/2021

	Rates	Fringes
SPRINKLER FITTER	$ 43.87	25.41

SHEE0018-007 06/01/2021

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technicians)	$ 36.00	27.81

TEAM0662-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	25.17
3 or more Axles	$ 32.72	23.81

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* SUWI2002-012 01/23/2002

	Rates	Fringes
Asbestos Worker/Heat and Frost Insulator	$ 25.36	8.37
Laborers:		
Concrete Worker	$ 16.34	3.59
Landscape	$ 8.73 **	4.90
ROOFER	$ 18.01	3.28
Tile & Marble Finisher	$ 13.89 **	8.25

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 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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 DECISIO"

August 2018

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: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

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	201.0105 Clearing	33.000 STA	_____.____	_____.____
0004	201.0205 Grubbing	33.000 STA	_____.____	_____.____
0006	203.0100 Removing Small Pipe Culverts	1.000 EACH	_____.____	_____.____
0008	204.0100 Removing Concrete Pavement	20,900.000 SY	_____.____	_____.____
0010	204.0120 Removing Asphaltic Surface Milling	26,700.000 SY	_____.____	_____.____
0012	204.0150 Removing Curb & Gutter	80.000 LF	_____.____	_____.____
0014	204.0155 Removing Concrete Sidewalk	190.000 SY	_____.____	_____.____
0016	204.0165 Removing Guardrail	830.000 LF	_____.____	_____.____
0018	204.0170 Removing Fence	3,660.000 LF	_____.____	_____.____
0020	204.0180 Removing Delineators and Markers	31.000 EACH	_____.____	_____.____
0022	204.0195 Removing Concrete Bases	34.000 EACH	_____.____	_____.____
0024	204.0220 Removing Inlets	8.000 EACH	_____.____	_____.____
0026	204.0225 Removing Septic Tanks	1.000 EACH	_____.____	_____.____
0028	204.0235 Removing Buildings (parcel) 001. Hudson SWEF	LS	LUMP SUM	_____.____
0030	204.0240 Site Clearance (parcel) 001. Hudson SWEF	LS	LUMP SUM	_____.____
0032	204.0245 Removing Storm Sewer (size) 001. 12-INCH	700.000 LF	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

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	204.0245 Removing Storm Sewer (size) 002. 15-INCH	220.000 LF	_____.____	_____.____
0036	204.0245 Removing Storm Sewer (size) 003. 18-INCH	580.000 LF	_____.____	_____.____
0038	204.0245 Removing Storm Sewer (size) 004. 24-INCH	59.000 LF	_____.____	_____.____
0040	204.0245 Removing Storm Sewer (size) 005. 32-INCH	41.000 LF	_____.____	_____.____
0042	204.0265 Abandoning Wells	1.000 EACH	_____.____	_____.____
0044	204.9060.S Removing (item description) 001. Street Light Assembly	31.000 EACH	_____.____	_____.____
0046	204.9060.S Removing (item description) 002. Traffic Signal Assembly	3.000 EACH	_____.____	_____.____
0048	204.9060.S Removing (item description) 003. Speaker Assembly	3.000 EACH	_____.____	_____.____
0050	204.9060.S Removing (item description) 004. Electronic Message Board	3.000 EACH	_____.____	_____.____
0052	204.9060.S Removing (item description) 005. Electrical Pedestal	1.000 EACH	_____.____	_____.____
0054	204.9060.S Removing (item description) 006. Security Camera	1.000 EACH	_____.____	_____.____
0056	204.9060.S Removing (item description) 007. CORS Station	2.000 EACH	_____.____	_____.____
0058	204.9090.S Removing (item description) 001. Electrical Conductors from Existing Conduit	8,110.000 LF	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0060	205.0100 Excavation Common	302,466.000 CY	_____.____	_____.____
0062	208.0100 Borrow	33,355.000 CY	_____.____	_____.____
0064	213.0100 Finishing Roadway (project) 001. 1020-01-80	1.000 EACH	_____.____	_____.____
0066	305.0110 Base Aggregate Dense 3/4-Inch	2,680.000 TON	_____.____	_____.____
0068	305.0120 Base Aggregate Dense 1 1/4-Inch	58,480.000 TON	_____.____	_____.____
0070	312.0110 Select Crushed Material	515.000 TON	_____.____	_____.____
0072	405.0100 Coloring Concrete WisDOT Red	685.000 CY	_____.____	_____.____
0074	415.0100 Concrete Pavement 10-Inch	17,680.000 SY	_____.____	_____.____
0076	415.0110 Concrete Pavement 11-Inch	16,370.000 SY	_____.____	_____.____
0078	415.0125 Concrete Pavement 12 1/2-Inch	1,550.000 SY	_____.____	_____.____
0080	415.6000.S Rout and Seal	10,090.000 LF	_____.____	_____.____
0082	450.4000 HMA Cold Weather Paving	3,060.000 TON	_____.____	_____.____
0084	455.0605 Tack Coat	4,430.000 GAL	_____.____	_____.____
0086	460.2000 Incentive Density HMA Pavement	4,610.000 DOL	1.00000	4,610.00
0088	460.6243 HMA Pavement 3 MT 58-34 S	3,680.000 TON	_____.____	_____.____
0090	460.6244 HMA Pavement 4 MT 58-34 S	3,510.000 TON	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0092	465.0125 Asphaltic Surface Temporary	11,230.000 TON	_____.____	_____.____
0094	465.0315 Asphaltic Flumes	82.000 SY	_____.____	_____.____
0096	465.0400 Asphaltic Shoulder Rumble Strips	17,005.000 LF	_____.____	_____.____
0098	520.2018 Culvert Pipe Temporary 18-Inch	39.000 LF	_____.____	_____.____
0100	520.2024 Culvert Pipe Temporary 24-Inch	31.000 LF	_____.____	_____.____
0102	520.8000 Concrete Collars for Pipe	3.000 EACH	_____.____	_____.____
0104	521.1018 Apron Endwalls for Culvert Pipe Steel 18-Inch	2.000 EACH	_____.____	_____.____
0106	521.1024 Apron Endwalls for Culvert Pipe Steel 24-Inch	2.000 EACH	_____.____	_____.____
0108	521.1030 Apron Endwalls for Culvert Pipe Steel 30-Inch	1.000 EACH	_____.____	_____.____
0110	521.3118 Culvert Pipe Corrugated Steel 18-Inch	38.000 LF	_____.____	_____.____
0112	521.3124 Culvert Pipe Corrugated Steel 24-Inch	22.000 LF	_____.____	_____.____
0114	521.3130 Culvert Pipe Corrugated Steel 30-Inch	94.000 LF	_____.____	_____.____
0116	522.0115 Culvert Pipe Reinforced Concrete Class III 15-Inch	550.000 LF	_____.____	_____.____
0118	522.0124 Culvert Pipe Reinforced Concrete Class III 24-Inch	194.000 LF	_____.____	_____.____
0120	522.0130 Culvert Pipe Reinforced Concrete Class III 30-Inch	88.000 LF	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0122	522.1012 Apron Endwalls for Culvert Pipe Reinforced Concrete 12-Inch	4.000 EACH	_____.____	_____.____
0124	522.1015 Apron Endwalls for Culvert Pipe Reinforced Concrete 15-Inch	8.000 EACH	_____.____	_____.____
0126	522.1024 Apron Endwalls for Culvert Pipe Reinforced Concrete 24-Inch	2.000 EACH	_____.____	_____.____
0128	522.1030 Apron Endwalls for Culvert Pipe Reinforced Concrete 30-Inch	1.000 EACH	_____.____	_____.____
0130	531.1100 Concrete Masonry Ancillary Structures Type NS	11.000 CY	_____.____	_____.____
0132	531.1140 Steel Reinforcement HS Ancillary Structures Type NS	994.000 LB	_____.____	_____.____
0134	531.2024 Drilling Shaft 24-Inch	91.000 LF	_____.____	_____.____
0136	531.2030 Drilling Shaft 30-Inch	26.000 LF	_____.____	_____.____
0138	531.2042 Drilling Shaft 42-Inch	18.000 LF	_____.____	_____.____
0140	531.2048 Drilling Shaft 48-Inch	30.000 LF	_____.____	_____.____
0142	531.4500 Foundation High Mast 100-FT (structure) 001. L-55-11	1.000 EACH	_____.____	_____.____
0144	531.4500 Foundation High Mast 100-FT (structure) 002. L-55-12	1.000 EACH	_____.____	_____.____
0146	531.5130 Foundation Single-Shaft Type MC-III (structure) 001. S-55-76	1.000 EACH	_____.____	_____.____
0148	531.5220 Foundation Single-Shaft Type MF-II (structure) 002. S-55-77	2.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0150	532.4500 High Mast 100-FT (structure) 001. L-55-11	1.000 EACH	_____.____	_____.____
0152	532.4500 High Mast 100-FT (structure) 002. L-55-12	1.000 EACH	_____.____	_____.____
0154	532.5130 Monotube Cantilever Type III (structure) 001. S-55-76	1.000 EACH	_____.____	_____.____
0156	532.5220 Monotube Full Span Type II (structure) 002. S-55-77	1.000 EACH	_____.____	_____.____
0158	602.0410 Concrete Sidewalk 5-Inch	4,860.000 SF	_____.____	_____.____
0160	602.0505 Curb Ramp Detectable Warning Field Yellow	88.000 SF	_____.____	_____.____
0162	603.1132 Concrete Barrier Type S32	130.000 LF	_____.____	_____.____
0164	603.8000 Concrete Barrier Temporary Precast Delivered	15,800.000 LF	_____.____	_____.____
0166	603.8125 Concrete Barrier Temporary Precast Installed	23,700.000 LF	_____.____	_____.____
0168	606.0200 Riprap Medium	725.000 CY	_____.____	_____.____
0170	608.0312 Storm Sewer Pipe Reinforced Concrete Class III 12-Inch	298.000 LF	_____.____	_____.____
0172	608.0324 Storm Sewer Pipe Reinforced Concrete Class III 24-Inch	14.000 LF	_____.____	_____.____
0174	611.0612 Inlet Covers Type C	1.000 EACH	_____.____	_____.____
0176	611.0624 Inlet Covers Type H	2.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0178	611.0639 Inlet Covers Type H-S	1.000 EACH	_____.____	_____.____
0180	611.0642 Inlet Covers Type MS	3.000 EACH	_____.____	_____.____
0182	611.2005 Manholes 5-FT Diameter	1.000 EACH	_____.____	_____.____
0184	611.3230 Inlets 2x3-FT	3.000 EACH	_____.____	_____.____
0186	611.3901 Inlets Median 1 Grate	1.000 EACH	_____.____	_____.____
0188	611.3902 Inlets Median 2 Grate	2.000 EACH	_____.____	_____.____
0190	614.0800 Crash Cushions Permanent	2.000 EACH	_____.____	_____.____
0192	614.0905 Crash Cushions Temporary	4.000 EACH	_____.____	_____.____
0194	614.2300 MGS Guardrail 3	662.500 LF	_____.____	_____.____
0196	614.2610 MGS Guardrail Terminal EAT	5.000 EACH	_____.____	_____.____
0198	614.2620 MGS Guardrail Terminal Type 2	2.000 EACH	_____.____	_____.____
0200	616.0100 Fence Woven Wire (height) 001. 4-FT	3,212.000 LF	_____.____	_____.____
0202	616.0700.S Fence Safety	500.000 LF	_____.____	_____.____
0204	618.0100 Maintenance And Repair of Haul Roads (project) 001. 1020-01-80	1.000 EACH	_____.____	_____.____
0206	619.1000 Mobilization	1.000 EACH	_____.____	_____.____
0208	623.0200 Dust Control Surface Treatment	44,640.000 SY	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0210	624.0100 Water	1,040.000 MGAL	_____.____	_____.____
0212	625.0500 Salvaged Topsoil	234,500.000 SY	_____.____	_____.____
0214	627.0200 Mulching	111,100.000 SY	_____.____	_____.____
0216	628.1504 Silt Fence	4,920.000 LF	_____.____	_____.____
0218	628.1520 Silt Fence Maintenance	29,510.000 LF	_____.____	_____.____
0220	628.1905 Mobilizations Erosion Control	17.000 EACH	_____.____	_____.____
0222	628.1910 Mobilizations Emergency Erosion Control	10.000 EACH	_____.____	_____.____
0224	628.2002 Erosion Mat Class I Type A	131,700.000 SY	_____.____	_____.____
0226	628.2004 Erosion Mat Class I Type B	63,900.000 SY	_____.____	_____.____
0228	628.2008 Erosion Mat Urban Class I Type B	1,390.000 SY	_____.____	_____.____
0230	628.6510 Soil Stabilizer Type B	10.000 ACRE	_____.____	_____.____
0232	628.7005 Inlet Protection Type A	9.000 EACH	_____.____	_____.____
0234	628.7010 Inlet Protection Type B	19.000 EACH	_____.____	_____.____
0236	628.7015 Inlet Protection Type C	4.000 EACH	_____.____	_____.____
0238	628.7504 Temporary Ditch Checks	1,900.000 LF	_____.____	_____.____
0240	628.7555 Culvert Pipe Checks	19.000 EACH	_____.____	_____.____
0242	628.7560 Tracking Pads	5.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0244	629.0210 Fertilizer Type B	123.000 CWT	_____.____	_____.____
0246	630.0130 Seeding Mixture No. 30	3,410.000 LB	_____.____	_____.____
0248	630.0140 Seeding Mixture No. 40	38.000 LB	_____.____	_____.____
0250	630.0200 Seeding Temporary	58,890.000 LB	_____.____	_____.____
0252	630.0500 Seed Water	5,400.000 MGAL	_____.____	_____.____
0254	632.0201 Shrubs (species) (size) (root) 001. Cornus Alternifolia (Pagoda Dogwood) Multi-Stem B&B 4-FT HT	2.000 EACH	_____.____	_____.____
0256	632.0201 Shrubs (species) (size) (root) 002. Corylus Americana (American Hazelnut) #2 CG	5.000 EACH	_____.____	_____.____
0258	632.0201 Shrubs (species) (size) (root) 003. Amelenchier Stolonifera (Running Serviceberry) #2 CG	5.000 EACH	_____.____	_____.____
0260	632.0201 Shrubs (species) (size) (root) 004. Forsythia 'Arnold's Dwarf' (Arnold's Dwarf Forsythia) #2 CG	13.000 EACH	_____.____	_____.____
0262	632.0201 Shrubs (species) (size) (root) 005. Diervilla Lonicera (Dwarf Bush Honeysuckle) #2 CG	17.000 EACH	_____.____	_____.____
0264	632.0201 Shrubs (species) (size) (root) 006. Rhus Aromatica 'Grow Low' (Gro Low Fragrant Sumac) #2 CG	15.000 EACH	_____.____	_____.____
0266	632.0201 Shrubs (species) (size) (root) 007. Corunis Sericea 'Isanti' (Isanti Redosier Dogwood) #2 CG	11.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0268	632.0201 Shrubs (species) (size) (root) 008. Juniperus Chinensis 'Kallay's Compact' (Kallay's Compact Juniper) #5 CG 24"	3.000 EACH	_____.____	_____.____
0270	632.9101 Landscape Planting Surveillance and Care Cycles	16.000 EACH	_____.____	_____.____
0272	633.0100 Delineator Posts Steel	205.000 EACH	_____.____	_____.____
0274	633.0500 Delineator Reflectors	222.000 EACH	_____.____	_____.____
0276	633.1100 Delineators Temporary	466.000 EACH	_____.____	_____.____
0278	633.5100 Markers ROW	17.000 EACH	_____.____	_____.____
0280	633.5200 Markers Culvert End	15.000 EACH	_____.____	_____.____
0282	634.0612 Posts Wood 4x6-Inch X 12-FT	1.000 EACH	_____.____	_____.____
0284	634.0614 Posts Wood 4x6-Inch X 14-FT	36.000 EACH	_____.____	_____.____
0286	634.0616 Posts Wood 4x6-Inch X 16-FT	3.000 EACH	_____.____	_____.____
0288	634.0618 Posts Wood 4x6-Inch X 18-FT	6.000 EACH	_____.____	_____.____
0290	634.0620 Posts Wood 4x6-Inch X 20-FT	2.000 EACH	_____.____	_____.____
0292	635.0200 Sign Supports Structural Steel HS	3,812.000 LB	_____.____	_____.____
0294	637.1220 Signs Type I Reflective SH	463.000 SF	_____.____	_____.____
0296	637.2210 Signs Type II Reflective H	256.550 SF	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0298	637.2230 Signs Type II Reflective F	48.000 SF	_____.____	_____.____
0300	638.2102 Moving Signs Type II	2.000 EACH	_____.____	_____.____
0302	638.2601 Removing Signs Type I	6.000 EACH	_____.____	_____.____
0304	638.2602 Removing Signs Type II	25.000 EACH	_____.____	_____.____
0306	638.3000 Removing Small Sign Supports	23.000 EACH	_____.____	_____.____
0308	638.3100 Removing Structural Steel Sign Supports	6.000 EACH	_____.____	_____.____
0310	638.3610 Erecting State Owned Signs Type I	1.000 EACH	_____.____	_____.____
0312	638.4000 Moving Small Sign Supports	2.000 EACH	_____.____	_____.____
0314	642.5001 Field Office Type B	1.000 EACH	_____.____	_____.____
0316	643.0300 Traffic Control Drums	85,900.000 DAY	_____.____	_____.____
0318	643.0420 Traffic Control Barricades Type III	3,150.000 DAY	_____.____	_____.____
0320	643.0705 Traffic Control Warning Lights Type A	6,250.000 DAY	_____.____	_____.____
0322	643.0715 Traffic Control Warning Lights Type C	9,550.000 DAY	_____.____	_____.____
0324	643.0800 Traffic Control Arrow Boards	675.000 DAY	_____.____	_____.____
0326	643.0900 Traffic Control Signs	11,450.000 DAY	_____.____	_____.____
0328	643.0920 Traffic Control Covering Signs Type II	37.000 EACH	_____.____	_____.____
0330	643.1205.S Basic Traffic Queue Warning System	43.000 DAY	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0332	643.5000 Traffic Control	1.000 EACH	_____.____	_____.____
0334	645.0112 Geotextile Type DF Schedule B	1,360.000 SY	_____.____	_____.____
0336	645.0120 Geotextile Type HR	1,440.000 SY	_____.____	_____.____
0338	646.1020 Marking Line Epoxy 4-Inch	58,630.000 LF	_____.____	_____.____
0340	646.3020 Marking Line Epoxy 8-Inch	3,200.000 LF	_____.____	_____.____
0342	646.5220 Marking Symbol Epoxy	1.000 EACH	_____.____	_____.____
0344	646.6120 Marking Stop Line Epoxy 18-Inch	26.000 LF	_____.____	_____.____
0346	646.7020 Marking Diagonal Epoxy 6-Inch	135.000 LF	_____.____	_____.____
0348	646.7120 Marking Diagonal Epoxy 12-Inch	729.000 LF	_____.____	_____.____
0350	646.7420 Marking Crosswalk Epoxy Transverse Line 6-Inch	119.000 LF	_____.____	_____.____
0352	646.8320 Marking Parking Stall Epoxy	2,678.000 LF	_____.____	_____.____
0354	646.9000 Marking Removal Line 4-Inch	41,810.000 LF	_____.____	_____.____
0356	649.0120 Temporary Marking Line Epoxy 4-Inch	116,850.000 LF	_____.____	_____.____
0358	649.0150 Temporary Marking Line Removable Tape 4-Inch	5,550.000 LF	_____.____	_____.____
0360	649.0250 Temporary Marking Line Removable Tape 8-Inch	600.000 LF	_____.____	_____.____
0362	649.0760 Temporary Marking Raised Pavement Marker Type I	171.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0364	649.0850 Temporary Marking Stop Line Removable Tape 18-Inch	24.000 LF	_____.____	_____.____
0366	650.4000 Construction Staking Storm Sewer	27.000 EACH	_____.____	_____.____
0368	650.4500 Construction Staking Subgrade	14,132.000 LF	_____.____	_____.____
0370	650.5000 Construction Staking Base	2,145.000 LF	_____.____	_____.____
0372	650.5500 Construction Staking Curb Gutter and Curb & Gutter	283.000 LF	_____.____	_____.____
0374	650.6000 Construction Staking Pipe Culverts	10.000 EACH	_____.____	_____.____
0376	650.7000 Construction Staking Concrete Pavement	13,953.000 LF	_____.____	_____.____
0378	650.7500 Construction Staking Concrete Barrier	130.000 LF	_____.____	_____.____
0380	650.8500 Construction Staking Electrical Installations (project) 001. 1020-01-80	LS	LUMP SUM	_____.____
0382	650.9000 Construction Staking Curb Ramps	9.000 EACH	_____.____	_____.____
0384	650.9910 Construction Staking Supplemental Control (project) 001. 1020-01-80	LS	LUMP SUM	_____.____
0386	650.9920 Construction Staking Slope Stakes	14,132.000 LF	_____.____	_____.____
0388	652.0225 Conduit Rigid Nonmetallic Schedule 40 2-Inch	7,540.000 LF	_____.____	_____.____
0390	652.0235 Conduit Rigid Nonmetallic Schedule 40 3-Inch	80.000 LF	_____.____	_____.____
0392	652.0240 Conduit Rigid Nonmetallic Schedule 40 4-Inch	960.000 LF	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0394	652.0700.S Install Conduit into Existing Item	1.000 EACH	_____.____	_____.____
0396	653.0164 Pull Boxes Non-Conductive 24x42-Inch	17.000 EACH	_____.____	_____.____
0398	653.0905 Removing Pull Boxes	33.000 EACH	_____.____	_____.____
0400	654.0101 Concrete Bases Type 1	1.000 EACH	_____.____	_____.____
0402	654.0106 Concrete Bases Type 6	30.000 EACH	_____.____	_____.____
0404	654.0111 Concrete Bases Type 11	7.000 EACH	_____.____	_____.____
0406	654.0230 Concrete Control Cabinet Bases Type L30	1.000 EACH	_____.____	_____.____
0408	655.0610 Electrical Wire Lighting 12 AWG	6,622.000 LF	_____.____	_____.____
0410	655.0615 Electrical Wire Lighting 10 AWG	2,229.000 LF	_____.____	_____.____
0412	655.0625 Electrical Wire Lighting 6 AWG	34,544.000 LF	_____.____	_____.____
0414	656.0200 Electrical Service Meter Breaker Pedestal (location) 001. CB 100, 368+97R	LS	LUMP SUM	_____.____
0416	657.0100 Pedestal Bases	1.000 EACH	_____.____	_____.____
0418	657.0255 Transformer Bases Breakaway 11 1/2-Inch Bolt Circle	30.000 EACH	_____.____	_____.____
0420	657.0327 Poles Type 6-Aluminum	30.000 EACH	_____.____	_____.____
0422	657.0420 Traffic Signal Standards Aluminum 13-FT	1.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0424	657.0615 Luminaire Arms Single Member 4 1/2-Inch Clamp 8-FT	32.000 EACH	_____.____	_____.____
0426	659.0400 Luminaires High Mast Lighting LED	6.000 EACH	_____.____	_____.____
0428	659.0700 Lighting Units Walkway	7.000 EACH	_____.____	_____.____
0430	659.1120 Luminaires Utility LED B	32.000 EACH	_____.____	_____.____
0432	659.2130 Lighting Control Cabinets 120/240 30-Inch	1.000 EACH	_____.____	_____.____
0434	659.5000.S Lamp, Ballast, LED, Switch Disposal by Contractor	34.000 EACH	_____.____	_____.____
0436	660.0500 High Mast Lowering Assembly (structure) 001. L-55-11	1.000 EACH	_____.____	_____.____
0438	660.0500 High Mast Lowering Assembly (structure) 002. L-55-12	1.000 EACH	_____.____	_____.____
0440	661.0100 Temporary Traffic Signals for Bridges (structure) 001. Virtual Weigh Station	LS	LUMP SUM	_____.____
0442	671.0112 Conduit HDPE 1-Duct 2-Inch	1,300.000 LF	_____.____	_____.____
0444	673.0105 Communication Vault Type 1	3.000 EACH	_____.____	_____.____
0446	673.0200 Tracer Wire Marker Posts	1.000 EACH	_____.____	_____.____
0448	678.0012 Install Fiber Optic Cable Outdoor Plant 12-CT	2,620.000 LF	_____.____	_____.____
0450	678.0300 Fiber Optic Splice	4.000 EACH	_____.____	_____.____
0452	678.0400 Fiber Optic Termination	6.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0454	690.0150 Sawing Asphalt	3,350.000 LF	_____._____	_____._____
0456	690.0250 Sawing Concrete	1,200.000 LF	_____._____	_____._____
0458	715.0603 Incentive Strength Concrete Barrier	65.000 DOL	1.00000	65.00
0460	715.0720 Incentive Compressive Strength Concrete Pavement	11,020.000 DOL	1.00000	11,020.00
0462	740.0440 Incentive IRI Ride	4,164.000 DOL	1.00000	4,164.00
0464	ASP.1T0A On-the-Job Training Apprentice at $5.00/HR	2,100.000 HRS	5.00000	10,500.00
0466	ASP.1T0G On-the-Job Training Graduate at $5.00/HR	2,400.000 HRS	5.00000	12,000.00
0468	SPV.0035 Special 001. Red Granite Chips	43.000 CY	_____._____	_____._____
0470	SPV.0060 Special 001. Trash Receptacles	2.000 EACH	_____._____	_____._____
0472	SPV.0060 Special 002. Electrical Service, Hudson SWEF	1.000 EACH	_____._____	_____._____
0474	SPV.0060 Special 003. Electrical Service, Hudson SWEF Mainline WIM	1.000 EACH	_____._____	_____._____
0476	SPV.0060 Special 004. Electrical Service, Hudson SWEF Virtual Weigh Station	1.000 EACH	_____._____	_____._____
0478	SPV.0060 Special 005. Discontinue Electrical Service, Hudson SWEF Existing Mainline WIM	1.000 EACH	_____._____	_____._____
0480	SPV.0060 Special 006. Natural Gas Service, Hudson SWEF	1.000 EACH	_____._____	_____._____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0482	SPV.0060 Special 007. Internet Service, Hudson SWEF Virtual Weigh Station	1.000 EACH	_____.____	_____.____
0484	SPV.0060 Special 008. Construction Staking Initial Layout Parking Lot	1.000 EACH	_____.____	_____.____
0486	SPV.0060 Special 009. Construction Staking Subgrade Parking Lot	1.000 EACH	_____.____	_____.____
0488	SPV.0060 Special 010. Construction Staking Concrete Pavement Parking Lot	1.000 EACH	_____.____	_____.____
0490	SPV.0060 Special 011. OSOW Warning System	1.000 EACH	_____.____	_____.____
0492	SPV.0060 Special 012. Scale Pit Oil/Water Separator System	1.000 EACH	_____.____	_____.____
0494	SPV.0060 Special 013. Traffic Control Vertical Panels	75.000 EACH	_____.____	_____.____
0496	SPV.0060 Special 014. Fiber Optic Patch Panel	2.000 EACH	_____.____	_____.____
0498	SPV.0060 Special 015. Electrical Service, Hudson SWEF Communications Tower	1.000 EACH	_____.____	_____.____
0500	SPV.0060 Special 100. SWEF Building, General Construction	1.000 EACH	_____.____	_____.____
0502	SPV.0060 Special 101. SWEF Building, Plumbing	1.000 EACH	_____.____	_____.____
0504	SPV.0060 Special 102. SWEF Building, Heating and Ventilation	1.000 EACH	_____.____	_____.____
0506	SPV.0060 Special 103. SWEF Building, Electrical	1.000 EACH	_____.____	_____.____
0508	SPV.0060 Special 104. Emergency Generator SWEF Building	1.000 EACH	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0510	SPV.0060 Special 105. Lighting Protection and Grounding System	1.000 EACH	_____.____	_____.____
0512	SPV.0060 Special 106. Emergency Generator Communications Tower	1.000 EACH	_____.____	_____.____
0514	SPV.0060 Special 200. Weigh-In-Motion System	1.000 EACH	_____.____	_____.____
0516	SPV.0060 Special 201. Static Scale System	1.000 EACH	_____.____	_____.____
0518	SPV.0060 Special 202. Virtual Weigh Station System	1.000 EACH	_____.____	_____.____
0520	SPV.0060 Special 203. Weigh-In-Motion System Warranty Maintenance	1.000 EACH	_____.____	_____.____
0522	SPV.0060 Special 204. Static Scale System Warranty Maintenance	1.000 EACH	_____.____	_____.____
0524	SPV.0060 Special 205. Virtual Weigh Station System Warranty Maintenance	1.000 EACH	_____.____	_____.____
0526	SPV.0060 Special 206. Removing Weight Scale and Pit	1.000 EACH	_____.____	_____.____
0528	SPV.0060 Special 300. Communications Tower	1.000 EACH	_____.____	_____.____
0530	SPV.0090 Special 001. Concrete Curb and Gutter 24-Inch Type A Special	1,580.000 LF	_____.____	_____.____
0532	SPV.0090 Special 002. Concrete Curb and Gutter 24-inch Type D Special	285.000 LF	_____.____	_____.____
0534	SPV.0090 Special 003. Fiber Optic Tracer Wire 12 AWG	1,930.000 LF	_____.____	_____.____
0536	SPV.0090 Special 004. Construction Staking Fence	3,212.000 LF	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0538	SPV.0090 Special 005. Aluminum Landscaping Edging Material	190.000 LF	_____.____	_____.____
0540	SPV.0180 Special 001. Scale Approach Pavement Reinforcement	270.000 SY	_____.____	_____.____
0542	SPV.0180 Special 002. Weed Barrier Fabric	390.000 SY	_____.____	_____.____
0544	SPV.0195 Special 001. Base Aggregate Dense 3/4-Inch Washed	240.000 TON	_____.____	_____.____
	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

July 25, 2022

NOTICE TO ALL CONTRACTORS:

Federal Wage Rate Addendum #01

Letting of August 9, 2022

Attached is a copy of the revised WI 10 Highway Davis Bacon Prevailing Wage Rates that are included in proposals 01 – 05, 08, and 10 – 14; WI 8 Heavy (Sewer & Water Line & Tunnel) Davis Bacon Prevailing Wage Rates that are included in proposal 13; and WI 113 Building Davis Bacon Prevailing Wage Rates that are included in proposal 14. These wage rates are effective for all proposals they are included in in the August 9, 2022 letting. The updated wage rates (WI 10, WI 8) are dated July 22, 2022 and are effective on or after August 1, 2022. The updated wage rates WI 13) are dated July 15 and are effective on or after July 25, 2022.

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractors.

Sincerely,

Mike Coleman

Proposal Development Specialist
Proposal Management Section

"General Decision Number: WI20220010 07/22/2022

Superseded General Decision Number: WI20210010

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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	01/21/2022
2	02/04/2022
3	02/25/2022
4	03/11/2022
5	03/18/2022
6	04/29/2022
7	05/13/2022
8	06/17/2022
9	07/08/2022
10	07/22/2022

BRWI0001-002 06/01/2021

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.81	25.17

BRWI0002-002 06/01/2021

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.35	23.89

BRWI0002-005 06/01/2021

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	$ 37.73	24.15

BRWI0003-002 06/01/2021

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0004-002 06/01/2021

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.30	26.03

BRWI0006-002 06/01/2021

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.78	24.20

BRWI0007-002 06/01/2021

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.38	25.31

BRWI0008-002 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 42.38	24.64

BRWI0011-002 06/01/2021

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0019-002 06/01/2021

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.31	25.67

BRWI0034-002 06/01/2021

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

CARP0087-001 05/01/2016

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	$ 36.85	18.39

CARP0252-002 06/01/2016

ADAMS, BARRON, BAYFIELD (Eastern 2/3), BROWN, BUFFALO, BURNETT (E. of Hwy 48), CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE (except area bordering Michigan State Line), FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN,

MANITOWOC, MARATHON, MARINETTE (except N.E. corner), MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwys 29 & 65), POLK (E. of Hwys 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
CARPENTER		
CARPENTER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVER	$ 34.12	18.00

CARP0252-010 06/01/2016

ASHLAND COUNTY

	Rates	Fringes
Carpenters		
Carpenter	$ 33.56	18.00
Millwright	$ 35.08	18.35
Pile Driver	$ 34.12	18.00

CARP0264-003 06/01/2016

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WAUKESHA, AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER	$ 35.78	22.11

CARP0361-004 05/01/2018

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 36.15	20.43

CARP2337-001 06/01/2016

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON

ZONE B: KENOSHA & RACINE

	Rates	Fringes
PILEDRIVERMAN		
Zone A	$ 31.03	22.69
Zone B	$ 31.03	22.69

ELEC0014-002 12/26/2021

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:	$ 37.83	21.89

ELEC0014-007 05/30/2021

REMAINING COUNTIES

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 28.50	15.92

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 06/01/2021

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 43.16	30%+12.70

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 05/30/2021

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:	$ 36.22	26%+11.24

ELEC0430-002 06/01/2022

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 45.02	24.35

ELEC0494-005 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 44.39	25.67

ELEC0494-006 06/01/2021

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 37.91	22.74

ELEC0494-013 06/01/2021

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	$ 22.39	18.80
Technician	$ 32.49	20.26

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 06/01/2021

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:	$ 35.66	29.50%+10.00

ELEC0890-003 06/01/2021

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 39.00	25.95%+11.17

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

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* ENGI0139-005 06/01/2022

	Rates	Fringes

Power Equipment Operator

Group 1	$ 43.27	25.95
Group 2	$ 42.77	25.95
Group 3	$ 42.27	25.95
Group 4	$ 42.01	25.95
Group 5	$ 41.72	25.95
Group 6	$ 35.82	25.95

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.

IRON0008-002 06/01/2021

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2021

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 40.57	28.40

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/05/2022

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	$ 39.00	28.58

IRON0498-005 06/01/2021

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 41.37	44.41

IRON0512-008 06/03/2019

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON,

PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 37.60	29.40

IRON0512-021 05/03/2021

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 35.09	31.80

LABO0113-002 06/01/2022

MILWAUKEE AND WAUKESHA COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 32.65	23.09
Group 2	$ 32.80	23.09
Group 3	$ 33.00	23.09
Group 4	$ 33.15	23.09
Group 5	$ 33.30	23.09
Group 6	$ 29.14	23.09

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 06/01/2022

OZAUKEE AND WASHINGTON COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.90	23.09

Group 2	$ 32.00	23.09
Group 3	$ 32.05	23.09
Group 4	$ 32.25	23.09
Group 5	$ 32.10	23.09
Group 6	$ 28.99	23.09

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 06/01/2022

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.71	23.09
Group 2	$ 31.86	23.09
Group 3	$ 32.06	23.09
Group 4	$ 32.03	23.09
Group 5	$ 32.36	23.09
Group 6	$ 28.85	23.09

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 06/01/2022

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	$ 36.42	18.68
Group 2	$ 36.52	18.68
Group 3	$ 36.57	18.68
Group 4	$ 36.77	18.68
Group 5	$ 36.62	18.68
Group 6	$ 33.05	18.68

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 06/01/2022

DANE COUNTY

	Rates	Fringes
LABORER		
Group 1	$ 36.70	18.68
Group 2	$ 36.80	18.68
Group 3	$ 36.85	18.68
Group 4	$ 37.05	18.68
Group 5	$ 36.90	18.68

Group 6.....$ 33.05 18.68

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 05/01/2022

ASHLAND, BAYFIELD, BURNETT, AND DOUGLAS COUNTIES

	Rates	Fringes
Painters:		
New:		
Brush, Roller	$ 33.99	22.70
Spray, Sandblast, Steel	$ 34.59	22.70
Repaint:		
Brush, Roller	$ 33.09	22.70
Spray, Sandblast, Steel	$ 32.49	22.70

PAIN0108-002 06/01/2021

RACINE COUNTY

	Rates	Fringes
Painters:		
Brush, Roller	$ 36.08	20.36
Spray & Sandblast	$ 37.52	23.27

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 06/01/2021

JEFFERSON, MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Painters:		
Bridge	$ 36.70	24.50
Brush	$ 35.95	24.50
Spray & Sandblast	$ 36.70	24.50

PAIN0802-002 06/01/2021

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, LAFAYETTE, RICHLAND, ROCK, AND SAUK COUNTIES

	Rates	Fringes
PAINTER		
Brush	$ 29.98	18.78

PREMIUM PAY:
Structural Steel, Spray, Bridges = $1.00 additional per hour.

PAIN0802-003 06/01/2021

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	$ 29.98	18.78

PAIN0934-001 06/01/2021

KENOSHA AND WALWORTH COUNTIES

	Rates	Fringes
Painters:		
Brush	$ 36.52	23.27
Spray	$ 37.52	23.27
Structural Steel	$ 36.67	23.27

PAIN1011-002 06/06/2021

FLORENCE COUNTY

	Rates	Fringes
Painters:	$ 26.71	14.38

PLAS0599-010 06/01/2021

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area 1	$ 42.06	20.87
Area 2 (BAC)	$ 37.73	23.80
Area 3	$ 38.74	22.46
Area 4	$ 38.59	22.66
Area 5	$ 38.16	22.98
Area 6	$ 34.94	26.36

AREA DESCRIPTIONS

AREA 1: BAYFIELD, DOUGLAS, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA 2: 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

AREA 3: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA 4: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA 5: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA 6: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	23.81
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 32.72	23.81
WELL DRILLER	$ 16.52	3.70

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) (ii)).

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 DECISIO"

"General Decision Number: WI20220008 07/15/2022

Superseded General Decision Number: WI20210008

State: Wisconsin

Construction Types: Heavy (Sewer and Water Line and Tunnel)

Counties: Wisconsin Statewide.

TUNNEL, SEWER & WATER LINE CONSTRUCTION PROJECTS

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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	01/21/2022

2	02/04/2022
3	02/25/2022
4	03/11/2022
5	03/18/2022
6	04/29/2022
7	06/17/2022
8	07/08/2022
9	07/15/2022

BRWI0001-002 06/01/2021

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.81	25.17

BRWI0002-002 06/01/2021

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.35	23.89

BRWI0002-005 06/01/2021

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	$ 37.73	24.15

BRWI0003-002 06/01/2021

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0004-002 06/01/2021

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.30	26.03

BRWI0006-002 06/01/2021

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes

BRICKLAYER.....$ 37.78 24.20

BRWI0007-002 06/01/2021

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.38	25.31

BRWI0008-002 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 42.38	24.64

BRWI0009-001 06/01/2021

GREEN LAKE, MARQUETTE, OUTAGAMIE, SHAWANO, WAUPACA, WASHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0011-002 06/01/2021

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0013-002 06/01/2021

DANE, GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

BRWI0019-002 06/01/2021

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.31	25.67

BRWI0021-002 06/01/2021

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.75	25.92

BRWI0034-002 06/01/2021

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

CARP0087-001 05/01/2016

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	$ 36.85	18.39

CARP0252-002 06/01/2016

ADAMS, BARRON, BAYFIELD (Eastern 2/3), BROWN, BUFFALO, BURNETT (E. of Hwy 48), CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE (except area bordering Michigan State Line), FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE (except N.E. corner), MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwys 29 & 65), POLK (E. of Hwys 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
CARPENTER		
CARPENTER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVER	$ 34.12	18.00

CARP0252-010 06/01/2016

ASHLAND COUNTY

	Rates	Fringes
Carpenters		
Carpenter	$ 33.56	18.00
Millwright	$ 35.08	18.35
Pile Driver	$ 34.12	18.00

CARP0264-003 06/01/2016

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WAUKESHA, AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER	$ 35.78	22.11

CARP0361-004 05/01/2018

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 36.15	20.43

CARP2337-001 06/01/2016

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON

ZONE B: KENOSHA & RACINE

	Rates	Fringes
PILEDRIVERMAN		
Zone A	$ 31.03	22.69
Zone B	$ 31.03	22.69

CARP2337-003 06/01/2019

	Rates	Fringes
MILLWRIGHT		
Zone A	$ 33.58	21.53
Zone B	$ 33.58	21.53

ZONE DEFINITIONS

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON COUNTIES

ZONE B: KENOSHA & RACINE COUNTIES

ELEC0014-002 12/26/2021

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:	$ 37.83	21.89

ELEC0127-002 06/01/2021

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 43.16	30%+12.70

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 05/30/2021

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:.....	$ 36.22	26%+11.24

ELEC0430-002 06/01/2022

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:.....	$ 45.02	24.35

ELEC0494-005 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes

Electricians:.....$ 44.39 25.67

ELEC0494-006 06/01/2021

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:.....	$ 37.91	22.74

ELEC0577-003 06/01/2021

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:.....	$ 35.66	29.50%+10.00

ELEC0890-003 06/01/2021

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:.....	$ 39.00	25.95%+11.17

ENGI0139-003 06/06/2022

REMAINING COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1.....	$ 45.22	24.85
Group 2.....	$ 43.97	24.85
Group 3.....	$ 41.57	24.85
Group 4.....	$ 41.04	24.85
Group 5.....	$ 38.97	24.85
Group 6.....	$ 37.44	24.85

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; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,00 lbs and over; Cranes, Tower Cranes and Derricks with or without

attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete pumps 46 meter and under; Grout Pumps; Rotec type machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Material Haulers.

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large; Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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ENGI0139-007 06/05/2022

DODGE, FOND DU LAC, JEFFERSON, KENOSHA, MILWAUKEE, OZAUKEE, RACINE, SHEBOYGAN, WALWORTH, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 43.54	24.20

Group 2	$ 42.76	24.20
Group 3	$ 41.81	24.20
Group 4	$ 40.76	24.20
Group 5	$ 39.36	24.20

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; Backhoes (Excavators) 130,000 lbs and over; Caisson Rigs and Pile Drivers

GROUP 2: Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or under; or Cranes, Tower Cranes, and Derricks with boom, lead, and\or jib lengths measuring 175 feet or under; Backhoes (Excavators) under 130,000 lbs; Skid Rigs; Dredge Operator: Traveling Crane (Bridge type); Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Pumps and Boring Machines (directional)

GROUP 3: Material Hoists; Stack Hoists; Tractor or Truck mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane, 5 tons or under; Manhoist; Tractor over 40 hp; Bulldozer over 40 hp; Endloader over 40 hp; Forklift, 25 ft and over; Motor Patrol; Scraper Operator; Sideboom; Straddle Carrier; Mechanic and Welder; Bituminous Plant and Paver Operator; Roller over 5 tons; Percussion Drill Operator; Rotary Drill Operator; Blaster; Air Track Drill; Trencher (wheel type or chain type having over 8 inch bucket); Elevator; Milling Machine and Boring Machine (horizontal or vertical); Backhoe Mounted Compactor

GROUP 4: Backfiller; Concrete Auto Breaker (large); Concrete Finishing Machine (road type); Roller, Rubber Tire; Concrete Batch Hopper; Concrete Conveyor System; Concrete Mixers (14S or over); Screw type Pumps and Gypsum Pumps; Grout Pumps; Tractor, Bulldozer, End Loader, under 40 hp; Pumps (well points); Trencher (chain type 8 inch or smaller bucket; Industrial Locomotives; Roller under 5 tons; Fireman (Piledrivers and Derricks); Robotic Tool Carrier with or without attachments.

GROUP 5: Hoists (Automatic); Forklift, 12 ft to 25 ft; Tamper-Compactors, riding type; A-Frame andWinch Trucks; Concrete Auto Breaker; Hydrohammer, small; Brooms and Sweepers; Hoist (Tuggers); Stump Chipper, large; Boats (Tug, Safety, Work Barges and Launch); Shouldering Machine Operator; Screed Operator; Farm or Industrial Tractor; Post Hole Digger; Stone Crushers and Screening Plants; Firemen (Asphalt Plants); Air Compressor (400 CFM or over); Augers (vertical and horizontal); Generators, 150 KW and over; Air, Electric Hydraulic Jacks (Slipform); Prestress Machines; Skid Steer Loader with or without attachments; Boiler operators (temporary heat); Forklift, 12 ft and under; Screed Operator Milling Machine; Refrigeration Plant/Freeze Machine; Power Pack Vibratory/Ultra Sound Driver and Extractor; Generators under 150 KW; Combination

small equipment operator; Compressors under 400 CFM; Welding Machines; Heaters, Mechanical; Pumps; Winches, Small Electric; Oiler and Greaser; Conveyor; High pressure utility locating machine (daylighting machine).

IRON0008-002 06/01/2021

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2021

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 40.57	28.40

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/05/2022

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	$ 39.00	28.58

IRON0498-005 06/01/2021

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 41.37	44.41

IRON0512-008 06/03/2019

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 37.60	29.40

IRON0512-021 05/03/2021

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 35.09	31.80

LABO0113-004 06/01/2022

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Open Cut)		
Group 1	$ 17.62	21.98
Group 2	$ 19.89	21.98
Group 3	$ 23.43	21.98
Group 4	$ 32.80	21.98
Group 5	$ 32.94	21.98
Group 6	$ 33.00	21.98
Group 7	$ 36.85	21.98
Group 8	$ 39.67	21.98
Group 9	$ 40.31	21.98

LABORERS CLASSIFICATIONS [OPEN CUT]

GROUP 1: Yard Laborer

GROUP 2: Landscaper

GROUP 3: Flag Person

GROUP 4: Paving Laborer

GROUP 5: General Laborer on Surface; Top Man

GROUP 6: Mud Mixer

GROUP 7: Mucker; Form Stripper; Bottom Digger and Misc; Bottom Man and Welder on Surface

GROUP 8: Concrete Manhole Builder; Caisson Worker; Miner; Pipe Layer; Rock Driller and Joint Man; Timber Man and Concrete Brusher; Bracer in Trench Behind Machine & Tight Sheeting; Concrete Formsetter and Shoveler; Jackhammer Operator

GROUP 9: Blaster

LABO0113-005 06/01/2022

SEWER, TUNNEL & UNDERGROUND

KENOSHA AND RACINE COUNTIES

	Rates	Fringes

Laborers:
Group 1.....$ 24.29 21.98
Group 2.....$ 30.22 23.09
Group 3.....$ 34.42 23.09
Group 4.....$ 36.19 23.09

TUNNEL WORK UNDER COMPRESSED AIR: 0-15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS

GROUP 1: Flagperson

GROUP 2: Top Man, General Laborer, Wellpoint Installation, Wire Mesh and Reinforcement, Concrete Worker, Form Stripper, Strike-off Work

GROUP 3: Machine and Equipment Operator, Sheeting, Form Setting, Patch Finisher, Bottom Man, Joint Sawer, Gunnite Man, Manhole Builder, Welder-Torchman, Blaster, Caulker, Bracer, Bull Float, Conduit Worker, Mucker and Car Pusher, Raker and Luteman, Hydraulic Jacking of Shields, Shield Drivers, Mining Machine, Lock Tenders, Mucking Machine Operator, Motor Men & Gauge Tenders and operation of incidental Mechanical Equipment and all Power Driven Tools

GROUP 4: Pipelayer, Miner and Laser Operator

LABO0113-008 06/01/2022

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel-Free Air)		
Group 1	$ 23.43	21.98
Group 2	$ 32.94	21.98
Group 3	$ 33.00	21.98
Group 4	$ 36.98	21.98
Group 5	$ 36.99	21.98
Group 6	$ 39.67	21.98
Group 7	$ 40.31	21.98

LABORERS CLASSIFICATIONS [TUNNEL - FREE AIR]:

GROUP 1: Flagperson

GROUP 2: General Laborer on surface; Tower Man

GROUP 3: Saw Man; Top Man

GROUP 4: Form Stripper; Car Pusher

GROUP 5: Mucker; Dinkey; Welder (rate on surface)

GROUP 6: Concrete Manhole Builder; Mucking Machine; Miner; Mining Machine; Welder; Rock Driller; Concrete Buster; Jack Hammer Operator; Caisson Worker; Pipelayer and Joint Man; Bracerman

GROUP 7: Blaster

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* LABO0113-009 06/01/2022

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel - *COMPRESSED AIR 0 - 15 lbs.)		
Group 1	$ 23.43	21.98
Group 2	$ 32.94	21.98
Group 3	$ 37.39	21.98
Group 4	$ 38.19	21.98
Group 5	$ 38.31	21.98
Group 6	$ 41.01	21.98
Group 7	$ 41.63	21.98

LABORERS CLASSIFICATIONS [TUNNEL - COMPRESSED AIR]:

*Compressed Air 15 - 30 lbs add $2.00 to all classifications
*Compressed Air over 30 lbs add $3.00 to all classifcations

GROUP 1: Flagperson

GROUP 2: General Laborer on surface

GROUP 3: Lock Tender on surface

GROUP 4: Form Stripper; Car Pusher

GROUP 5: Mucker; Dinkey

GROUP 6: Mucking Machine; Miner; Mining Machine; Welder & Rock Driller; Lock Tender in tunnel; Concrete Buster; Jack Hammer Operator; Caisson Worker; Pielayer and Joint Man; Bracerman; Nozzle Man on Gunite; Timber Man; Concrete Brusher

GROUP 7: Blaster

NOTE: Hazardous & Toxic Waste Removal: add $0.15 per hour.

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* LABO0140-005 06/06/2022

ADAMS, ASHLAND, BARRON, BROWN, BUFFALO, CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE,FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, JACKSON, JEFFERSON, JUNEAU, LACROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RICHLAND, ROCK, RUSK, ST CROIX, SAUK, SAWYER, SHAWANO, SHEBOYGAN, TAYLOR, TREMMPEALEAU, VERNON, VILAS, WALWWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
LABORER (SEWER & WATER)		
Group 1	$ 31.48	18.68
Group 2	$ 33.33	18.68
Group 3	$ 33.53	18.68
Group 4	$ 34.28	18.68

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR: 0-15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORER CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: General Laborer, Wellpoint Installation; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Drivers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

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* LABO0464-002 06/06/2022

DANE AND DOUGLAS COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.38	18.68
Group 2	$ 33.58	18.68
Group 3	$ 33.78	18.68
Group 4	$ 34.53	18.68

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR: 0 - 15 lbs add $1.00, 15- 30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: General Laborer; Wellpoint Installation; Concrete Worker; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Dirvers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

LABO1091-010 06/06/2022

BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Laborers: (SEWER & WATER)		
Group 1	$ 31.17	18.68
Group 2	$ 33.23	18.68

Group 3.....$ 33.43 18.68
Group 4.....$ 34.18 18.68

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR:
0 - 15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: Laborers, Wellpoint Installation; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Dirvers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

PLAS0599-010 06/01/2021

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area 1	$ 42.06	20.87
Area 2 (BAC)	$ 37.73	23.80
Area 3	$ 38.74	22.46
Area 4	$ 38.59	22.66
Area 5	$ 38.16	22.98
Area 6	$ 34.94	26.36

AREA DESCRIPTIONS

AREA 1: BAYFIELD, DOUGLAS, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA 2: 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

AREA 3: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA 4: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA 5: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA 6: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	23.81
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 32.72	23.81
WELL DRILLER	$ 16.52	3.70

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) (ii)).

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 DECISIO"

"General Decision Number: WI20220013 07/15/2022

Superseded General Decision Number: WI20210013

State: Wisconsin

Construction Type: Building

Counties: Pierce and St Croix 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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	01/21/2022
2	02/04/2022
3	02/11/2022
4	02/25/2022
5	03/11/2022
6	03/18/2022
7	06/17/2022
8	07/08/2022
9	07/15/2022

ASBE0205-006 01/01/2002

	Rates	Fringes
Asbestos Removal worker/hazardous material handler		
Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not	$ 23.06	5.25

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

BRWI0019-001 06/01/2021

	Rates	Fringes
Bricklayer & Tile Setter	$ 36.31	25.67

CARP0087-002 05/01/2016

ST CROIX COUNTY (West of Hwy 65)

	Rates	Fringes
Carpenter; piledriver; soft floor layer	$ 31.69	17.71

CARP0252-004 06/01/2016

PIERCE AND ST CROIX (East of Hwy 65) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work; Excluding Batt Insulation)		
CARPENTER & SOFT FLOOR LAYER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVERMAN	$ 34.12	18.00

ELEC0014-004 12/26/2021

	Rates	Fringes
ELECTRICIAN	$ 37.83	21.89

ELEC0014-005 05/30/2021

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 28.50	15.92

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).

ELEV0009-003 01/01/2020

	Rates	Fringes
ELEVATOR MECHANIC	$ 51.55	34.765

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

ENGI0139-002 06/06/2021

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 44.27	23.80
Group 2	$ 43.02	23.80
Group 3	$ 40.97	23.80
Group 4	$ 40.44	23.80
Group 5	$ 38.37	23.80
Group 6	$ 36.84	23.80

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; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,000 lbs & over; Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or

jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; Over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete Pumps 46 meter & under; Grout Pumps; Rotec Type Machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Maaerial Haulers

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large; Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Compressors, under 400 CFM; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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IRON0512-007 05/03/2021

	Rates	Fringes
IRONWORKER	$ 39.35	31.80

LABO0268-002 06/06/2022

	Rates	Fringes
Laborer, General	$ 32.20	18.68

Laborer: Asbestos/hazardous material remover (Preparation, Removal and Encapsulation of Hazardous Materials from Non-Mechanical Systems).....$ 31.15 18.68

NOTE: Mason Tender $.25 over general laborer.

PAIN0259-001 05/01/2008

	Rates	Fringes
DRYWALL FINISHER/TAPER	$ 24.61	12.15
PAINTER	$ 24.11	12.15

PAIN1324-004 02/28/2022

	Rates	Fringes
GLAZIER	$ 38.62	9.78

PLUM0434-001 05/29/2022

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 45.84	21.68

SFWI0669-002 04/01/2021

	Rates	Fringes
SPRINKLER FITTER	$ 43.87	25.41

SHEE0018-007 06/01/2021

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technicians)	$ 36.00	27.81

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* TEAM0662-001 06/01/2022

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 34.07	24.95
3 or more Axles	$ 34.22	24.95

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* SUWI2002-012 01/23/2002

	Rates	Fringes
Asbestos Worker/Heat and Frost Insulator	$ 25.36	8.37
Laborers:		
Concrete Worker	$ 16.34	3.59
Landscape	$ 8.73 **	4.90
ROOFER	$ 18.01	3.28
Tile & Marble Finisher	$ 13.89 **	8.25

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 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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 DECISIO"

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

August 1, 2022

NOTICE TO ALL CONTRACTORS:

Federal Wage Rate Addendum #02

Letting of August 9, 2022

Attached is a copy of the revised WI 10 Highway Davis Bacon Prevailing Wage Rates that are included in proposals 01 – 05, 08, and 10 – 14; WI 8 Heavy (Sewer & Water Line & Tunnel) Davis Bacon Prevailing Wage Rates that are included in proposal 13; and WI 13 Building Davis Bacon Prevailing Wage Rates that are included in proposal 14. These wage rates are effective for all proposals they are included in in the August 9, 2022 letting. The updated wage rates are dated July 29, 2022 and are effective on or after August 8, 2022.

The responsibility for notifying potential subcontractors and suppliers of these changes remains with the prime contractors.

Sincerely,

Mike Coleman
Proposal Development Specialist
Proposal Management Section

"General Decision Number: WI20220010 07/29/2022

Superseded General Decision Number: WI20210010

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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	01/21/2022
2	02/04/2022
3	02/25/2022
4	03/11/2022
5	03/18/2022
6	04/29/2022
7	05/13/2022
8	06/17/2022
9	07/08/2022
10	07/22/2022
11	07/29/2022

BRWI0001-002 06/01/2021

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.81	25.17

BRWI0002-002 06/01/2021

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.35	23.89

BRWI0002-005 06/01/2021

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	$ 37.73	24.15

BRWI0003-002 06/01/2021

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0004-002 06/01/2021

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.30	26.03

BRWI0006-002 06/01/2021

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.78	24.20

BRWI0007-002 06/01/2021

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.38	25.31

BRWI0008-002 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 42.38	24.64

BRWI0011-002 06/01/2021

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0019-002 06/01/2021

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.31	25.67

BRWI0034-002 06/01/2021

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

CARP0087-001 05/01/2016

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	$ 36.85	18.39

CARP0252-002 06/01/2016

ADAMS, BARRON, BAYFIELD (Eastern 2/3), BROWN, BUFFALO, BURNETT (E. of Hwy 48), CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE (except area bordering Michigan State Line), FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON,

JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE (except N.E. corner), MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwys 29 & 65), POLK (E. of Hwys 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
CARPENTER		
CARPENTER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVER	$ 34.12	18.00

CARP0252-010 06/01/2016

ASHLAND COUNTY

	Rates	Fringes
Carpenters		
Carpenter	$ 33.56	18.00
Millwright	$ 35.08	18.35
Pile Driver	$ 34.12	18.00

CARP0264-003 06/01/2016

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WAUKESHA, AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER	$ 35.78	22.11

CARP0361-004 05/01/2018

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 36.15	20.43

CARP2337-001 06/01/2016

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON

ZONE B: KENOSHA & RACINE

	Rates	Fringes
PILEDRIVERMAN		
Zone A	$ 31.03	22.69
Zone B	$ 31.03	22.69

ELEC0014-002 12/26/2021

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:	$ 37.83	21.89

ELEC0014-007 05/30/2021

REMAINING COUNTIES

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 28.50	15.92

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 06/01/2021

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 43.16	30%+12.70

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 05/30/2021

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:	$ 36.22	26%+11.24

ELEC0430-002 06/01/2022

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 45.02	24.35

ELEC0494-005 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 44.39	25.67

ELEC0494-006 06/01/2021

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 37.91	22.74

ELEC0494-013 06/01/2021

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	$ 22.39	18.80
Technician	$ 32.49	20.26

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 06/01/2021

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:	$ 35.66	29.50%+10.00

ELEC0890-003 06/01/2021

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 39.00	25.95%+11.17

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 06/01/2022

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 43.27	25.95
Group 2	$ 42.77	25.95
Group 3	$ 42.27	25.95
Group 4	$ 42.01	25.95
Group 5	$ 41.72	25.95
Group 6	$ 35.82	25.95

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.

IRON0008-002 06/01/2021

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2021

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 40.57	28.40

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/05/2022

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	$ 39.00	28.58

IRON0498-005 06/01/2021

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 41.37	44.41

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* IRON0512-008 05/01/2022

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 41.00	33.11

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* IRON0512-021 05/01/2022

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 36.94	33.11

LABO0113-002 06/01/2022

MILWAUKEE AND WAUKESHA COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 32.65	23.09
Group 2	$ 32.80	23.09
Group 3	$ 33.00	23.09
Group 4	$ 33.15	23.09
Group 5	$ 33.30	23.09
Group 6	$ 29.14	23.09

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 06/01/2022

OZAUKEE AND WASHINGTON COUNTIES

	Rates	Fringes
LABORER		

Group 1	$ 31.90	23.09
Group 2	$ 32.00	23.09
Group 3	$ 32.05	23.09
Group 4	$ 32.25	23.09
Group 5	$ 32.10	23.09
Group 6	$ 28.99	23.09

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 06/01/2022

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.71	23.09
Group 2	$ 31.86	23.09
Group 3	$ 32.06	23.09
Group 4	$ 32.03	23.09
Group 5	$ 32.36	23.09
Group 6	$ 28.85	23.09

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 06/01/2022

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	$ 36.42	18.68
Group 2	$ 36.52	18.68
Group 3	$ 36.57	18.68
Group 4	$ 36.77	18.68
Group 5	$ 36.62	18.68
Group 6	$ 33.05	18.68

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 06/01/2022

DANE COUNTY

	Rates	Fringes
LABORER		
Group 1	$ 36.70	18.68
Group 2	$ 36.80	18.68
Group 3	$ 36.85	18.68
Group 4	$ 37.05	18.68

Group 5	$ 36.90	18.68
Group 6	$ 33.05	18.68

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 05/01/2022

ASHLAND, BAYFIELD, BURNETT, AND DOUGLAS COUNTIES

	Rates	Fringes
Painters:		
New:		
Brush, Roller	$ 33.99	22.70
Spray, Sandblast, Steel	$ 34.59	22.70
Repaint:		
Brush, Roller	$ 33.09	22.70
Spray, Sandblast, Steel	$ 32.49	22.70

PAIN0108-002 06/01/2021

RACINE COUNTY

	Rates	Fringes
Painters:		
Brush, Roller	$ 36.08	20.36
Spray & Sandblast	$ 37.52	23.27

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 06/01/2021

JEFFERSON, MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Painters:		
Bridge	$ 36.70	24.50
Brush	$ 35.95	24.50
Spray & Sandblast	$ 36.70	24.50

PAIN0802-002 06/01/2021

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, LAFAYETTE, RICHLAND, ROCK, AND SAUK COUNTIES

	Rates	Fringes
PAINTER		
Brush	$ 29.98	18.78

PREMIUM PAY:
Structural Steel, Spray, Bridges = $1.00 additional per hour.

PAIN0802-003 06/01/2021

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	$ 29.98	18.78

PAIN0934-001 06/01/2021

KENOSHA AND WALWORTH COUNTIES

	Rates	Fringes
Painters:		
Brush	$ 36.52	23.27
Spray	$ 37.52	23.27
Structural Steel	$ 36.67	23.27

PAIN1011-002 06/06/2021

FLORENCE COUNTY

	Rates	Fringes
Painters:	$ 26.71	14.38

PLAS0599-010 06/01/2021

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area 1	$ 42.06	20.87
Area 2 (BAC)	$ 37.73	23.80
Area 3	$ 38.74	22.46
Area 4	$ 38.59	22.66
Area 5	$ 38.16	22.98
Area 6	$ 34.94	26.36

AREA DESCRIPTIONS

AREA 1: BAYFIELD, DOUGLAS, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA 2: 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

AREA 3: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA 4: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA 5: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA 6: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	23.81
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 32.72	23.81
WELL DRILLER	$ 16.52	3.70

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) (ii)).

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 DECISIO"

"General Decision Number: WI20220008 07/29/2022

Superseded General Decision Number: WI20210008

State: Wisconsin

Construction Types: Heavy (Sewer and Water Line and Tunnel)

Counties: Wisconsin Statewide.

TUNNEL, SEWER & WATER LINE CONSTRUCTION PROJECTS

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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022
1	01/21/2022

2	02/04/2022
3	02/25/2022
4	03/11/2022
5	03/18/2022
6	04/29/2022
7	06/17/2022
8	07/08/2022
9	07/15/2022
10	07/29/2022

BRWI0001-002 06/01/2021

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.81	25.17

BRWI0002-002 06/01/2021

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.35	23.89

BRWI0002-005 06/01/2021

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	$ 37.73	24.15

BRWI0003-002 06/01/2021

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0004-002 06/01/2021

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.30	26.03

BRWI0006-002 06/01/2021

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.78	24.20

BRWI0007-002 06/01/2021

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.38	25.31

BRWI0008-002 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 42.38	24.64

BRWI0009-001 06/01/2021

GREEN LAKE, MARQUETTE, OUTAGAMIE, SHAWANO, WAUPACA, WASHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0011-002 06/01/2021

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.03	24.95

BRWI0013-002 06/01/2021

DANE, GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

BRWI0019-002 06/01/2021

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 36.31	25.67

BRWI0021-002 06/01/2021

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 37.75	25.92

BRWI0034-002 06/01/2021

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.53	25.16

CARP0087-001 05/01/2016

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	$ 36.85	18.39

CARP0252-002 06/01/2016

ADAMS, BARRON, BAYFIELD (Eastern 2/3), BROWN, BUFFALO, BURNETT (E. of Hwy 48), CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE (except area bordering Michigan State Line), FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE (except N.E. corner), MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwys 29 & 65), POLK (E. of Hwys 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
CARPENTER		
CARPENTER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVER	$ 34.12	18.00

CARP0252-010 06/01/2016

ASHLAND COUNTY

	Rates	Fringes
Carpenters		
Carpenter	$ 33.56	18.00
Millwright	$ 35.08	18.35
Pile Driver	$ 34.12	18.00

CARP0264-003 06/01/2016

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WAUKESHA, AND WASHINGTON COUNTIES

	Rates	Fringes
CARPENTER	$ 35.78	22.11

CARP0361-004 05/01/2018

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 36.15	20.43

CARP2337-001 06/01/2016

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON

ZONE B: KENOSHA & RACINE

	Rates	Fringes
PILEDRIVERMAN		
Zone A	$ 31.03	22.69
Zone B	$ 31.03	22.69

CARP2337-003 06/01/2019

	Rates	Fringes
MILLWRIGHT		
Zone A	$ 33.58	21.53
Zone B	$ 33.58	21.53

ZONE DEFINITIONS

ZONE A: MILWAUKEE, OZAUKEE, WAUKESHA AND WASHINGTON COUNTIES

ZONE B: KENOSHA & RACINE COUNTIES

ELEC0014-002 12/26/2021

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:	$ 37.83	21.89

ELEC0127-002 06/01/2021

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 43.16	30%+12.70

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 05/30/2021

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:.....	$ 36.22	26%+11.24

ELEC0430-002 06/01/2022

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:.....	$ 45.02	24.35

ELEC0494-005 06/01/2021

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 44.39	25.67

ELEC0494-006 06/01/2021

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 37.91	22.74

ELEC0577-003 06/01/2021

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:	$ 35.66	29.50%+10.00

ELEC0890-003 06/01/2021

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 39.00	25.95%+11.17

ENGI0139-003 06/06/2022

REMAINING COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 45.22	24.85
Group 2	$ 43.97	24.85
Group 3	$ 41.57	24.85
Group 4	$ 41.04	24.85
Group 5	$ 38.97	24.85
Group 6	$ 37.44	24.85

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; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,00 lbs and over;

Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete pumps 46 meter and under; Grout Pumps; Rotec type machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Material Haulers.

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large; Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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* ENGI0139-007 06/05/2022

DODGE, FOND DU LAC, JEFFERSON, KENOSHA, MILWAUKEE, OZAUKEE, RACINE, SHEBOYGAN, WALWORTH, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Power Equipment Operator		

Group 1	$ 43.54	24.85
Group 2	$ 42.76	24.85
Group 3	$ 41.81	24.85
Group 4	$ 40.76	24.85
Group 5	$ 39.36	24.85

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; Backhoes (Excavators) 130,000 lbs and over; Caisson Rigs and Pile Drivers

GROUP 2: Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or under; or Cranes, Tower Cranes, and Derricks with boom, lead, and\or jib lengths measuring 175 feet or under; Backhoes (Excavators) under 130,000 lbs; Skid Rigs; Dredge Operator: Traveling Crane (Bridge type); Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Pumps and Boring Machines (directional)

GROUP 3: Material Hoists; Stack Hoists; Tractor or Truck mounted Hydraulic Backhoe; Tractor or Truck Mounted Hydraulic Crane, 5 tons or under; Manhoist; Tractor over 40 hp; Bulldozer over 40 hp; Endloader over 40 hp; Forklift, 25 ft and over; Motor Patrol; Scraper Operator; Sideboom; Straddle Carrier; Mechanic and Welder; Bituminous Plant and Paver Operator; Roller over 5 tons; Percussion Drill Operator; Rotary Drill Operator; Blaster; Air Track Drill; Trencher (wheel type or chain type having over 8 inch bucket); Elevator; Milling Machine and Boring Machine (horizontal or vertical); Backhoe Mounted Compactor

GROUP 4: Backfiller; Concrete Auto Breaker (large); Concrete Finishing Machine (road type); Roller, Rubber Tire; Concrete Batch Hopper; Concrete Conveyor System; Concrete Mixers (14S or over); Screw type Pumps and Gypsum Pumps; Grout Pumps; Tractor, Bulldozer, End Loader, under 40 hp; Pumps (well points); Trencher (chain type 8 inch or smaller bucket; Industrial Locomotives; Roller under 5 tons; Fireman (Piledrivers and Derricks); Robotic Tool Carrier with or without attachments.

GROUP 5: Hoists (Automatic); Forklift, 12 ft to 25 ft; Tamper-Compactors, riding type; A-Frame andWinch Trucks; Concrete Auto Breaker; Hydrohammer, small; Brooms and Sweepers; Hoist (Tuggers); Stump Chipper, large; Boats (Tug, Safety, Work Barges and Launch); Shouldering Machine Operator; Screed Operator; Farm or Industrial Tractor; Post Hole Digger; Stone Crushers and Screening Plants; Firemen (Asphalt Plants); Air Compressor (400 CFM or over); Augers (vertical and horizontal); Generators, 150 KW and over; Air, Electric Hydraulic Jacks (Slipform); Prestress Machines; Skid Steer Loader with or without attachments; Boiler operators (temporary heat); Forklift, 12 ft and under; Screed Operator Milling Machine; Refrigeration Plant/Freeze Machine; Power Pack Vibratory/Ultra Sound

Driver and Extractor; Generators under 150 KW; Combination small equipment operator; Compressors under 400 CFM; Welding Machines; Heaters, Mechanical; Pumps; Winches, Small Electric; Oiler and Greaser; Conveyor; High pressure utility locating machine (daylighting machine).

IRON0008-002 06/01/2021

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 38.77	28.15

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2021

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 40.57	28.40

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/05/2022

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	$ 39.00	28.58

IRON0498-005 06/01/2021

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 41.37	44.41

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* IRON0512-008 05/01/2022

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 41.00	33.11

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* IRON0512-021 05/01/2022

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 36.94	33.11

LABO0113-004 06/01/2022

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Open Cut)		
Group 1	$ 17.62	21.98
Group 2	$ 19.89	21.98
Group 3	$ 23.43	21.98
Group 4	$ 32.80	21.98
Group 5	$ 32.94	21.98
Group 6	$ 33.00	21.98
Group 7	$ 36.85	21.98
Group 8	$ 39.67	21.98
Group 9	$ 40.31	21.98

LABORERS CLASSIFICATIONS [OPEN CUT]

GROUP 1: Yard Laborer

GROUP 2: Landscaper

GROUP 3: Flag Person

GROUP 4: Paving Laborer

GROUP 5: General Laborer on Surface; Top Man

GROUP 6: Mud Mixer

GROUP 7: Mucker; Form Stripper; Bottom Digger and Misc; Bottom Man and Welder on Surface

GROUP 8: Concrete Manhole Builder; Caisson Worker; Miner; Pipe Layer; Rock Driller and Joint Man; Timber Man and Concrete Brusher; Bracer in Trench Behind Machine & Tight Sheeting; Concrete Formsetter and Shoveler; Jackhammer Operator

GROUP 9: Blaster

LABO0113-005 06/01/2022

SEWER, TUNNEL & UNDERGROUND

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
Laborers:		
Group 1	$ 24.29	21.98
Group 2	$ 30.22	23.09
Group 3	$ 34.42	23.09
Group 4	$ 36.19	23.09

TUNNEL WORK UNDER COMPRESSED AIR: 0-15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS

GROUP 1: Flagperson

GROUP 2: Top Man, General Laborer, Wellpoint Installation, Wire Mesh and Reinforcement, Concrete Worker, Form Stripper, Strike-off Work

GROUP 3: Machine and Equipment Operator, Sheeting, Form Setting, Patch Finisher, Bottom Man, Joint Sawer, Gunnite Man, Manhole Builder, Welder-Torchman, Blaster, Caulker, Bracer, Bull Float, Conduit Worker, Mucker and Car Pusher, Raker and Luteman, Hydraulic Jacking of Shields, Shield Drivers, Mining Machine, Lock Tenders, Mucking Machine Operator, Motor Men & Gauge Tenders and operation of incidental Mechanical Equipment and all Power Driven Tools

GROUP 4: Pipelayer, Miner and Laser Operator

LABO0113-008 06/01/2022

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel-Free Air)		
Group 1	$ 23.43	21.98
Group 2	$ 32.94	21.98
Group 3	$ 33.00	21.98
Group 4	$ 36.98	21.98
Group 5	$ 36.99	21.98
Group 6	$ 39.67	21.98
Group 7	$ 40.31	21.98

LABORERS CLASSIFICATIONS [TUNNEL - FREE AIR]:

GROUP 1: Flagperson

GROUP 2: General Laborer on surface; Tower Man

GROUP 3: Saw Man; Top Man

GROUP 4: Form Stripper; Car Pusher

GROUP 5: Mucker; Dinkey; Welder (rate on surface)

GROUP 6: Concrete Manhole Builder; Mucking Machine; Miner; Mining Machine; Welder; Rock Driller; Concrete Buster; Jack Hammer Operator; Caisson Worker; Pipelayer and Joint Man; Bracerman

GROUP 7: Blaster

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* LABO0113-009 06/01/2022

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel - *COMPRESSED AIR 0 - 15 lbs.)		
Group 1	$ 23.43	21.98
Group 2	$ 32.94	21.98
Group 3	$ 37.39	21.98
Group 4	$ 38.19	21.98
Group 5	$ 38.31	21.98
Group 6	$ 41.01	21.98
Group 7	$ 41.63	21.98

LABORERS CLASSIFICATIONS [TUNNEL - COMPRESSED AIR]:

*Compressed Air 15 - 30 lbs add $2.00 to all classifications
*Compressed Air over 30 lbs add $3.00 to all classifcations

GROUP 1: Flagperson

GROUP 2: General Laborer on surface

GROUP 3: Lock Tender on surface

GROUP 4: Form Stripper; Car Pusher

GROUP 5: Mucker; Dinkey

GROUP 6: Mucking Machine; Miner; Mining Machine; Welder & Rock Driller; Lock Tender in tunnel; Concrete Buster; Jack Hammer Operator; Caisson Worker; Pielayer and Joint Man; Bracerman; Nozzle Man on Gunite; Timber Man; Concrete Brusher

GROUP 7: Blaster

NOTE: Hazardous & Toxic Waste Removal: add $0.15 per hour.

LABO0140-005 06/06/2022

ADAMS, ASHLAND, BARRON, BROWN, BUFFALO, CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE,FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, JACKSON, JEFFERSON, JUNEAU, LACROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RICHLAND, ROCK, RUSK, ST CROIX, SAUK, SAWYER, SHAWANO, SHEBOYGAN, TAYLOR, TREMMPEALEAU, VERNON, VILAS, WALWWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
LABORER (SEWER & WATER)		
Group 1	$ 31.48	18.68
Group 2	$ 33.33	18.68
Group 3	$ 33.53	18.68

Group 4.....$ 34.28 18.68

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR: 0-15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORER CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: General Laborer, Wellpoint Installation; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Drivers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

LABO0464-002 06/06/2022

DANE AND DOUGLAS COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 31.38	18.68
Group 2	$ 33.58	18.68
Group 3	$ 33.78	18.68
Group 4	$ 34.53	18.68

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR: 0 - 15 lbs add $1.00, 15- 30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: General Laborer; Wellpoint Installation; Concrete Worker; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Dirvers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

LABO1091-010 06/06/2022

BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Laborers: (SEWER & WATER)		
Group 1	$ 31.17	18.68

Group 2	$ 33.23	18.68
Group 3	$ 33.43	18.68
Group 4	$ 34.18	18.68

FOR ALL TUNNEL WORK UNDER COMPRESSED AIR:
0 - 15 lbs add $1.00, 15-30 lbs add $2.00, over 30 lbs add $3.00

LABORERS CLASSIFICATIONS:

GROUP 1: Flagperson

GROUP 2: Laborers, Wellpoint Installation; Form Stripper; Strike Off worker

GROUP 3: Sheeting Formsetting; Patch Finisher; Bottom Man; Joint Sawer; Gunnite Man; Manhole Builder; Welder; Torchman; Blaster; Caulker Bracer; Bull Float; Mucker and Car Pusher; Raker and Luteman; Hydraulic jacking of shields, Shield Dirvers; Mining Machine; Lock Tenders; Mucking Machine Operators; Motor Men and Gauge Tenders; Power Tool Operators

GROUP 4: Pipelayer, Miner, and Laser Operator

PLAS0599-010 06/01/2021

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area 1	$ 42.06	20.87
Area 2 (BAC)	$ 37.73	23.80
Area 3	$ 38.74	22.46
Area 4	$ 38.59	22.66
Area 5	$ 38.16	22.98
Area 6	$ 34.94	26.36

AREA DESCRIPTIONS

AREA 1: BAYFIELD, DOUGLAS, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA 2: 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

AREA 3: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA 4: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA 5: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA 6: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2021

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 32.57	23.81
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 32.72	23.81
WELL DRILLER	$ 16.52	3.70

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) (ii)).

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 DECISIO"

"General Decision Number: WI20220013 07/29/2022

Superseded General Decision Number: WI20210013

State: Wisconsin

Construction Type: Building

Counties: Pierce and St Croix 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)(2)-(60).

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 $15.00 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 2022.
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 $11.25 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 2022.

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 https://www.dol.gov/agencies/whd/government-contracts.

Modification Number	Publication Date
0	01/07/2022

1	01/21/2022
2	02/04/2022
3	02/11/2022
4	02/25/2022
5	03/11/2022
6	03/18/2022
7	06/17/2022
8	07/08/2022
9	07/15/2022
10	07/29/2022

ASBE0205-006 01/01/2002

	Rates	Fringes
Asbestos Removal worker/hazardous material handler		
Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not	$ 23.06	5.25

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

BRWI0019-001 06/01/2021

	Rates	Fringes
Bricklayer & Tile Setter	$ 36.31	25.67

CARP0087-002 05/01/2016

ST CROIX COUNTY (West of Hwy 65)

	Rates	Fringes
Carpenter; piledriver; soft floor layer	$ 31.69	17.71

CARP0252-004 06/01/2016

PIERCE AND ST CROIX (East of Hwy 65) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work; Excluding Batt Insulation)		
CARPENTER & SOFT FLOOR LAYER	$ 33.56	18.00
MILLWRIGHT	$ 35.08	18.35
PILEDRIVERMAN	$ 34.12	18.00

ELEC0014-004 12/26/2021

	Rates	Fringes
ELECTRICIAN	$ 37.83	21.89

ELEC0014-005 05/30/2021

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 28.50	15.92

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).

ELEV0009-003 01/01/2020

	Rates	Fringes
ELEVATOR MECHANIC	$ 51.55	34.765

FOOTNOTE:
PAID VACATION: Employer contributes 8% of regular hourly rate as vacation pay credit for employees with more than 5 years of service, and 6% for 6 months to 5 years of service.
PAID HOLIDAYS: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, Friday after Thanksgiving, and Christmas Day.

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* ENGI0139-002 06/06/2022

	Rates	Fringes
OPERATOR: Power Equipment		
Group 1	$ 45.22	24.85
Group 2	$ 43.97	24.85
Group 3	$ 41.57	24.85
Group 4	$ 41.04	24.85
Group 5	$ 38.97	24.85
Group 6	$ 37.44	24.85

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; Cranes, Tower Cranes, and Derricks with boom, leads and/or jib lengths 176 ft or longer.

GROUP 2: Backhoes (Excavators) weighing 130,000 lbs & over; Cranes, Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less;

Cranes, Tower Cranes, and Derricks with boom, leads, and/or jib lengths 175 ft or less; Caisson Rigs; Pile Driver

GROUP 3: Backhoes (Excavators) weighing under 130,000 lbs; Travelling Crane (bridge type); Milling Machine; Concrete Paver over 27 E; Concrete Spreader and Distributor; Concrete Laser Screed; Concrete Grinder and Planing Machine; Slipform Curb and Gutter Machine; Boring Machine (Directional); Dredge Operator; Skid Rigs; Over 46 meter Concrete Pump.

GROUP 4: Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 10 tons or less; Tractor, Bulldozer, or End Loader (over 40 hp); Motor Patrol; Scraper Operator; Bituminous Plant and Paver Operator; Screed-Milling Machine; Roller over 5 tons; Concrete Pumps 46 meter & under; Grout Pumps; Rotec Type Machine; Hydro Blaster, 10,000 psi and over; Rotary Drill Operator; Percussion Drilling Machine; Air Track Drill with or without integral hammer; Blaster; Boring Machine (vertical or horizontal); Side Boom; Trencher, wheel type or chain type having 8 inch or larger bucket; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Straddle Carrier; Material Hoists; Stack Hoist; Man Hoists; Mechanic and Welder; Off Road Maaerial Haulers

GROUP 5: Tractor, Bulldozer, or Endloader (under 40 hp); Tampers -Compactors, riding type; Stump Chipper, large; Roller, Rubber Tire; Backfiller; Trencher, chain type (bucket under 8 inch); Concrete Auto Breaker, large; Concrete Finishing Machine (road type); Concrete Batch Hopper; Concrete Conveyor Systems; Concrete Mixers, 14S or over; Pumps, Screw Type and Gypsum); Hydrohammers, small; Brooms and Sweeeprs; Lift Slab Machine; Roller under 5 tons; Industrial Locomotives; Fireman (Pile Drivers and Derricks); Pumps (well points); Hoists, automatic; A-Frames and Winch Trucks; Hoists (tuggers); Boats (Tug, Safety, Work Barges and Launches); Assistant Engineer

GROUP 6: Shouldering Machine Operator; Farm or Industrial Tractor mounted equipment; Post Hole Digger; Auger (vertical and horizontal); Skid Steer Loader with or without attachments; Robotic Tool Carrier with or without attachments; Power Pack Vibratory/Ultra Sound Driver and Extractor; Fireman (Asphalt Plants); Screed Operator; Stone Crushers and Screening Plants; Air, Electric, Hydraulic Jacks (Slip Form); Prestress Machines; Air Compressor, 400 CFM or over; Refrigeration Plant/Freese Machine; Boiler Operators (temporary heat); Forklifts; Welding Machines; Generators; Pumps over 3""; Compressors, under 400 CFM; Heaters, Mechanical; Combination small equipment operator; Winches, small electric; Oiler; Greaser; Rotary Drill Tender; Conveyor; Elevator Operator

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* IRON0512-007 05/01/2022

	Rates	Fringes
IRONWORKER	$ 41.00	33.11

LABO0268-002 06/06/2022

	Rates	Fringes

Laborer, General.....$ 32.20 18.68
Laborer: Asbestos/hazardous material remover (Preparation, Removal and Encapsulation of Hazardous Materials from Non-Mechanical Systems).....$ 31.15 18.68

NOTE: Mason Tender $.25 over general laborer.

PAIN0259-001 05/01/2008

	Rates	Fringes
DRYWALL FINISHER/TAPER	$ 24.61	12.15
PAINTER	$ 24.11	12.15

PAIN1324-004 02/28/2022

	Rates	Fringes
GLAZIER	$ 38.62	9.78

PLUM0434-001 05/29/2022

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 45.84	21.68

SFWI0669-002 04/01/2021

	Rates	Fringes
SPRINKLER FITTER	$ 43.87	25.41

SHEE0018-007 06/01/2021

	Rates	Fringes
Sheet Metal Worker (Including HVAC duct work and Technicians)	$ 36.00	27.81

TEAM0662-001 06/01/2022

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 34.07	24.95
3 or more Axles	$ 34.22	24.95

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* SUWI2002-012 01/23/2002

	Rates	Fringes
Asbestos Worker/Heat and Frost Insulator	$ 25.36	8.37
Laborers:		
Concrete Worker	$ 16.34	3.59
Landscape	$ 8.73 **	4.90
ROOFER	$ 18.01	3.28

Tile & Marble Finisher.....$ 13.89 ** 8.25

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 ($15.00) or 13658 ($11.25). Please see the Note at the top of the wage determination for more information.

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) (ii)).

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 DECISIO"

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

August 2, 2022

NOTICE TO ALL CONTRACTORS:

Proposal #14: 1020-01-80, WISC 2022372
Hudson – Baldwin
IH 94 SWEF 61 Hudson
IH 94
St. Croix County

Letting of August 9, 2022

This is Addendum No. 01, which provides for the following:

Special Provisions:

Revised Special Provisions	
Article No.	Description
53	SWEF Building, General Construction, Item SPV.0060.100

Plan Sheets:

Revised Plan Sheets	
Plan Sheet	Plan Sheet Title (brief description of changes to sheet)
191-193	Revised Building Architectural Plan (updated A403, A404, A405)
195	Revised Building Architectural Plan (updated A407)
197-198	Revised Building Architectural Plan (updated A409, A410)
200-201	Revised Building Architectural Plan (updated A412, A413)

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

PROJECT ID 1020-01-80

August 2, 2022

Special Provisions

53. SWEF Building, General Construction, Item SPV.0060.100.

Replace subsection titled 2.2 Materials *under section titled* **Section 07 22 00 – Nailbase Roof Insulation** *with the following:*

2.2 MATERIALS

A. Description of System:

1. The insulation shall be a factory assembled panel consisting of a 5/8" oriented strand board top surface, polyisocyanurate insulation and a layer of felt on the bottom.

1a. Optional: The completed system can be constructed of multiple layers of components in the field if needed.

2. The overall thickness of the roof insulation shall be 6-5/8" with a 'Long Term Thermal Resistance' (LTTR) R value = 36.6.

3. Panels shall be a nominal 48" x 96" and shall be accurately trimmed to length and width after assembly.

4. Foam insulation edges shall be to tongue & groove.

5. OSB or CDX topside sheathing shall be fire rated and rabbetted to allow clearance between the wood on adjoining panels.

B. Insulation fasteners shall be as recommended by the insulation manufacturer for use with the supporting structural roof deck shown in the plans.

Replace subsection titled 2.1 Manufacturers *and* 2.2 Materials *under section titled* **Section 07 46 00 – Prefinished Metal Soffit Panels** *with the following:*

2.1 MANUFACTURERS

A. Provide prefinished metal soffit panels from one of the following manufacturers:

1. Una-Clad by Copper Sales, Anoka, MN; UC-500

2. Pac-Clad (Peterson Aluminum Corp.), Elk Grove Village, IL: 'Soffit Flush' Non-vented.

3. McElroy Metal Inc.; Bossier City, LA: Marquee Series

4. AEP/Span Metal Corporation; Dallas, TX

2.2 MATERIALS

A. Soffit Panels

1. Panel Profile: Non-vented 12" wide x 1" deep roll formed of .024" galvanized coil-coated steel with flanged panels for concealed fastening.

2. Finish: Kynar 500

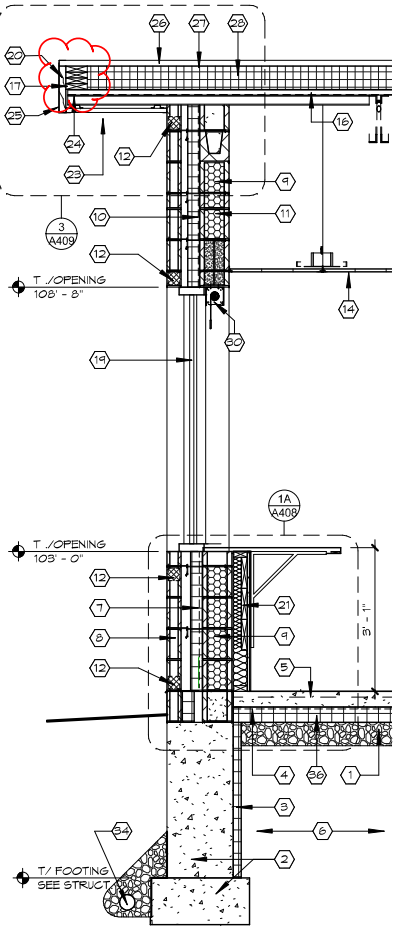
3. Color: Match Peterson Aluminum 'Colonial Red'

B. Furring Channels

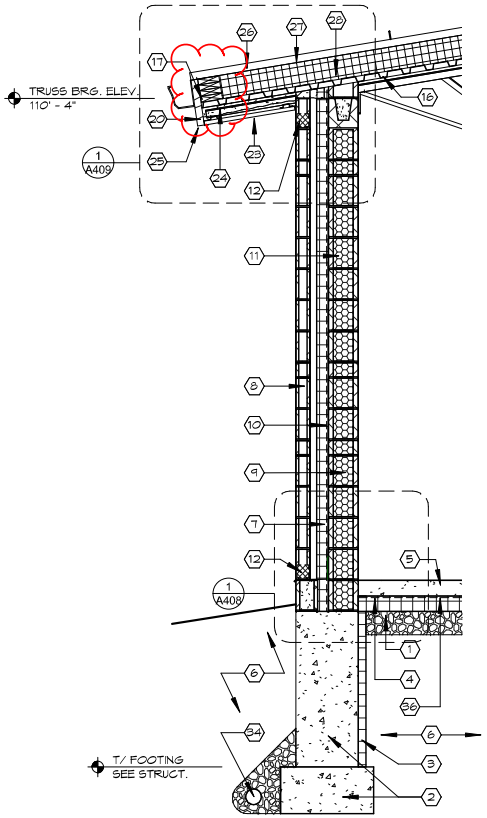
1. Roll-formed, 20-ga. hat-shaped corrosion resistant steel, 7/8” deep.

Plan Sheets
The following 8½ x 11-inch sheets are attached and made part of the plans for this proposal:
Revised: 191-193, 195, 197-198, and 200-201.

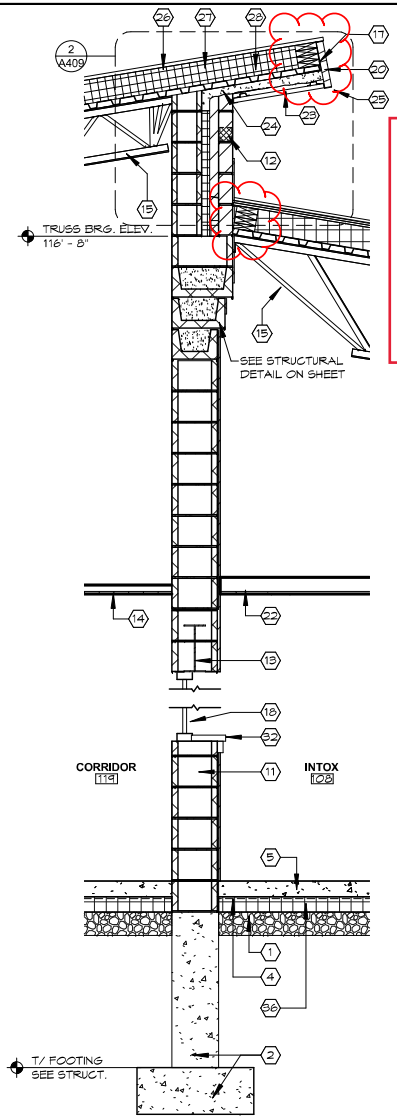
END OF ADDENDUM



1 WALL SECTION
3/8" = 1'-0"



2 WALL SECTION
3/8" = 1'-0"



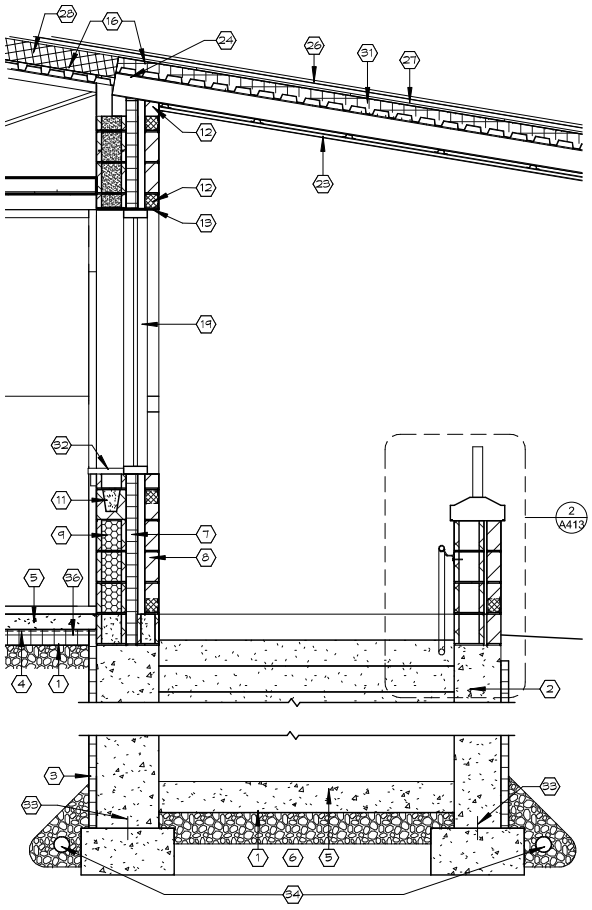
3 WALL SECTION
3/8" = 1'-0"

Addendum No. 01
ID 1020-01-80
Revised Sheet 191
August 2, 2022

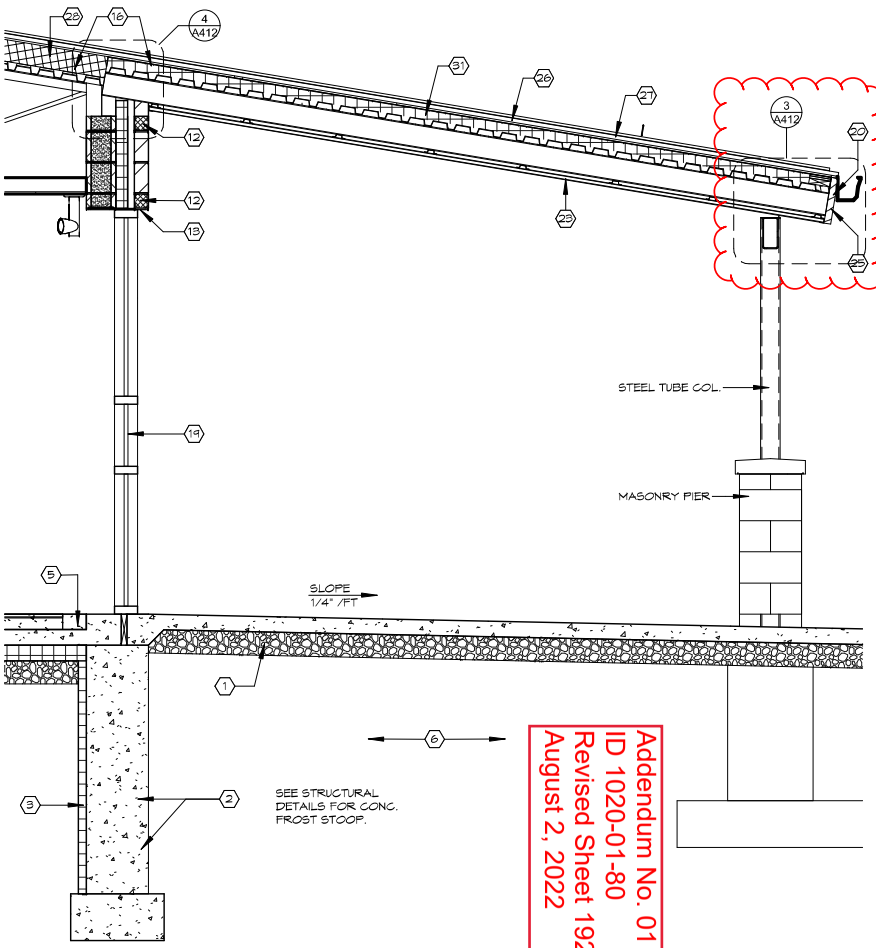
WALL SECTION KEYNOTES

MARK	SECTION KEYNOTES
1	6" COMPACT AGGREGATE BASE
2	REFER TO STRUCTURAL PLANS FOR CAST-IN-PLACE CONCRETE FOUNDATION & FOOTING
3	2" THICK RIGID INSULATION
4	15 MIL VAPOR BARRIER
5	CONCRETE SLAB-ON-GRADE. SEE STRUCTURAL PLANS FOR THICKNESS & REINFORCING.
6	COMPACTED BACKFILL
7	3" RIGID CAVITY INSULATION
8	CMU VENEER. REFER TO EXTERIOR ELEVATIONS & SPECIFICATION.
9	CORE-FILLED FOAM INSULATION. SEE SPEC.
10	SPRAY-APPLIED AIR BARRIER MEMBRANE.
11	CMU-REFER TO STRUCTURAL PLANS FOR REINFORCING. SEE PLANS, WALL TYPES & EXTERIOR ELEVATIONS.
12	WEEP VENTS IN HEAD JOINTS 32" O.C.
13	GALV. STEEL LINTEL. PAINT EXPOSED.
14	SUSPENDED ACOUSTICAL TILE CEILING
15	STEEL BAR JOISTS. REFER TO STRUCTURAL PLANS.
16	STEEL ROOF DECKING. REFER TO STRUCT. PLANS.
17	PERIMETER STEEL ANGLE. REFER TO STRUCT. PLANS.
18	HOLLOW METAL BORROWED LITE
19	ALUMINUM STOREFRONT WINDOW W/ INSUL. GLAZING.
20	LSL SUB-FASCIA ATTACHED TO PERIMETER ANGLE. SEE ENLARGED DETAIL
21	GYP. BD. OVER LIGHT GUAGE METAL STUDS 24" O.C. WALL TYPES
22	SUSPENDED GYP. BD. CEILING SYSTEM
23	PRE.FIN. METAL SOFFIT PANEL.
24	CLOSED-CELL SPRAY-FOAM INSULATION.
25	PRE.FIN. METAL FASCIA TRIM
26	STANDING SEAM METAL ROOFING
27	ICE & WATERSHIELD ROOF UNDERLAYMENT
28	6" NAIL-BASE INSULATION SYSTEM
29	FLOOR GRID - SEE DETAIL
30	ROLLER SHADE WINDOW TREATMENT RECESS IN CEILING SEE DETAIL
31	2 1/2" NAIL BASE INSULATION SYSTEM
32	SOLID SURFACE WINDOW STOOL.
33	PVC WATERSTOP
34	PERIMETER DRAIN TILE - SEE DETAIL 2/A101
35	TRANSLUCENT WALL PANEL. SEE SPECIFICATION.
36	4" THICK RIGID INSULATION UNDERSLAB

PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			WALL SECTIONS		DATE: 03/09/2022	FINAL
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A403	191



1 WALL SECTION C - OPERATIONS
3/8" = 1'-0"



2 WALL SECTION D - OPERATIONS
3/8" = 1'-0"

Addendum No. 01
ID 1020-01-80
Revised Sheet 192
August 2, 2022

WALL SECTION KEYNOTES

MARK	SECTION KEYNOTES
1	6" COMPACT AGGREGATE BASE
2	REFER TO STRUCTURAL PLANS FOR CAST-IN-PLACE CONCRETE FOUNDATION & FOOTING
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4	15 MIL VAPOR BARRIER
5	CONCRETE SLAB-ON-GRADE. SEE STRUCTURAL PLANS FOR THICKNESS & REINFORCING.
6	COMPACTED BACKFILL
7	3" RIGID CAVITY INSULATION
8	CMU VENEER. REFER TO EXTERIOR ELEVATIONS & SPECIFICATION.
9	CORE-FILLED FOAM INSULATION. SEE SPEC.
10	SPRAY-APPLIED AIR BARRIER MEMBRANE.
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16	STEEL ROOF DECKING. REFER TO STRUCT. PLANS.
17	PERIMETER STEEL ANGLE. REFER TO STRUCT. PLANS.
18	HOLLOW METAL BORROWED LITE
19	ALUMINUM STOREFRONT WINDOW W/ INSUL. GLAZING.
20	LSL SUB-FASCIA ATTACHED TO PERIMETER ANGLE. SEE ENLARGED DETAIL
21	GYP. BD. OVER LIGHT GUAGE METAL STUDS 24" O.C. WALL TYPES
22	SUSPENDED GYP. BD. CEILING SYSTEM
23	PRE.FIN. METAL SOFFIT PANEL.
24	CLOSED-CELL SPRAY-FOAM INSULATION.
25	PRE.FIN. METAL FASCIA TRIM
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27	ICE & WATERSHIELD ROOF UNDERLAYMENT
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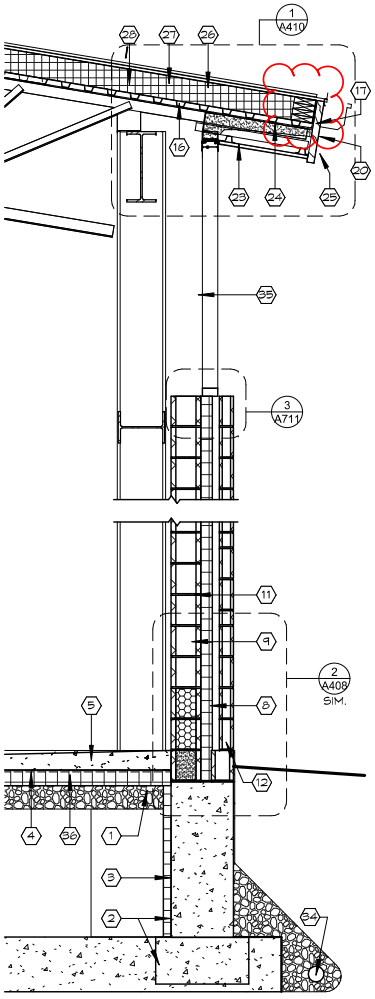
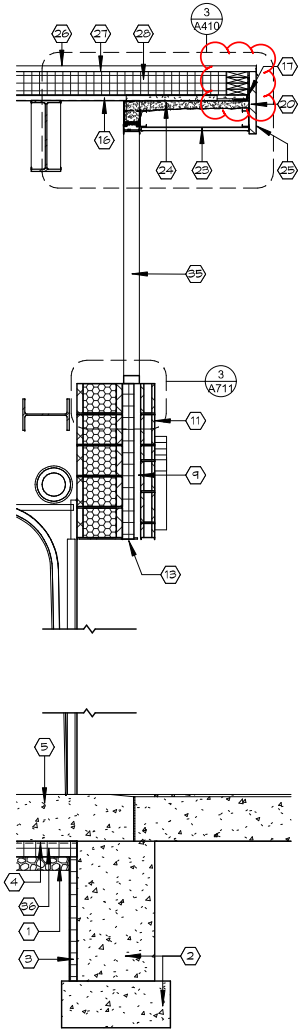
31	2 1/2" NAIL BASE INSULATION SYSTEM
32	SOLID SURFACE WINDOW STOOL.
33	PVC WATERSTOP
34	PERIMETER DRAIN TILE - SEE DETAIL 2/A101
35	TRANSLUCENT WALL PANEL. SEE SPECIFICATION.
36	4" THICK RIGID INSULATION UNDERSLAB

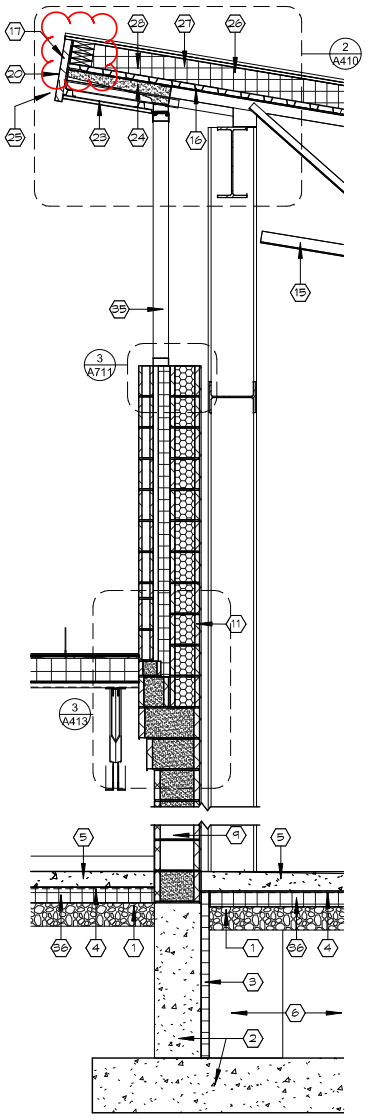
PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			WALL SECTIONS		DATE: 03/09/2022	FINAL
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A404	192



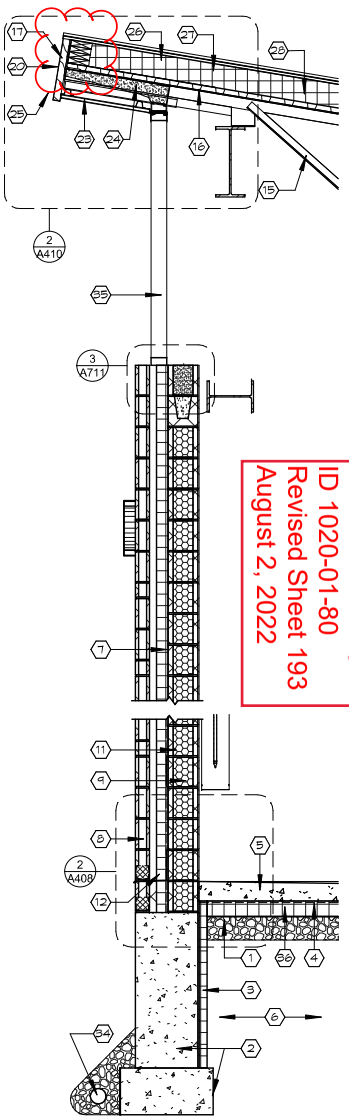
1 WALL SECTION
3/8" = 1'-0"



2 WALL SECTION
3/8" = 1'-0"



3 WALL SECTION
3/8" = 1'-0"



4 WALL SECTION
3/8" = 1'-0"

Addendum No. 01
ID 1020-01-80
Revised Sheet 193
August 2, 2022

WALL SECTION KEYNOTES

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4	15 MIL VAPOR BARRIER
5	CONCRETE SLAB-ON-GRADE. SEE STRUCTURAL PLANS FOR THICKNESS & REINFORCING.
6	COMPACTED BACKFILL
7	3" RIGID CAVITY INSULATION
8	CMU VENEER. REFER TO EXTERIOR ELEVATIONS & SPECIFICATION.
9	CORE-FILLED FOAM INSULATION. SEE SPEC.
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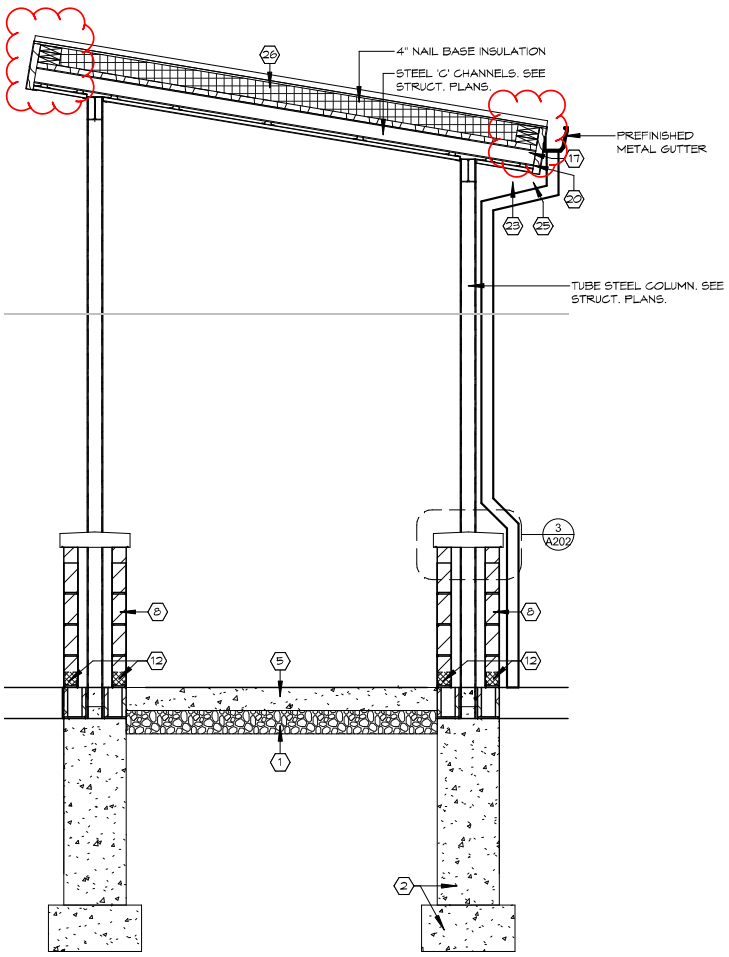
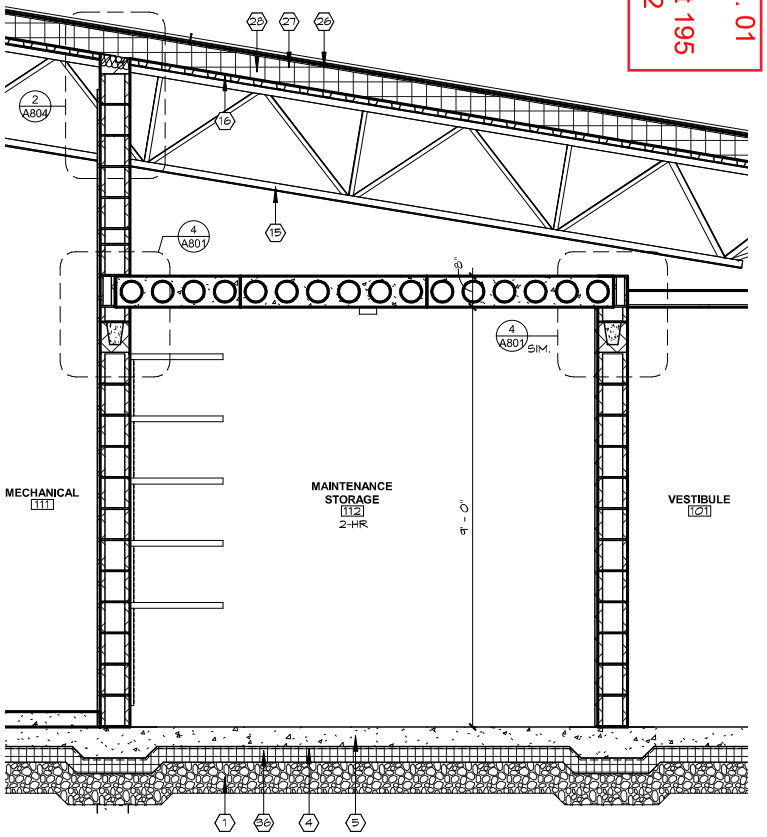
34	PERIMETER DRAIN TILE - SEE DETAIL 2/A101
35	TRANSLUCENT WALL PANEL. SEE SPECIFICATION.
36	4" THICK RIGID INSULATION UNDERSLAB

PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			WALL SECTIONS		DATE: 03/09/2022	FINAL
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A405	193

Addendum No. 01
ID 1020-01-80
Revised Sheet 195
August 2, 2022



1 NORTH ENTRANCE CANOPY SECTION
3/8" = 1'-0"



2 STORAGE SECTION
3/8" = 1'-0"

WALL SECTION KEYNOTES

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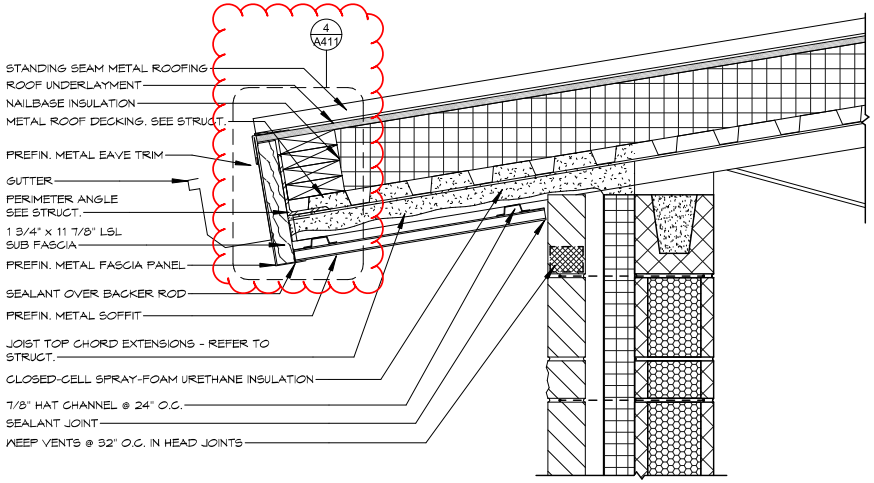
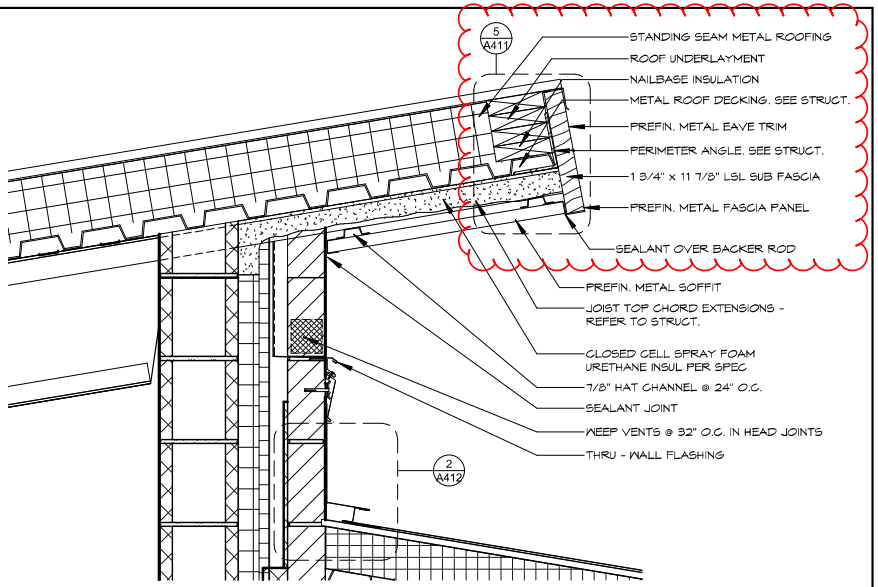
17	PERIMETER STEEL ANGLE. REFER TO STRUCT. PLANS.
18	HOLLOW METAL BORROWED LITE
19	ALUMINUM STOREFRONT WINDOW W/ INSUL. GLAZING.
20	LSL SUB-FASCIA ATTACHED TO PERIMETER ANGLE. SEE ENLARGED DETAIL
21	GYP. BD. OVER LIGHT GUAGE METAL STUDS 24" O.C. WALL TYPES
22	SUSPENDED GYP. BD. CEILING SYSTEM
23	PRE.FIN. METAL SOFFIT PANEL.
24	CLOSED-CELL SPRAY-FOAM INSULATION.
25	PRE.FIN. METAL FASCIA TRIM
26	STANDING SEAM METAL ROOFING
27	ICE & WATERSHIELD ROOF UNDERLAYMENT
28	6" NAIL-BASE INSULATION SYSTEM
29	FLOOR GRID - SEE DETAIL
30	ROLLER SHADE WINDOW TREATMENT RECESS IN CEILING SEE DETAIL
31	2 1/2" NAIL BASE INSULATION SYSTEM
32	SOLID SURFACE WINDOW STOOL.
33	PVC WATERSTOP
34	PERIMETER DRAIN TILE - SEE DETAIL 2/A101
35	TRANSLUCENT WALL PANEL. SEE SPECIFICATION.
36	4" THICK RIGID INSULATION UNDERSLAB

PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			SECTIONS		DATE: 03/09/2022	FINAL
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A407	195



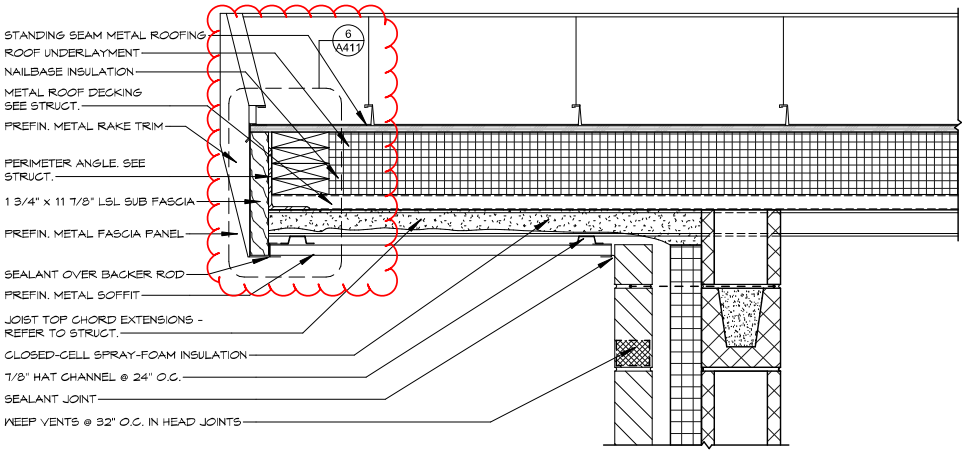
1 OVERHANG DETAIL - EAVE LOW SIDE

1" = 1'-0"



2 OVERHANG DETAIL - EAVE HIGH SIDE

1" = 1'-0"

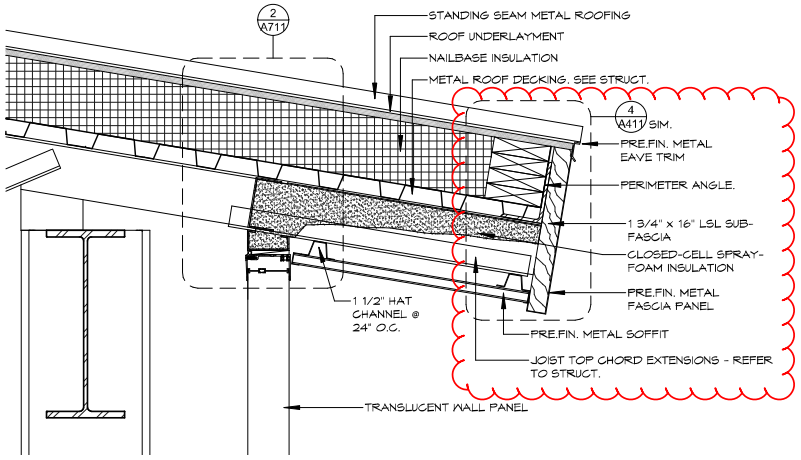


3 OVERHANG DETAIL - RAKE

1" = 1'-0"

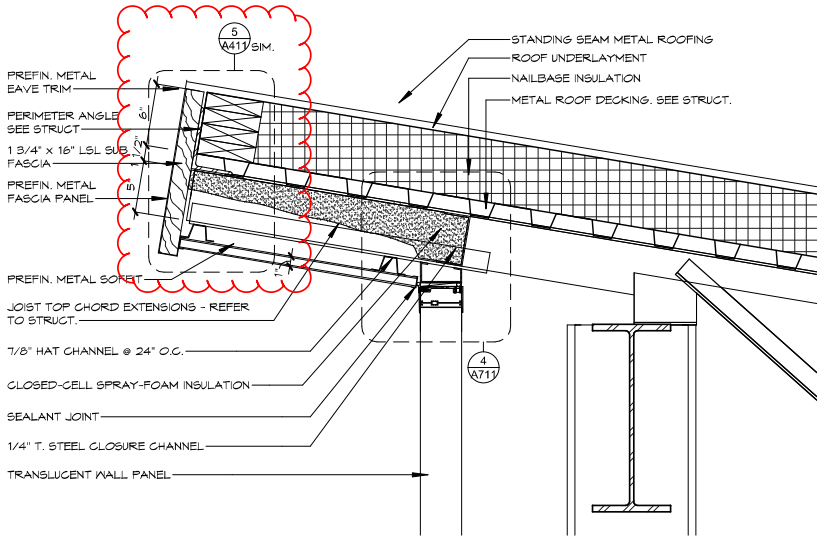
Addendum No. 01
ID 1020-01-80
Revised Sheet 197
August 2, 2022

PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			ROOF DETAILS – OPERATIONS		DATE: 03/09/2022	FINAL	
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A409		197



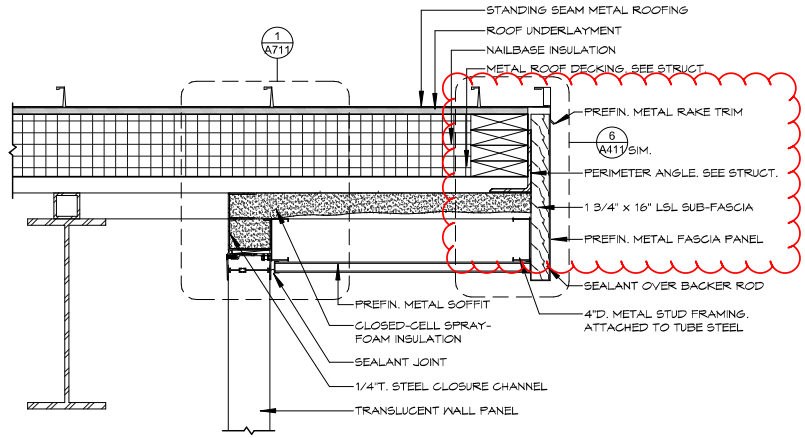
1 INSPECTIONS - OVERHANG DETAIL A

1" = 1'-0"



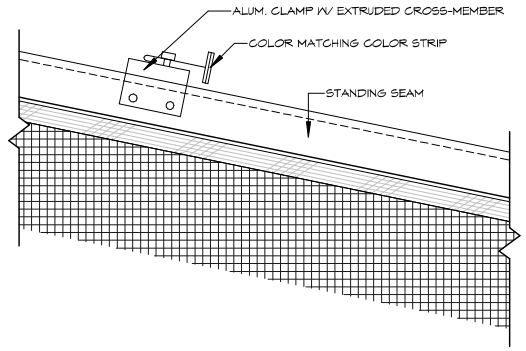
2 INSPECTIONS - OVERHANG DETAIL C

1" = 1'-0"



3 ROOF DETAILS

1" = 1'-0"



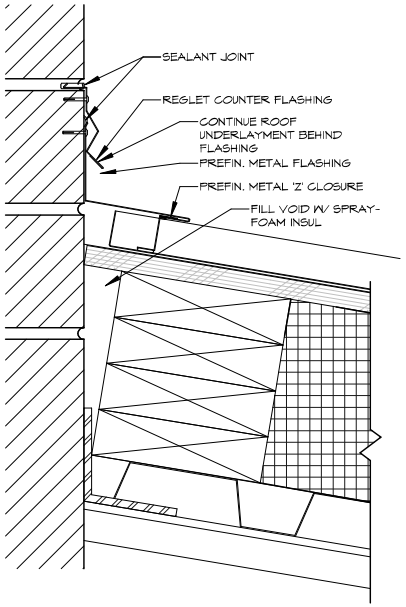
4 SNOW GUARD DETAIL

3" = 1'-0"

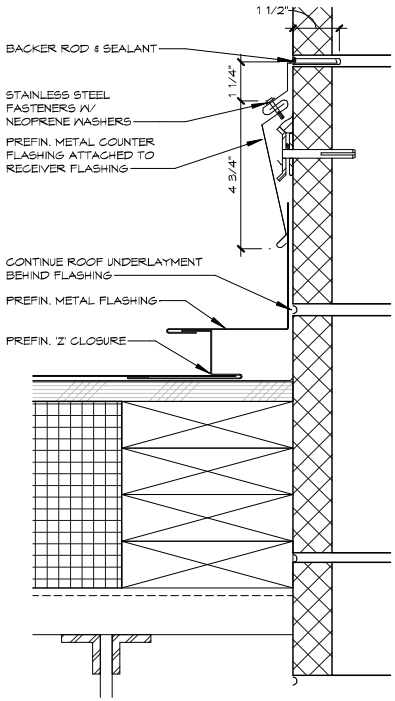
Addendum No. 01
ID 1020-01-80
Revised Sheet 198
August 2, 2022

PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			ROOF DETAILS – INSPECTIONS		DATE: 03/09/2022	FINAL	
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A410		198

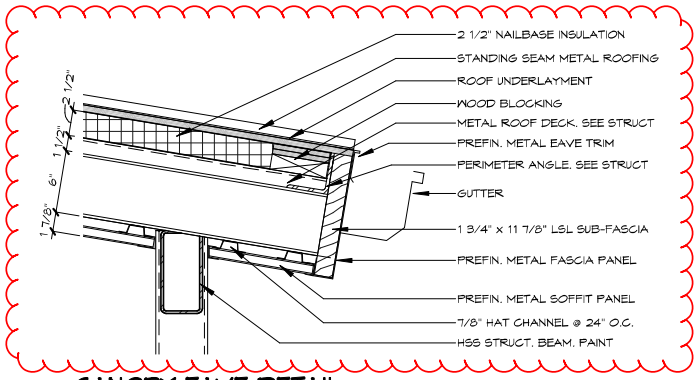
Addendum No. 01
ID 1020-01-80
Revised Sheet 200
August 2, 2022



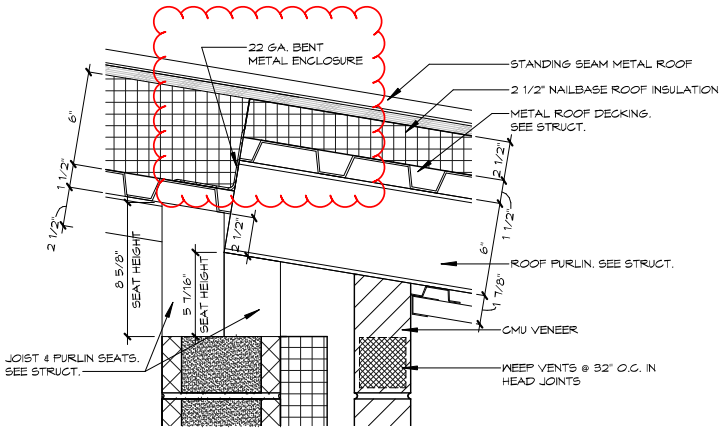
1 HIGH SIDE ROOF TRANSITION DETAIL
3" = 1'-0"



2 SIDEWALL ROOF TRANSITION DETAIL
3" = 1'-0"

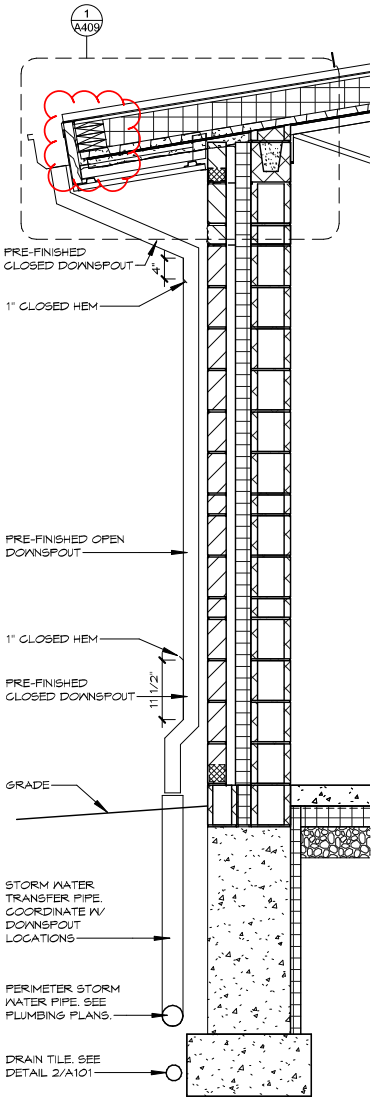


3 CANOPY EAVE DETAIL
1" = 1'-0"

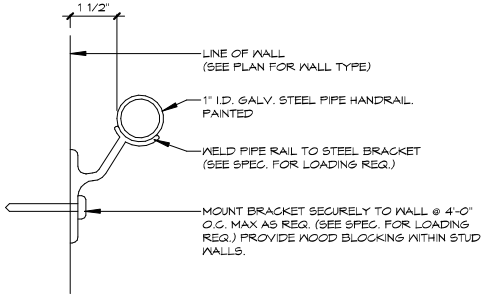


4 ROOF DETAIL AT ENTRY CANOPY
1 1/2" = 1'-0"

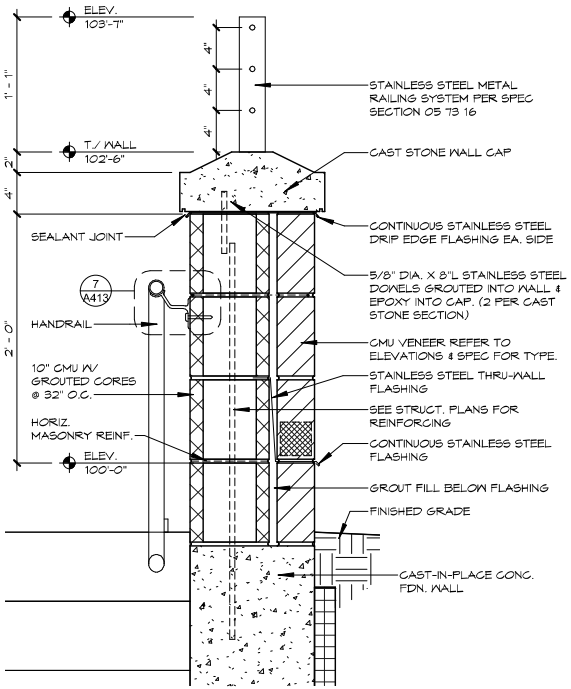
PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			ROOF DETAILS		DATE: 03/09/2022	FINAL
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A412	200



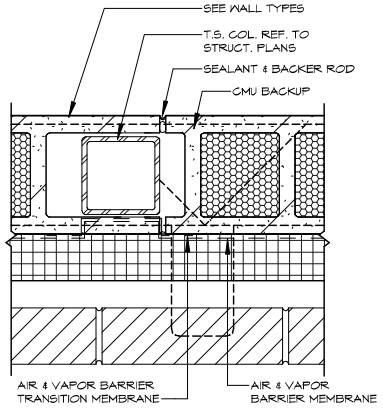
1 WALL SECTION AT DOWNSPOUT
1/2" = 1'-0"



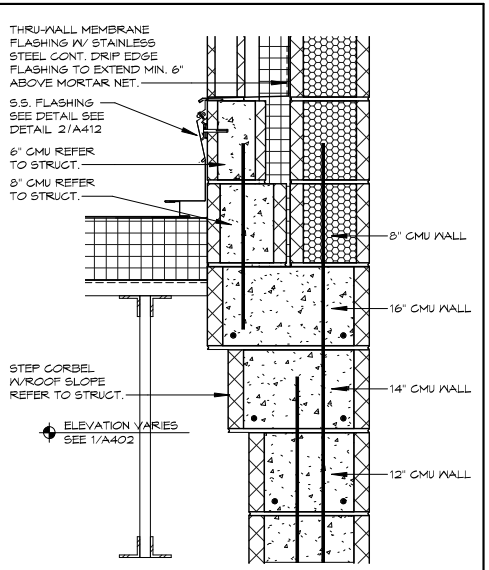
7 SURFACE MOUNTED PIPE RAILING ANCHOR
3" = 1'-0"



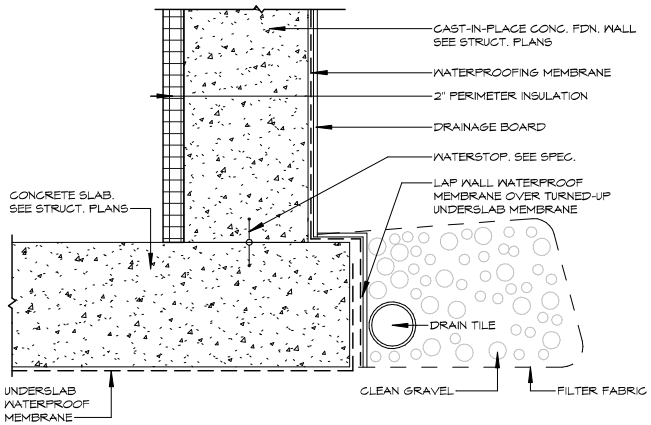
2 PARTIAL HIEGHT WALL SECTION W/CABLE
1" = 1'-0"



6 STEEL COLUMN AT CAVITY WALL
1 1/2" = 1'-0"



3 CMU WALL STEP DETAIL
1" = 1'-0"



5 FOUNDATION WATERPROOFING DRAIN TILE DETAIL
1" = 1'-0"

Addendum No. 01
ID 1020-01-80
Revised Sheet 201
August 2, 2022

PLANS PREPARED BY: VANTAGE ARCHITECTS, INC			DETAILS		DATE: 03/09/2022	FINAL
STATE PROJECT NUMBER: 1020-01-80	HWY: IH 94	COUNTY: ST CROIX	HUDSON SWEF NO. 61	SCALE:	SHEET NO: A413	201

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

August 4, 2022

NOTICE TO ALL CONTRACTORS:

Proposal #14: 1020-01-80, WISC 2022372
Hudson – Baldwin
IH 94 SWEF 61 Hudson
IH 94
St. Croix County

Letting of August 9, 2022

This is Addendum No. 02, which provides for the following:

Special Provisions:

Revised Special Provisions	
Article No.	Description
3	Prosecution and Progress
5	Traffic
55	SWEF Building, Heating and Ventilation, Item SPV.0060.102

Schedule of Items:

Revised Bid Item Quantities					
Bid Item	Item Description	Unit	Old Quantity	Revised Quantity	Proposal Total
460.2000	Incentive Density HMA Pavement	DOL	4,610	-680	3,930
460.6244	HMA Pavement 4 MT 58-34 S	Ton	3,510	-1,050	2,460

Added Bid Item Quantities					
Bid Item	Item Description	Unit	Old Quantity	Revised Quantity	Proposal Total
465.0105	Asphaltic Surface	Ton	0	1,050	1,050

Plan Sheets:

Revised Plan Sheets	
Plan Sheet	Plan Sheet Title (brief description of changes to sheet)
380	Traffic Control Stage 1
490	Miscellaneous Quantities

Other

ASP-5 has been revised and is added to this addendum.

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

PROJECT ID 1020-01-80

August 4, 2022

Special Provisions

3. Prosecution and Progress.

Replace section titled **Exit Ramp to Hudson SWEF** *with the following:*

Exit Ramp to Hudson SWEF

Construction traffic must utilize either the existing exit ramp taper or the proposed exit ramp taper from November 18, 2022 – March 17, 2023 to access the site from IH 94. The taper being utilized shall consist of pavement and shoulders through the gore area.

Replace section titled **Entrance Ramp to Hudson SWEF** *with the following:*

Entrance Ramp from Hudson SWEF

Construction traffic must utilize either the existing entrance ramp taper or the proposed entrance ramp taper from November 18, 2022 – March 17, 2023 to access IH 94 from the site. The taper being utilized shall consist of pavement and shoulders through the gore area.

5. Traffic.

Replace section titled Hudson SWEF site construction *with the following:*

Hudson SWEF site construction

Construction of the exit and entrance ramp tapers can be completed during off-peak traffic periods or when EB IH 94 traffic is shifted onto temporary pavement in the median.

55. SWEF Building, Heating and Ventilation, Item SPV.0060.102

Replace subsection titled **Installer:** *under section titled* **Section 23 09 23 – Direct Digital Control System for HVAC** *with the following:*

INSTALLER:
A firm specializing and experienced in DDC control system installation for no less than 3 years. All engineering and commissioning work shall be done by qualified employees of this manufacturer, or qualified employees of an Authorized Representative of that manufacturer that provides engineering and commissioning of the manufacturer's control equipment. Where installing contractor is an authorized representative of the control equipment manufacturer, submit written confirmation of such authorization. Indicate in letter of authorization that the installing contractor has successfully completed all necessary training required for the engineering, installation, and commissioning of equipment and systems to be provided for the project and that such authorization has been in effect for a period of not less than three years. The letter of authorization should also indicate that the installing contractor is authorized to install the manufacturer's DDC equipment at the project location at the time the project is bid. Installation of the equipment shall be done by qualified mechanics and/or electricians in the direct employ or be directly subcontracted and under the supervision of the manufacturer or Authorized Representative.

Delete the paragraph under SYSEM SOFTWARE FEATURES *under subsection titled* **SUPERVISORY CONTROLLERS** *under* **Section 23 09 23 – Direct Digital Control System for HVAC** *that reads as follows:*

> Supervisory controllers shall automatically accumulate and store runtime hours for binary input and output points specified in Section 23 09 14 of this specification.

Replace subsection titled **PROGAMMABLE CONTROLLERS** *under section titled* **Section 23 09 23 – Direct Digital Control System for HVAC** *with the following:*

> **PROGRAMMABLE CONTROLLERS**
> Programmable controllers shall be provided with a software program that shall allow the user to design flexible software algorithms for the control sequences as described in Section 23 09 93 portions of this specification.
> Programmable controllers shall support all necessary point inputs and outputs to perform the specified control sequence in a totally stand-alone fashion.
> Each programmable controller shall perform its own limit and status monitoring and analysis to maximize network performance by reducing unnecessary communications.
> Each programmable controller shall support the use of a locally mounted status and adjust panel interface to allow for the local adjustment of all setpoints, temporary override of any input or output points and status of all points directly at the controller. The capabilities of the locally mounted status and adjust panel shall include, but not be limited to, the following information for the programmable controllers to which:
>
> - Display temperatures
> - Display status
> - Display setpoints
> - Display control parameters
> - Override binary output control
> - Override analog output control
> - Override analog setpoints
> - Modification of gain and offset constants
>
> All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the programmable controller.
> Programmable controllers shall support, but not be limited to, the following configurations of systems to address current requirements as described in Sections 23 09 93 portions of this specification, and for future expansion of air handling units:
>
> - Mixed air handling units
> - 100 percent outside air handling units
> - Boiler or chiller plants with pump logic
> - Hot water heat exchangers
> - Cooling towers
> - Zone pressurization of labs
> - Smoke control systems
> - Generic system interlocking through hardware

Replace subsection titled **APPLICATION SPECIFIC CONTROLLER – HVAC APPLICATIONS** *under section titled* **Section 23 09 23 – Direct Digital Control System for HVAC** *with the following:*

APPLICATION SPECIFIC CONTROLLERS - HVAC APPLICATIONS

Each supervisory controller shall be able to extend its monitoring and control through the use of stand-alone application specific controllers (ASC's).

Each ASC shall operate as a stand-alone controller capable of performing its specified control responsibilities independently of other controllers in the network. Each ASC shall be a microprocessor based, multi-tasking, real-time digital control processor.

Each ASC shall have sufficient memory to support its own operating system and databases including:

- Control Processes
- Energy Management Applications
- Operator I/O (Portable Service Terminal)

The operator interface to any ASC point or program shall be through the supervisory controller connection to any ASC on the network.

ASC's shall directly support the temporary use of a portable service terminal that can be connected to the ASC via zone temperature or directly at the controller. The capabilities of the portable service terminal shall include, but not be limited to, the following information for the:

- Display temperatures
- Display status
- Display setpoints
- Display control parameters
- Override binary output control
- Override analog output control
- Override analog setpoints
- Modification of gain and offset constants

All system setpoints, proportional bands, control algorithms, and any other programmable parameters shall be stored such that a power failure of any duration does not necessitate reprogramming the ASC.

ASC’s shall support, but not be limited to, the following configurations of systems to address current requirements as described in Section 23 09 93 portions of this specification, and for future expansion of air handling units:

- Variable Air Volume Terminals
- Reheat Terminals
- Fan Coils
- Unit Ventilators
- Packaged Air Handling Units

All application specific controllers shall be fully programmable. Question and answer or template programming are not acceptable. Control sequences for terminal unit control that utilize devices wired directly to the terminal unit application controller shall be programmed in the application specific controller and shall be stand-alone in function, i.e., occupancy sensing, temperature setpoint setback, etc. Supervisory controllers shall not be involved in the control sequence logic unless it involves sharing data between or from individual terminal unit controllers to be utilized in a global sequence, i.e., trim and respond strategies, terminal unit grouping, etc.

Replace paragraph one under section titled **PART 3 – EXECUTION, GENERAL** *under section titled* **Section 23 09 23 – Direct Digital Control System for HVAC** *with the following:*

All electronic work required as an integral part of the Direct Digital Control system work is the responsibility of this section unless specifically indicated otherwise in this section or in Division 26.

Replace paragraph one under section titled **PART 3 – EXECUTION, INSTALLATION** *under section titled* **Section 23 09 23 – Direct Digital Control System for HVAC** *with the following:*

All work and materials are to conform in every detail to the rules and requirements of the National Electrical Code and present manufacturing standards. All material shall be UL approved.

Replace paragraph nine under section titled **PART 3 – EXECUTION, INSTALLATION** *under section titled* **Section 23 09 23 – Direct Digital Control System for HVAC** *with the following:*

Where a new system is required to be extended to an existing agency Building Automation Network (BAN) (typically connected via the agency Local Area Network (LAN) or Wide Area Network (WAN)), extension of the data-net between DDC Controllers and to the BAN to be by this contractor unless specified to be provided by the division 27 contractor.

Replace the last paragraph under section titled **SMOKE DAMPERS AND COMBINATION FIRE/SMOKE DAMPERS, INSTALLATION** *under section titled* **Section 23 33 00 – Air Duct Accessories** *with the following:*

Use airfoil shaped damper blades on the following system:

- Control dampers as specified as part of Specification Section 23 09 93.
- Smoke detectors **S**moke detectors are furnished and installed by the Electrical Contractor.

Schedule of Items
Attached, dated August 4, 2022, are the revised Schedule of Items Pages 3 and 19.

Plan Sheets
The following 8½ x 11-inch sheets are attached and made part of the plans for this proposal:
Revised: 356, 490

END OF ADDENDUM

ADDITIONAL SPECIAL PROVISIONS 5
FUEL COST ADJUSTMENT

A Description

Fuel Cost Adjustments will be applied to partial and final payments for work items categorized in Section B as a payment to the contractor or a credit to the department. ASP-5 shall not apply to any force account work.

B Categories of Work Items

The following items and Fuel Usage Factors shall be used to determine Fuel Cost Adjustments:

(1) Earthwork.		Unit	Gal. Fuel Per Unit
205.0100	Excavation Common	CY	0.23
205.0200	Excavation Rock	CY	0.39
205.0400	Excavation Marsh	CY	0.29
208.0100	Borrow	CY	0.23
208.1100	Select Borrow	CY	0.23
209.1100	Backfill Granular Grade 1	CY	0.23
209.1500	Backfill Granular Grade 1	Ton	0.115
209.2100	Backfill Granular Grade 2	CY	0.23
209.2500	Backfill Granular Grade 2	Ton	0.115
350.0102	Subbase	CY	0.28
350.0104	Subbase	Ton	0.14
350.0115	Subbase 6-Inch	SY	0.05
350.0120	Subbase 7-Inch	SY	0.05
350.0125	Subbase 8-Inch	SY	0.06
350.0130	Subbase 9-Inch	SY	0.07
350.0135	Subbase 10-Inch	SY	0.08
350.0140	Subbase 11-Inch	SY	0.09
350.0145	Subbase 12-Inch	SY	0.09

C Fuel Index

A Current Fuel Index (CFI) in dollars per gallon will be established by the Department of Transportation for each month. The CFI will be the price of No. 2 fuel oil, as reported in U.S. Oil Week, using the first issue dated that month. The CFI will be the average of prices quoted for Green Bay, Madison, Milwaukee and Minneapolis.

The base Fuel Index (BFI) for this contract is $3.90 per gallon.

D Computing the Fuel Cost Adjustment

The engineer will compute the ratio CFI/BFI each month. If the ratio falls between 0.85 and 1.15, inclusive, no fuel adjustment will be made for that month. If the ratio is less than 0.85 a credit to the department will be computed. If the ratio is greater than 1.15 additional payment to the contractor will be computed. Credit or additional payment will be computed as follows:

(1) The engineer will estimate the quantity of work done in that month under each of the contract items categorized in Section B.

(2) The engineer will compute the gallons of fuel used in that month for each of the contract items categorized in Section B by applying the unit fuel usage factors shown in Section B.

(3) The engineer will summarize the total gallons (Q) of fuel used in that month for the items categorized in Section B.

(4) The engineer will determine the Fuel Cost Adjustment credit or payment from the following formula:

$$FA = \left(\frac{CFI}{BFI} - 1\right) x\ Q\ x\ BFI$$

(plus is payment to contractor; minus is credit to the department)

Where	FA	=	Fuel Cost Adjustment (plus or minus)
	CFI	=	Current Fuel Index
	BFI	=	Base Fuel Index
	Q	=	Monthly total gallons of fuel

E Payment

A Fuel Cost Adjustment credit to the department will be deducted as a dollar amount each month from any sums due to the contractor. A Fuel Cost Adjustment payment to the contractor will be made as a dollar amount each month.

Upon completion of the work under the contract, any difference between the estimated quantities and the final quantities will be determined. An average CFI, calculated by averaging the CFI for all months that fuel cost adjustment was applied, will be applied to the quantity differences. The average CFI shall be applied in accordance with the procedure set forth in Section D.

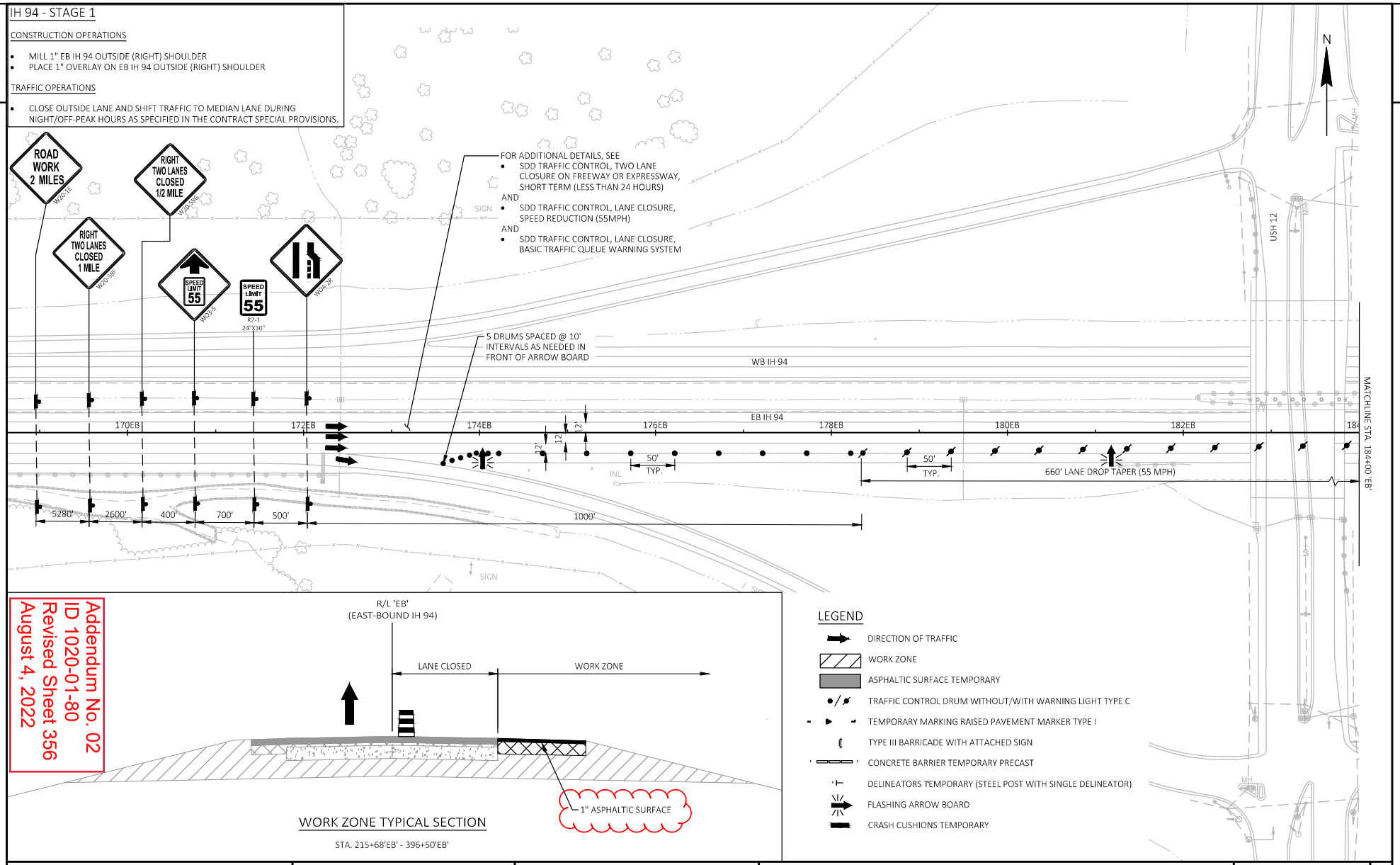
IH 94 - STAGE 1

CONSTRUCTION OPERATIONS

- MILL 1" EB IH 94 OUTSIDE (RIGHT) SHOULDER
- PLACE 1" OVERLAY ON EB IH 94 OUTSIDE (RIGHT) SHOULDER

TRAFFIC OPERATIONS

- CLOSE OUTSIDE LANE AND SHIFT TRAFFIC TO MEDIAN LANE DURING NIGHT/OFF-PEAK HOURS AS SPECIFIED IN THE CONTRACT SPECIAL PROVISIONS.



Addendum No. 02
ID 1020-01-80
Revised Sheet 356
August 4, 2022

WORK ZONE TYPICAL SECTION

STA. 215+68'EB' - 396+50'EB'

LEGEND

- DIRECTION OF TRAFFIC
- WORK ZONE
- ASPHALTIC SURFACE TEMPORARY
- TRAFFIC CONTROL DRUM WITHOUT/WITH WARNING LIGHT TYPE C
- TEMPORARY MARKING RAISED PAVEMENT MARKER TYPE I
- TYPE III BARRICADE WITH ATTACHED SIGN
- CONCRETE BARRIER TEMPORARY PRECAST
- DELINEATORS TEMPORARY (STEEL POST WITH SINGLE DELINEATOR)
- FLASHING ARROW BOARD
- CRASH CUSHIONS TEMPORARY

PROJECT NO: 1020-01-80	HWY: IH 94	COUNTY: ST. CROIX	TRAFFIC CONTROL - STAGE 1	SHEET 356	E

3

ROUT AND SEAL

PROJECT	CATEGORY	LOCATION	STATION - STATION	415.6000.S (LF)
1020-01-80				
	0010	RAMP	325+96 R - 361+50 R	5,553
		RAMP	361+50 R - 373+05 R	1,157
		RAMP	373+05 R - 395+69 R	3,380
PROJECT 1020-01-80 TOTAL				10,090

HMA ITEMS

PROJECT	CATEGORY	LOCATION	STATION - STATION	***450.4000 HMA COLD WEATHER PAVING (TON)	455.0605 TACK COAT (GAL)	460.6243 HMA PAVEMENT 3 MT 58-34S (TON)	460.6244 HMA PAVEMENT 4 MT 58-34S (TON)	465.0105 ASPHALTIC SURFACE (TON)	465.0315 ASPHALTIC FLUMES (SY)	465.0400 ASPHALTIC SHOULDER RUMBLE STRIPS (LF)
1020-01-80										
	0010	RAMP	325+96 R - 361+50 R	-	764	909	606	-	-	-
		RAMP	361+50 R - 373+05 R	-	68	81	55	-	-	-
		RAMP	373+05 R - 395+69 R	-	270	322	215	-	-	-
		PARKING LOT	2361+68 P - 2378+59 P	-	19	23	16	-	24	-
		LOOP	3362+50 L - 3380+45 L	-	454	541	361	-	58	-
		EMPLOYEE PARKING LOT	5373+10 E - 5374+89 E	-	164	190	128	-	-	-
		I-94 EB	246+53 EB - 282+75 EB	100	936	506	338	401	-	7,325
		I-94 EB	282+75 EB - 395+65 EB	160	1,755	1,109	740	648	-	9,680
PROJECT 1020-01-80 TOTAL				260	4,430	3,680	2,460	1,050	82	17,005

*** ADDITIONAL QUANTITY FOUND IN 'TRAFFIC CONTROL'

3

CONCRETE ITEMS

PROJECT	CATEGORY	LOCATION	STATION - STATION	405.0100 COLORING CONCRETE WISDOT RED (CY)	415.0100 CONCRETE PAVEMENT 10-INCH (SY)	415.0110 CONCRETE PAVEMENT 11-INCH (SY)	415.0125 CONCRETE PAVEMENT 12 1/2-INCH (SY)	SPV.0180.001 SCALE APPROACH PAVEMENT REINFORCEMENT (SY)
1020-01-80								
	0010	RAMP	325+96 R - 361+50 R	63	-	6,982	-	-
		RAMP	361+50 R - 373+05 R	244	-	4,354	-	-
		RAMP	373+05 R - 395+69 R	22	-	4,765	-	-
		SCALE	1354+25 S - 1380+44 S	-	-	269	-	270
		PARKING LOT	2361+68 P - 2378+59 P	-	13,370	-	-	-
		LOOP	3362+50 L - 3380+45 L	355	4,310	-	-	-
		I-94 EB	246+53 EB - 297+84 EB	-	-	-	1,550	-
PROJECT 1020-01-80 TOTAL				685	17,680	16,370	1,550	270

Addendum No. 02
ID 1020-01-80
Revised Sheet 490
August 4, 2022

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0060	205.0100 Excavation Common	302,466.000 CY	_____.____	_____.____
0062	208.0100 Borrow	33,355.000 CY	_____.____	_____.____
0064	213.0100 Finishing Roadway (project) 001. 1020-01-80	1.000 EACH	_____.____	_____.____
0066	305.0110 Base Aggregate Dense 3/4-Inch	2,680.000 TON	_____.____	_____.____
0068	305.0120 Base Aggregate Dense 1 1/4-Inch	58,480.000 TON	_____.____	_____.____
0070	312.0110 Select Crushed Material	515.000 TON	_____.____	_____.____
0072	405.0100 Coloring Concrete WisDOT Red	685.000 CY	_____.____	_____.____
0074	415.0100 Concrete Pavement 10-Inch	17,680.000 SY	_____.____	_____.____
0076	415.0110 Concrete Pavement 11-Inch	16,370.000 SY	_____.____	_____.____
0078	415.0125 Concrete Pavement 12 1/2-Inch	1,550.000 SY	_____.____	_____.____
0080	415.6000.S Rout and Seal	10,090.000 LF	_____.____	_____.____
0082	450.4000 HMA Cold Weather Paving	3,060.000 TON	_____.____	_____.____
0084	455.0605 Tack Coat	4,430.000 GAL	_____.____	_____.____
0086	460.2000 Incentive Density HMA Pavement	3,930.000 DOL	1.00000	3,930.00
0088	460.6243 HMA Pavement 3 MT 58-34 S	3,680.000 TON	_____.____	_____.____
0090	460.6244 HMA Pavement 4 MT 58-34 S	2,460.000 TON	_____.____	_____.____

Proposal ID: 20220809014 Project(s): 1020-01-80

Federal ID(s): WISC 2022372

SECTION: 0001 Contract Items

Alt Set ID: Alt Mbr ID:

Proposal Line Number	Item ID Description	Approximate Quantity and Units	Unit Price	Bid Amount
0538	SPV.0090 Special 005. Aluminum Landscaping Edging Material	190.000 LF	_____.____	_____.____
0540	SPV.0180 Special 001. Scale Approach Pavement Reinforcement	270.000 SY	_____.____	_____.____
0542	SPV.0180 Special 002. Weed Barrier Fabric	390.000 SY	_____.____	_____.____
0544	SPV.0195 Special 001. Base Aggregate Dense 3/4-Inch Washed	240.000 TON	_____.____	_____.____
0546	465.0105 Asphaltic Surface	1,050.000 TON	_____.____	_____.____
	Section: 0001		Total:	_____.____

Total Bid: _____.____