PROJECT MANUAL FOR
WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING
CITY OF MENOMONIE
DUNN COUNTY, WI

December 2025
Project #05323007.1



Prepared By:

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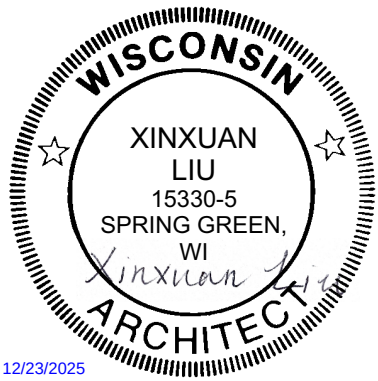
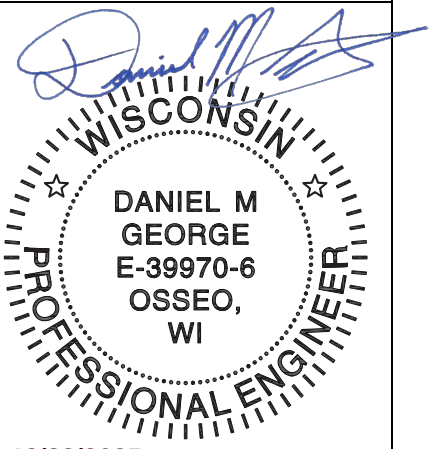
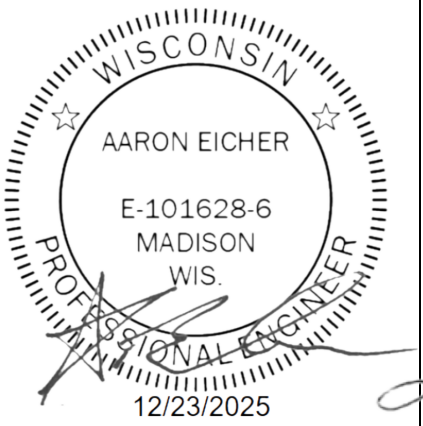
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WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING

CITY OF MENOMONIE, DUNN COUNTY, WI

Project #05323007.1

Seals Page

GENERAL/PROCESS ENGINEER: MSA Professional Services, Inc.	ARCHITECTURAL: MSA Professional Services, Inc.	STRUCTURAL: MSA Professional Services, Inc.
	 12/23/2025	 12/23/2025
PLUMBING/HVAC ENGINEER: MSA Professional Services, Inc.	ELECTRICAL/CONTROLS ENGINEER: MSA Professional Services, Inc.	SITE/CIVIL ENGINEER: MSA Professional Services, Inc.
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WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING
CITY OF MENOMONIE
DUNN COUNTY, WI

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ADVERTISEMENT FOR BIDS
CITY OF MENOMONIE, DUNN COUNTY, WI
WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING

General Notice

CITY OF MENOMONIE is requesting Bids for the construction of the following Project:

WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING
Project #05323007.105323007.1

The CITY OF MENOMONIE will receive and accept bids ONLY through QuestCDN.com via the online electronic bid service (Quest vBid) for the construction of WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING until January 21, 2026, at 2:00 p.m. All bids will be downloaded and publicly read aloud during a virtual public bid opening that will be held at the day and time of the bid closing. All plan holders will receive information via Quest on how to join the virtual meeting prior to the bid opening.

The Project includes the following Work:

Construction, test pumping, and sampling of an 18-inch diameter potable municipal sandstone well. Construction of 70-foot x 52-foot water treatment building with cast-in-place concrete foundation and floors, masonry walls, concrete plank ceiling and membrane roof; buried cast-in-place concrete detention tank; FRP and hollow metal doors and frames; louvers; plumbing; heating; ventilation; painting; interior and exterior lighting; electrical; process instrumentation and control; supervisory control and data acquisition (SCADA) system improvements; standby generator and automatic transfer switch; vertical turbine well pump, vertical turbine high lift pumps; process mechanical piping, valves, flowmeters, and appurtenances. Site work including 14-inch diameter water main and valves; 8-inch diameter sanitary sewer piping and associated manholes; two (2) 12,000-gallon nominal capacity buried precast concrete backwash detention tanks; site grading; concrete stoops and sidewalk; aggregate base course and asphalt pavement for driveway and parking areas; removal and reinstallation of existing chain link fence; erosion control; street restoration; and site restoration. All work shall be awarded under a single contract. Treatment equipment will be bid out in a separate bid package (Phase 2) after well construction has been completed.

The anticipated substantial completion date is August 2027, and final completion date is May 2028.

Obtaining the Bidding Documents

Information and Bidding Documents for the Project can be found at the following designated website: www.Quest cdn.com

Bidding Documents are available for download from Quest CDN at www.Quest cdn.com. You may download the digital plan documents for $45 by inputting Quest eBidDoc #9970263 on the website's Project Search page. Please contact QuestCDN at 952-233-1632 or contact by email at info@questcdn.com for assistance in free membership registration, downloading, and working with the digital project information. Prospective Bidders are urged to register with Quest CDN as a plan holder, even if Bidding Documents are obtained from a plan room or source other than the designated website in either electronic or paper format. Quest CDN requires the bidding documents to be downloaded from the site in order to submit a bid in the Vbid system. The designated website will be updated periodically with addenda, lists of registered plan holders, reports, and other information relevant to submitting a Bid for the Project. All official notifications, addenda, and other Bidding Documents will be offered only through Quest CDN. Neither Owner nor Engineer will be responsible for Bidding Documents, including addenda, if any, obtained from sources other than Quest CDN.

Instructions to Bidders.

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No proposal will be accepted unless accompanied by a certified check or bid bond equal to at least 5% of the amount bid, payable to the Owner as a guarantee that, if the bid is accepted, the bidder will execute and file the proper contract and bond within 15 days after the award of the contract. The certified check or bid bond will be returned to the bidder as soon as the contract is signed, and if after 15 days the bidder shall fail to do so, the certified check or bid bond shall be forfeited to the Owner as liquidated damages.

No bidder may withdraw their bid within 60 days after the actual date of the opening thereof.

The minimum wages to be paid on the project shall be in accordance with the wage rate scale established by Federal Davis Bacon Wage Rates. Federal wage rates can be found at https://sam.gov/content/wage-determinations. Be aware that project Administrators, Bidders, and Contractors are required to use the latest federal wage rate available at the time of bid opening.

This project anticipates use of Wisconsin DNR Safe Drinking Water Loan Program funding. We encourage Disadvantaged Business Enterprises (DBEs), including Minority-owned Business Enterprises (MBEs), Women's Business Enterprises (WBEs), and Small Businesses in Rural Areas (SBRAs) to submit bid proposals. A municipality, in awarding prime contracts, and primary contractor, in awarding subcontracts, are required to make a good faith effort to achieve a combined minimum goal of 15% participation for MBE/WBE utilization in accordance with s.NR 162.09(3), s.NR 166.12(4), and s.NR 167.18(4) Wis. Admin. Code. If a subcontractor awards subcontracts, these requirements shall apply to the subcontractor.

The Contractor shall conform to the "Use of American Iron and Steel" provision of H.R. 3547 Consolidated Appropriations Act, 2014, section 436, including all iron and steel products used in the project. Bid Proposals may be denied if the requirements of this section are not met and waivers are required. EPA guidance for the use of American Iron and Steel (AIS) can be found at http://water.epa.gov/grants_funding/aisrequirement.cfm.

Owner reserves the right to waive any informalities or to reject any or all bids.

Published by the authority of the CITY OF MENOMONIE.

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INSTRUCTIONS TO BIDDERS

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INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below:

A. Issuing Office - The office from which the Bidding Documents are to be issued and where the bidding procedures are to be administered.

ARTICLE 2 - BIDDING DOCUMENTS

2.01 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Agreement for a list of the Contract Documents. It is Bidder's responsibility to determine that it is using a complete set of documents in the preparation of a Bid. Bidder assumes sole responsibility for errors or misinterpretations resulting from the use of incomplete documents, by Bidder itself or by its prospective Subcontractors and Suppliers.

2.02 Bidding Documents are made available for the sole purpose of obtaining Bids for completion of the Project and permission to download or distribution of the Bidding Documents does not confer a license or grant permission or authorization for any other use. Authorization to download documents, or other distribution, includes the right for plan holders to print documents solely for their use, and the use of their prospective Subcontractors and Suppliers, provided the plan holder pays all costs associated with printing or reproduction. Printed documents may not be re-sold under any circumstances.

2.03 Owner has established a Bidding Documents Website as indicated in the Advertisement or invitation to bid. Owner recommends that Bidder register as a plan holder with the Issuing Office at such website, and obtain a complete set of the Bidding Documents from such website. Bidders may rely that sets of Bidding Documents obtained from the Bidding Documents Website are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.04 Plan rooms (including construction information subscription services, and electronic and virtual plan rooms) may distribute the Bidding Documents, or make them available for examination. Those prospective bidders that obtain an electronic (digital) copy of the Bidding Documents from a plan room are encouraged to register as plan holders from the Bidding Documents Website or Issuing Office. Owner is not responsible for omissions in Bidding Documents or other documents obtained from plan rooms, or for a Bidder's failure to obtain Addenda from a plan room.

2.05 Electronic Documents

A. When the Bidding Requirements indicate that electronic (digital) copies of the Bidding Documents are available, such documents will be made available to the Bidders as Electronic Documents in the manner specified.

1. Bidding Documents will be provided in Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader Version 2017 Standard/Pro or later. It is the intent of the Engineer and Owner that such Electronic Documents are to be exactly representative of the paper copies of the documents. However, because the Owner and Engineer cannot totally control the transmission and receipt of Electronic Documents nor the Contractor's means of reproduction of such documents, the Owner and Engineer

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cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

B. Unless otherwise stated in the Bidding Documents, the Bidder may use and rely upon complete sets of Electronic Documents of the Bidding Documents, described in Paragraph 2.06.A above. However, Bidder assumes all risks associated with differences arising from transmission/receipt of Electronic Documents versions of Bidding Documents and reproductions prepared from those versions and, further, assumes all risks, costs, and responsibility associated with use of the Electronic Documents versions to derive information that is not explicitly contained in printed paper versions of the documents, and for Bidder's reliance upon such derived information.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit with its Bid (a) written evidence establishing its qualifications such as financial data, previous experience, and present commitments, and (b) the following additional information:

A. Evidence of Bidder's authority to do business in the state where the Project is located.

B. Bidder's state or other contractor license number, if applicable.

C. Subcontractor and Supplier qualification information; coordinate with provisions of Article 12 of these Instructions, "Subcontractors, Suppliers, and Others."

D. No contractor or subcontractor may work on this project who is currently debarred either Federally or in the State of Wisconsin.

3.02 A Bidder's failure to submit required qualification information within the times indicated may disqualify Bidder from receiving an award of the Contract.

3.03 No requirement in this Article 3 to submit information will prejudice the right of Owner to seek additional pertinent information regarding Bidder's qualifications.

ARTICLE 4 - PRE-BID CONFERENCE

4.01 A pre-bid conference will not be conducted for this Project.

ARTICLE 5 - SITE AND OTHER AREAS; EXISTING SITE CONDITIONS; EXAMINATION OF SITE, OWNER'S SAFETY PROGRAM; OTHER WORK AT THE SITE

5.01 Site and Other Areas

A. The Site is identified in the Bidding Documents. By definition, the Site includes rights-of-way, easements, and other lands furnished by Owner for the use of the Contractor. Any additional lands required for temporary construction facilities, construction equipment, or storage of materials and equipment, and any access needed for such additional lands, are to be obtained and paid for by Contractor.

5.02 Existing Site Conditions

A. Subsurface and Physical Conditions; Hazardous Environmental Conditions.

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1. The Supplementary Conditions identify the following regarding existing conditions at or adjacent to the Site:

   Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data.

   Those drawings known to Owner of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data.

   Reports and drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site.

   Technical Data contained in such reports and drawings.

2. Owner will make copies of reports and drawings referenced above available to any Bidder on request. These reports and drawings are not part of the Contract Documents, but the Technical Data contained therein upon whose accuracy Bidder is entitled to rely, as provided in the General Conditions, has been identified and established in the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any Technical Data or any other data, interpretations, opinions, or information contained in such reports or shown or indicated in such drawings.

3. If the Supplementary Conditions do not identify Technical Data, the default definition of Technical Data set forth in Article 1 of the General Conditions will apply.

B. Underground Facilities: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05 of the General Conditions, and not in the drawings referred to in Paragraph 5.02.A of these Instructions to Bidders. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

5.03 Other Site-related Documents

A. No other Site-related documents are available.

5.04 Site Visit and Testing by Bidders

A. Bidder is required to visit the Site and conduct a thorough visual examination of the Site and adjacent areas. During the visit the Bidder must not disturb any ongoing operations at the Site.

B. Bidders visiting the Site are required to arrange their own transportation to the Site.

C. Bidder is not required to conduct any subsurface testing, or exhaustive investigations of Site conditions.

D. On request, and to the extent Owner has control over the Site, and schedule permitting, the Owner will provide Bidder general access to the Site to conduct such additional examinations, investigations, explorations, tests, and studies as Bidder deems necessary for preparing and submitting a successful Bid. Owner will not have any obligation to grant such access if doing so is not practical because of existing operations, security or safety concerns, or restraints on

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Owner's authority regarding the Site. Bidder is responsible for establishing access needed to reach specific selected test sites.

E. Bidder must comply with all applicable Laws and Regulations regarding excavation and location of utilities, obtain all permits, and comply with all terms and conditions established by Owner or by property owners or other entities controlling the Site with respect to schedule, access, existing operations, security, liability insurance, and applicable safety programs.

F. Bidder must fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.

5.05 Owner's Safety Program

A. Site visits and work at the Site may be governed by an Owner safety program. As the General Conditions indicate, if an Owner safety program exists, it will be noted in the Supplementary Conditions.

5.06 Other Work at the Site

A. Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other work of which Owner is aware (if any) that is to be performed at the Site by Owner or others (such as utilities and other prime contractors) and relates to the Work contemplated by these Bidding Documents. If Owner is party to a written contract for such other work, then on request, Owner will provide to each Bidder access to examine such contracts (other than portions thereof related to price and other confidential matters), if any.

ARTICLE 6 - BIDDER'S REPRESENTATIONS

6.01 Express Representations and Certifications in Bid Form, Agreement

A. The Bid Form that each Bidder will submit contains express representations regarding the Bidder's examination of Project documentation, Site visit, and preparation of the Bid, and certifications regarding lack of collusion or fraud in connection with the Bid. Bidder should review these representations and certifications, and assure that Bidder can make the representations and certifications in good faith, before executing and submitting its Bid.

B. If Bidder is awarded the Contract, Bidder (as Contractor) will make similar express representations and certifications when it executes the Agreement.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 Owner on its own initiative may issue Addenda to clarify, correct, supplement, or change the Bidding Documents.

7.02 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information and submittal procedures for such questions are as follows:

A. Brad Stuczynski, PE, (608) 355-8964 | bstuczynski@msa-ps.com

7.03 Interpretations or clarifications considered necessary by Engineer in response to such questions will be issued by Addenda delivered to all registered plan holders. Questions received less than seven days prior to the date for opening of Bids may not be answered.

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7.04 Only responses set forth in an Addendum will be binding. Oral and other interpretations or clarifications will be without legal effect. Responses to questions are not part of the Contract Documents unless set forth in an Addendum that expressly modifies or supplements the Contract Documents.

ARTICLE 8 - BID SECURITY

8.01 A Bid must be accompanied by Bid security made payable to Owner in an amount of 5% or 10% of Bidder's maximum Bid price and in the form of a certified check, or an electronic Bid Bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions.

8.02 The Bid security of the apparent Successful Bidder will be retained until Owner awards the contract to such Bidder, and such Bidder has executed the Contract Documents, furnished the required contract security, and met the other conditions of the Notice of Award, whereupon the Bid security will be released. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within 15 days after the Notice of Award, Owner may consider Bidder to be in default, annul the Notice of Award, and the Bid security of that Bidder will be forfeited. Such forfeiture shall be Owner's exclusive remedy if Bidder defaults.

8.03 The Bid security of other Bidders that Owner believes to have a reasonable chance of receiving the award may be retained by Owner until the earlier of 7 days after the Effective Date of the Agreement or 61 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

8.04 Bid security of other Bidders whom Owner believes do not have a reasonable chance of receiving the award will be released within 7 days after the Bid opening.

ARTICLE 9 - CONTRACT TIMES

9.01 The number of days within which, or the dates by which, the Work is to be (a) substantially completed and (b) ready for final payment, and (c) Milestones (if any) are to be achieved, are set forth in the Agreement.

9.02 Provisions for liquidated damages, if any, for failure to timely attain a Milestone, Substantial Completion, or completion of the Work in readiness for final payment, are set forth in the Agreement.

ARTICLE 10 - SUBSTITUTE AND "OR-EQUAL" ITEMS

10.01 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration during the bidding and Contract award process of possible substitute or "or-equal" items. In cases in which the Contract allows the Contractor to request that Engineer authorize the use of a substitute or "or-equal" item of material or equipment, application for such acceptance may not be made to and will not be considered by Engineer until after the Effective Date of the Contract.

10.02 All prices that Bidder sets forth in its Bid shall be based on the presumption that the Contractor will furnish the materials and equipment specified or described in the Bidding Documents, as supplemented by Addenda. Any assumptions regarding the possibility of post-Bid approvals of "or-equal" or substitution requests are made at Bidder's sole risk.

ARTICLE 11 - SUBCONTRACTORS, SUPPLIERS AND OTHERS

11.01 A Bidder shall be prepared to retain specific Subcontractors, Suppliers, or other individuals or entities for the performance of the Work if required by the Bidding Documents (most commonly in the Specifications)

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to do so. If a prospective Bidder objects to retaining any such Subcontractor, Supplier, or other individual or entity, and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.02 The apparent Successful Bidder, and any other Bidder so requested, must submit to Owner a list of the Subcontractors or Suppliers proposed for the following portions of the Work within 24-hours after Bid opening.

11.03 If requested by Owner, such list shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, or other individual or entity. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder shall submit a substitute, Bidder's Bid price will be increased *(or decreased)* by the difference in cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

11.04 If apparent Successful Bidder declines to make any such substitution, Owner may award the Contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, or other individuals or entities. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual, or entity so listed and against which Owner or Engineer makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to Owner and Engineer subject to subsequent revocation of such acceptance as provided in Paragraph 7.06 of the General Conditions.

ARTICLE 12 - PREPARATION OF FORM

12.01 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid form shall be completed and submitted via QUEST vBID.

12.02 Bidder shall complete and submit required attachments as listed in the Bid Form.

12.03 A Bid by a corporation shall be executed in the corporate name by a corporate officer (whose title must appear under the signature), accompanied by evidence of authority to sign. The corporate address and state of incorporation shall be shown.

12.04 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature), accompanied by evidence of authority to sign. The official address of the partnership must be shown.

12.05 A Bid by a limited liability company shall be executed in the name of the firm by a member or other authorized person and accompanied by evidence of authority to sign. The state of formation of the firm and the official address of the firm shall be shown.

12.06 A Bid by an individual shall show the Bidder's name and official address.

12.07 A Bid by a joint venture shall be executed by an authorized representative of each joint venturer in the manner indicated on the Bid Form. The joint venture must have been formally established prior to submittal of a Bid, and the official address of the joint venture shall be shown.

12.08 All names shall be printed in ink below the signatures.

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12.09 The Bid shall contain an acknowledgment of receipt of all Addenda, the numbers and dates of which shall be filled in on the Bid Form.

12.10 Postal and e-mail addresses and telephone number for communications regarding the Bid shall be shown.

12.11 The Bid must contain evidence of Bidder's authority to do business in the state where the Project is located, or Bidder must certify in writing that it will obtain such authority within the time for acceptance of Bids and attach such certification to the Bid.

12.12 If Bidder is required to be licensed to submit a Bid or perform the Work in the state where the Project is located, the Bid must contain evidence of Bidder's licensure, or Bidder must certify in writing that it will obtain such licensure within the time for acceptance of Bids and attach such certification to the Bid. Bidder's state contractor license number, if any, must also be shown on the Bid Form.

ARTICLE 13 - BASIS OF BID

13.01 Unit Price

A. Bidders shall submit a Bid on a unit price basis for each item of Work listed in the unit price section of the Bid Form.

B. The "Bid Price" (sometimes referred to as the extended price) for each unit price Bid item will be the product of the "Estimated Quantity" (which Owner or its representative has set forth in the Bid Form) for the item and the corresponding "Bid Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of these "Bid Prices"; such total will be used by Owner for Bid comparison purposes. The final quantities and Contract Price will be determined in accordance with Paragraph 13.03 of the General Conditions.

C. Discrepancies between the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

13.02 Allowances

A. For cash allowances the Bid price shall include such amounts as the Bidder deems proper for Contractor's overhead, costs, profit, and other expenses on account of cash allowances, if any, named in the Contract Documents, in accordance with Paragraph 13.02.B of the General Conditions.

ARTICLE 14 - SUBMITTAL OF BID

14.01 A Bid shall be submitted no later than the date and time prescribed and at the place indicated in the Advertisement for Bid or Invitation to Bid, and shall be accompanied by the Bid security and other required documents. Bids will ONLY be received and accepted via the online electronic bid service through Quest CDN (www.QuestCDN.com). To access the electronic bid form, download the project documents and click the online bidding button at the top of the advertisement. If you need further assistance, please feel free to contact Quest CDN at (952) 233-1632.

14.02 Bids received after the date and time prescribed for the opening of bids, or not submitted at the correct location or in the designated manner, will not be accepted and will be returned to the Bidder unopened.

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ARTICLE 15 - MODIFICATION AND WITHDRAWAL OF BID

15.01 A Bid may be withdrawn by an appropriate document duly executed in the same manner that a Bid must be executed and delivered to the place where Bids are to be submitted prior to the date and time for the opening of Bids. Upon receipt of such notice, the unopened Bid will be returned to the Bidder.

15.02 If a Bidder wishes to modify its Bid prior to Bid opening, Bidder must withdraw its initial Bid in the manner specified in Paragraph 15.01 and submit a new Bid prior to the date and time for the opening of Bids.

15.03 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with Owner and promptly thereafter demonstrates to the reasonable satisfaction of Owner that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 16 - OPENING OF BIDS

16.01 Bids will be opened at the time and place indicated in the Advertisement or Invitation to Bid and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

ARTICLE 17 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

17.01 All Bids will remain subject to acceptance for the period of time stated in the Bid form, but Owner may, in its sole discretion, release any Bid and return the Bid security prior to the end of this period.

ARTICLE 18 - EVALUATION OF BIDS AND AWARD OF CONTRACT

18.01 Owner reserves the right to reject any or all Bids, including without limitation, nonconforming, nonresponsive, unbalanced, or conditional Bids. Owner also reserves the right to waive all minor Bid informalities not involving price, time, or changes in the Work.

18.02 Owner will reject the Bid of any Bidder that Owner finds, after reasonable inquiry and evaluation, to not be responsible.

18.03 If Bidder purports to add terms or conditions to its Bid, takes exception to any provision of the Bidding Documents, or attempts to alter the contents of the Contract Documents for purposes of the Bid, then the Owner will reject the Bid as nonresponsive.

18.04 If Owner awards the contract for the Work, such award shall be to the responsible Bidder submitting the lowest responsive Bid which Owner determines to be in the best interest of the project.

18.05 Evaluation of Bids

A. In evaluating Bids, Owner will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices, and other data, as may be requested in the Bid Form or prior to the Notice of Award.

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B. The Bid contains bid alternates. The alternate bids will be used to shape the project to fit the budget. The Owner reserves to right to award the Contract on the base bid and any combination of the bid alternates

C. For the determination of the apparent low Bidder when unit price bids are submitted, Bids will be compared on the basis of the total of the products of the estimated quantity of each item and unit price Bid for that item, together with any lump sum items.

18.06 In evaluating whether a Bidder is responsible, Owner will consider the qualifications of the Bidder and may consider the qualifications and experience of Subcontractors and Suppliers proposed for those portions of the Work for which the identity of Subcontractors and Suppliers must be submitted as provided in the Bidding Documents.

18.07 Owner may conduct such investigations as Owner deems necessary to establish the responsibility, qualifications, and financial ability of Bidders and any proposed Subcontractors or Suppliers.

ARTICLE 19 - BONDS AND INSURANCE

19.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth Owner's requirements as to performance and payment bonds and insurance. When the Successful Bidder delivers the Agreement (executed by Successful Bidder) to Owner, it shall be accompanied by required bonds and insurance documentation.

19.02 Article 8, Bid Security, of these Instructions, addresses any requirements for providing bid bonds as part of the bidding process.

ARTICLE 20 - SIGNING OF AGREEMENT

20.01 When Owner issues a Notice of Award to the Successful Bidder, it shall be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 15 days thereafter, Successful Bidder shall execute and deliver the required number of counterparts of the Agreement (and any bonds and insurance documentation required to be delivered by the Contract Documents) to Owner. Within ten days thereafter, Owner shall deliver one fully executed counterpart of the Agreement to Successful Bidder, together with printed and electronic copies of the Contract Documents as stated in Paragraph 2.02 of the General Conditions.

ARTICLE 21 - SALES AND USE TAXES

21.01 Owner represents that it is a qualifying exempt entity under Section 77.54(9m), Wis. Stats. (as created by 2015 Wis. Act 126) with respect to exemption from Wisconsin sales and use tax of certain items that become part of eligible facilities owned by the qualifying exempt entity. The Bid shall account for such sales and use tax exemptions, to the extent applicable. The Contract will provide that the Contractor is not entitled to an increase in Contract Price if Contractor is not successful in obtaining an anticipated sales and use tax exemption, unless the reason for the inability to obtain the anticipated exemption is a formal determination by the State of Wisconsin that Owner is not a qualifying exempt entity.

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AVAILABLE PROJECT INFORMATION

1 – Geotechnical Report

2 – City Minimum Contractor Safety Rules

3 – City of Menomonie Building Permit

4 – Special Inspections Form

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Chosen Valley Testing

Design Phase Geotechnical Evaluation:

Proposed Water Treatment Plant
Southwest Quadrant of 21st Ave. N. E. and John Russell Road
Menomonie, Minnesota

Prepared for:

David Schofield, Director of Public Works
City of Menomonie

c/o Mr. Erik Evenson
MSA Professional Services

July 21, 2025
CVT Project: 25712.25.WIL

WISCONSIN COLBY T. VERGEGAN E-36326 CHATFIELD, MN PROFESSIONAL ENGINEER	I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly registered engineer under the laws of the State of Wisconsin. Colby T. Verdegan, PE Geotechnical Engineer Registration Number 36326 Date: July 21, 2025

Chosen Valley Testing, Inc.

Geotechnical Engineering and Testing • 414 37th Ave N., St. Cloud, MN 56303 • Telephone (320) 774-3500• Fax (320) 774-3554

Mr. David Schofield
City of Menomonie

June 21, 2025

c/o Mr. Erik Evenson
MSA Professional Services
1230 South Boulevard
Baraboo, WI 53913
Phone: 715-304-0311
Email: eevenson@MSA-PS.com

Re: Design Phase Geotechnical Evaluation
Well #9 / Water Treatment Plant
Southwest Quadrant of 21st Ave. N.E. and John Russel Road
Menomonie, Wisconsin
CVT Project Number: 25712.25.WIL

Dear Mr. Schofield,

As authorized, we have completed the attached geotechnical evaluation report for the water treatment plan for the City of Menomonie, Wisconsin.. This letter briefly summarizes the findings in the attached report.

Summary of Boring Results

At the surface, the borings met about 2 feet of topsoil.

Following the topsoil, the borings met fill and possible fill to depths of about 4 to 6 ½ feet. The fill and possible fill were mostly dark brown granular soils ranging from rather clean poorly graded sands to silty to clayey sands and along with lesser amounts of clays. The fill in the western water treatment boring was underlain by a buried topsoil layer.

The soils beneath the topsoil, fill and possible fill consisted of rather clean glacial sands to depths of about 4 to 15 feet. The utility borings immediately north of the planned backwash tank area (Borings B-5 and B-6) terminated in the glacial sands.

The remaining borings penetrated past the glacial sands into medium dense to dense sand or silty sand, which appeared to residual sandstone (sandstone that had weathered to the consistency of soil). The borings then encountered harder, weathered sandstone at depth of about 11 ½ to 16 ½ feet before terminating in the weathered sandstone at depths of about 15 to 20 feet.

Summary of Analysis and Recommendations

The topsoil and fill are not suitable for foundation support should be removed from below the water treatment building and backwash tanks and replaced as needed with engineered fill. At the locations explored up to 2 feet of topsoil removal would be expected and fill or possible fill depths were up to 6 ½ feet. For planning purposes, we recommend assuming the possible fill must be removed, subject to closer review during

construction. The deepest fill met in the area of the tanks would be removed as a consequence of excavating down to tank foundation elevation.

Excavation for the backwash tanks are expected to terminate in or close the residual sandstone but appeared to be above the harder weathered sandstone. Groundwater was met above the apparent planned depths for the tanks, suggesting dewatering will likely be required if installed at the understood depths.

After grading, the bearing soils for the structure are expected to consist of natural sand and sandstone or shallow depths of engineered sand fill over those materials. Based on the assumed loads and proper implementation of our recommendations, we are of the opinion that a design bearing pressure of 4,000 psf may be used to design foundations for all of the structures. Settlements at these loads are expected to be about ½ inch or less.

Remarks

We appreciate the opportunity to serve you. We refer you to the attached report for more details of our findings, analyses and recommendations. If you have any questions about our report, please feel free to contact us at (651) 756-7384.

Sincerely,
Chosen Valley Testing, Inc.



Hannah Fischer
Graduate Engineer



Colby T. Verdegan, PE
Sr. Geotechnical/Materials Engineer

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BORING LOCATION SKETCH
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LEGEND TO SOIL DESCRIPTION

Design Phase Geotechnical Evaluation
Proposed Water Treatment Plant
Southwest Quadrant of 21st Ave. N. E. and John Russell Road
Menomonie, Wisconsin

CVT Project Number: 25712.25.WIL
Date: July 20, 2025

A. Introduction

The intent of this report is to present our findings to the client in the same logical sequence that led us to arrive at the opinions and recommendations expressed. Since our services often must be completed before the design is finished, assumptions are often needed to prepare a proper scope and to analyze the data. A complete and thorough review of the entire document, including its assumptions and its appendices, should be undertaken immediately upon receipt.

A.1. Purpose

This geotechnical report was prepared to aid in the design and construction of the proposed water treatment facility in Menomonie, Wisconsin. Our services were authorized by Mr. David Schofield of the City of Menomonie. MSA Professional Services is the project design consultant.

A.2. Scope

To obtain data for analysis, a total of eight (8) penetration test borings were drilled to depths of 15 to about 20 feet, where auger refusal was met in several of the borings. Our engineering scope consisted of providing this geotechnical report summarizing our procedures, findings and geotechnical recommendations for the proposed improvements.

A.3. Boring Locations and Elevations

The boring locations were indicated to Chosen Valley Testing based on a boring location map from MSA. The Boring Location Sketch in the Appendix shows the approximate boring locations as drilled and was made by superposing GPS coordinates for the borings and the plan provided onto a satellite view of the project area using Google Earth software.

Ground surface elevations at the borings were estimated from topographic contours using the Beacon Street program on the Dunn County website and should be considered approximate.

A.4. Geologic Background

A geotechnical report is based on subsurface data collected for the specific structure or problem. Available geologic data from the region can help interpretation of the data and is briefly summarized in this section.

Geologic maps suggest that the natural soils in the area consist primarily of sandy outwash. Sandstone bedrock was indicated to have been present at a depth of 32 feet when installing the nearby well.

B. Subsurface Data

Procedures: The borings were performed using penetration test procedures (Method of Test D1586 of the American Society for Testing and Materials). This procedure allows for the extraction of intact soil specimens from deep in the ground. With this method, a hollow-stem auger is drilled to the desired sampling depth. A 2-inch OD sampling tube is then screwed onto the end of a sampling rod, inserted through the hole in the auger's tip, and then driven into the soil with a 140-pound hammer dropped repeatedly from a height of 30 inches above the sampling rod. The sampler is driven 18 inches into the soil unless the material is too hard. The samples are generally taken at 2½ to 5-foot intervals. The core of soil obtained was classified and logged by the driller on site and a representative portion was then sealed and delivered to the geotechnical engineer for further review.

B.1. Stratification

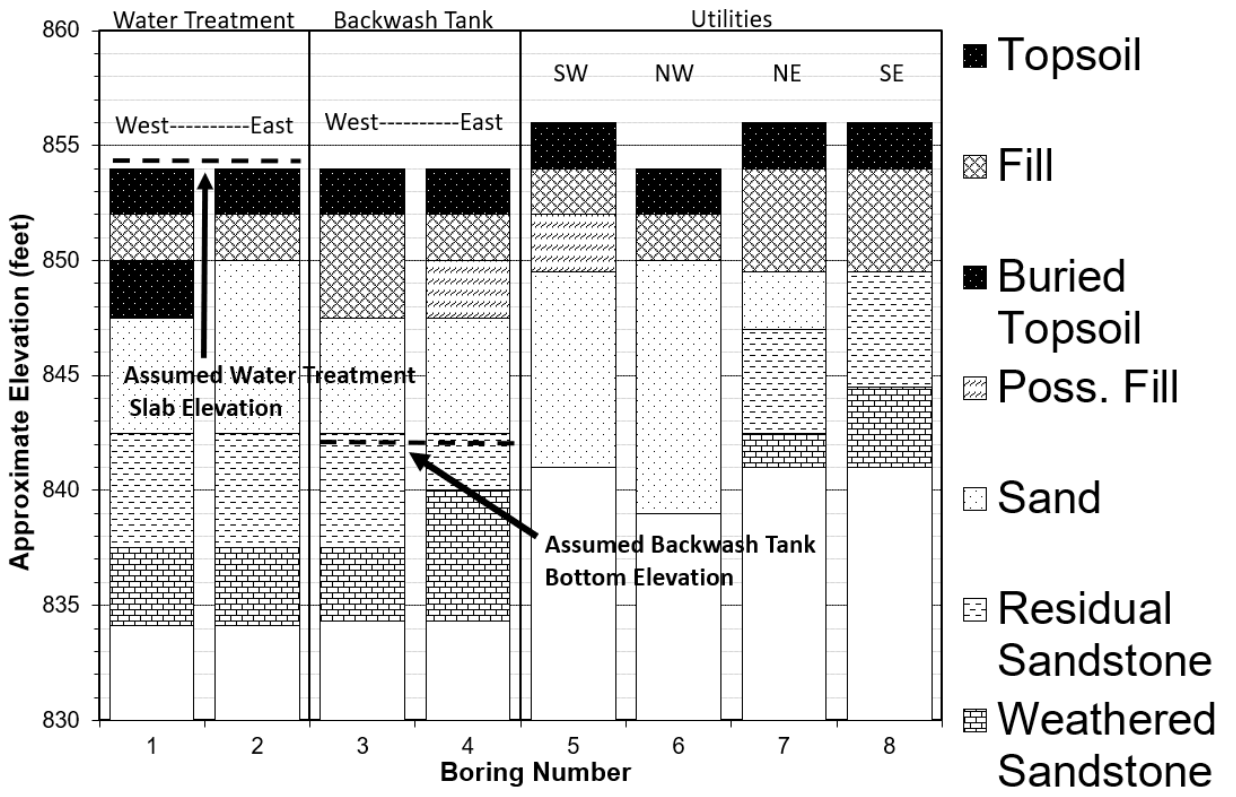
At the surface, the borings met about 2 feet of topsoil.

Following the topsoil, the borings met fill and possible fill to depths of about 4 to 6 ½ feet. The fill and possible fill were mostly dark brown granular soils ranging from rather clean poorly graded sands to silty to clayey sands and along with lesser amounts of clays. The fill in the western water treatment boring was underlain by a buried topsoil layer.

The soils beneath the topsoil, fill and possible fill consisted of rather clean glacial sands to depths of about 4 to 15 feet. The utility borings immediately north of the planned backwash tank area (Borings B-5 and B-6) terminated in the glacial sands.

The remaining borings penetrated past the glacial sands into medium dense to dense sand or silty sand, which appeared to residual sandstone (sandstone that had weathered to the consistency of soil). The borings then encountered harder, weathered sandstone at depth of about 11 ½ to 16 ½ feet before terminating in the weathered sandstone at depths of about 15 to 20 feet.

The boring data has been summarized in the cross-section following this paragraph. The understood elevations of the slabs for the water treatment plans and the approximate bottom elevation for the backwash tanks are included as an aid to later discussion. Please refer to the individual Log of Boring sheets in the Appendix for more detailed information.



B.2. Penetration Test and Laboratory Test Results

The number of blows needed for the hammer to advance the penetration test sampler is an indicator of soil characteristics. The results tend to be more meaningful for natural mineral soils than for fill soils. In fill soils, compaction tests are more meaningful.

Penetration resistance values (N-values) ranging from 6 to 20 Blows per Foot (BPF) were recorded in the fill, possible fill, and buried topsoil. Values in the glacial sands ranged from 6 to 20 BPF indicating they were loose to medium dense but mostly medium dense. The values in the residual sandstone ranged from 14 to 69 BPF, indicating they were medium dense to very dense. The weathered sandstone returned values of 50 blows for only 2 to 4 inches of penetration (equivalent to 150 to 300 BPF) indicating it very dense and still somewhat cemented.

A key to descriptors used to qualify the relative density of soil (such as *soft, stiff, loose,* and *dense*) can be found on the Legend to Soil Description in the Appendix.

B.3. Groundwater Data

During drilling, the drillers may note the presence of moisture on the sampler, in the cuttings, or in the borehole itself. These findings are reported on the boring logs. Because water levels vary with weather, time of year, and other factors, the presence or lack of water during exploration is subject to interpretation and is not always conclusive.

Free water was observed from 10 to 12 feet in the borings, corresponding to elevations of about 844 to 846 feet on the datum used to locate the borings. Groundwater levels on site would be expected to fluctuate seasonally, similar to levels in nearby ponds and lakes, along with local weather patterns.

C. Design Data

Because each structure has a different loading configuration and intensity, different grades, and different structural or performance tolerances, the results of a geotechnical exploration will mean different things for different facilities. If the facility changes, Chosen Valley Testing should be contacted to discuss possible implications of the changes. Without a chance to review such changes, the recommendations of the soils engineer may no longer be valid or appropriate.

The project consists of the construction of a water treatment facility consisting of a treatment building, backwash detention tanks and associated utility lines.

The water treatment plant is to be a 30-foot tall, slab-on-grade structure bearing on continuous frost depth footings. Strip footings loads are understood to on the order of 2 to 6 kips per lineal foot. Equipment loads on the slab are projected to range from 250 to 700 pounds per square foot, with point loads up to 40 kips.

Three (3) buried precast concrete backwash detention tanks are to be constructed north of the treatment building. The tanks are to be about 9.33 feet deep and have a bottom about 12 feet below the surface, resulting in about 3 feet of soil cover. Maximum water depth in the tanks is to be about 7 ½ feet.

Connecting utility lines are expected to be installed at depths of about 7 ½ feet below the surface, using open cut methods.

D. Analysis

The topsoil and fill are not suitable for foundation support should be removed from below the water treatment building and backwash tanks and replaced as needed with engineered fill. At the locations explored up to 2 feet of topsoil removal would be expected and fill or possible fill depths were up to 6 ½ feet. For planning purposes, we recommend assuming the possible fill must be removed, subject to closer review during construction. The deepest fill met in the area of the tanks would be removed as a consequence of excavating down to tank foundation elevation.

Excavation for the backwash tanks are expected to terminate in or close the residual sandstone but appeared to be above the harder weathered sandstone. Groundwater was met above the apparent planned depths for the tanks, suggesting dewatering will likely be required if installed at the understood depths.

After grading, the bearing soils for the structure are expected to consist of natural sand and sandstone or shallow depths of engineered sand fill over those materials. Based on the assumed loads and proper implementation of our recommendations, we are of the opinion that a design bearing pressure of 4,000 psf may be used to design foundations for all of the structures. Settlements at these loads are expected to be about ½ inch or less.

The remainder of this report provides more details of our recommendations.

E. Building and Tank Grading Recommendations

E.1. Excavation

We recommend removing all topsoil and fill from below building and tank areas, along with any existing foundation, utilities or other unsuitable materials. For planning purposes, we recommend assuming that the possible fill must also be removed. The tabulation following this paragraph shows the apparent depth of unsuitable soils at the locations explored.

Boring No.	Structure	Approx. Ground Surface Elevation (feet)	Approx. Depth of Unsuitable Soils (feet)	Approx. Bottom Elevation of Unsuitable Soils (feet)
1	Water Treatment Plant	854	6 ½	847 ½
2	Water Treatment Plant	854	4	850
3	Backwash Tank	854	6 ½	847 ½
4	Backwash Tank	854	6 ½	847 ½

E.2. Geotechnical Review

We recommend that geotechnical personnel from Chosen Valley Testing be on-site during excavation to evaluate the bearing soils and their consistency, in comparison the expectations from the soil boring data. Subject to that review, additional corrections or changes to our recommendations may be deemed warranted but are not anticipated.

E.3. Oversizing

Any stripping or corrective excavations should be oversized at least 1-foot horizontally beyond the edge of the building for each foot of fill needed below footing grade. This oversizing can be reduced by up to 50% if rather precise staking is present during grading.

E.4. Fill Placement and Compaction

For ease in compaction, we recommend using sand or gravel having less than 12% particles passing a number 200 sieve as bulk fill below footings and slabs for the headworks building. The natural glacial outwash poorly graded sand and poorly graded sand with silt would be expected to meet this requirement but should be reviewed in the field. Much of the fill and possible fill was silty or clayey and is not recommend for use below foundations or clays but might be used as exterior backfill around the perimeter of the treatment building.

Due to the present of groundwater, we recommend installing at least 1 foot of clean 1 ½ -inch minus aggregate or similar clean aggregate below the backwash tank structures. These materials would have to be imported. Clean sands or gravels having less than 12% passing a #200 sieve are recommended as fill against the tank structures. The manufacturer may have specific requirements, and we defer to them in that event.

We recommend that all engineered fills be compacted to at least 95% of their maximum standard Proctor density. Compaction testing on clean aggregate is not practical or necessary. The clean aggregate should be compacted until no yield is observed.

F. Building Design

F.1. Foundation Depth

For frost protection, foundations should be placed at least 48 inches below the exposed ground surface for heated structures. Interior foundations in heated areas may be placed directly below slabs. Footings for unheated structures should be placed at least 60 inches below the exposed ground surface.

F.2 Bearing Capacity and Settlement

Based on the assumed loads, assumed foundation and slab elevation, and implementation of our recommendations, we are of the opinion that foundations may be designed to exert pressures of up to 4,000 pounds per square foot (psf). This allowable bearing capacity includes a safety factor of at least 3 against shear failure. Total post-construction settlements are expected to be on the order of ½ inch or less.

F.3. Vapor Barrier

If the slab receives coverings that are less permeable than concrete, a vapor barrier should be placed below the slab. Some contractors prefer to place this barrier below a sand layer to limit the potential for curling.

F.4. Slab Design

The completed slab subgrade is expected to consist primarily of rather clean sand materials. We recommend using a modulus of subgrade reaction of 200 pounds per cubic inch (pci) for these subgrade materials.

F.5. Lateral Earth Pressures

Lateral earth parameters are provided for design of below-grade/retaining walls. Backfill should be compacted to at least 95% of its maximum standard Proctor density (ASTM D 698). Lateral resistance will depend on the materials used. We recommend using clean free-draining sands having less than 12% particles passing a number 200 sieve as backfill behind walls. Even if it meets that gradation, crushed or residual sandstone is not considered suitable for wall backfill as its fine-grained nature makes it not very permeable. The following table includes support values for the recommended clean sand. These values do not include safety factors.

Poorly Graded Sands (SP) 95% standard Proctor density	
Internal Friction Angle (degrees)	34
Cohesion (psf)	0
Coefficient of Friction between Concrete and Soil	0.5
Moist Unit Weight (pcf)	120
Backslope Behind Wall (degrees)	0 (Flat)
At-Rest Coefficient (Ko)	0.44
Active Coefficient (Ka)	0.28
Passive Coefficient (Kp)	3.54
Equivalent At-Rest Fluid Earth Pressure (psf/ft of wall height)	55

The actual loads exerted on the structure will depend on the movement or flexure of the structure. For sand fill, horizontal movement or flexure of about 0.2% of the height of soil retained may be sufficient to mobilize frictional forces from the at-rest state to the active state.

F.6 Seismic Class

Based on the boring and nearby well data, the site is considered to be characterized as seismic Site Class C.

G. Utilities

G.1. Groundwater/De-watering

As mentioned, free water was observed at depths of about 10 to 12 feet below the surface. This appears to be below or possibly close to pipe elevations. Due to the high permeability of the dominant sands, dewatering will likely be needed for excavations extending into the water table.

G.2. Trench Sidewalls

The contractor will be required to slope or shore the excavations as needed to meet OSHA requirements for safety. The fill, glacial and residual sands would be expected to classify as Type C soils. The weathered sandstone at depth will likely classify as Type B soils as defined by OSHA. Trench boxes or other stabilization methods may be necessary when excavating close to property limits or structures.

G.3. Trench Bottom Stability

The natural materials encountered are expected to generally provide adequate support for utilities, provided they are adequately dewatered. Cobbles, and boulders should be kept at least 6 to 8 inches away from pipes, to limit potential for point loads. Ideally, bedrock would be removed to a similar depth below pipes to provide bedding materials which can more readily conform to the pipe perimeter.

The weathered sandstone can likely be excavated with a large backhoe with a “tooth-lipped” bucket down near auger refusal depths. Below auger refusal depths, more aggressive rock removal techniques such as blasting, hydraulic hammering, or mechanical rock splitting would likely be required.

G.4. Backfill Placement and Compaction

The soils available for use as backfill are expected to consist primarily of granular materials and appear generally suitable for use as backfill above the piped. Cobbles and boulders should be kept away from the pipes. All fill below paved areas should ideally be compacted to 95% of their maximum standard Proctor density (ASTM D 698). In green areas, 90% compaction is normally adequate.

H. General Grading Recommendations

H.1. Earthwork

The stripping operations can likely be accomplished with a variety of equipment. A backhoe is recommended for deep excavations. The weathered sandstone could likely be excavated with a large

backhoe with a "tooth-lipped" bucket down near auger refusal depths, though perhaps with some difficulty. Below auger refusal depths, more aggressive rock removal techniques such as blasting, hydraulic hammering, or mechanical rock splitting would likely be required.

The fill, glacial and residual sands would be expected to classify as Type C soils. The weathered sandstone on site will likely classify as Type B soils as defined by OSHA. Trench boxes or other stabilization methods may be necessary when excavating close to property limits or structures.

As mentioned, free water was observed at depths of about 10 to 12 feet below the surface. This appears to be above the planned bottom elevations for the buried tanks, and below or possibly close to pipe elevations for the utilities. Due to the high permeability of the dominant sands, dewatering will likely be needed for excavations extending into the water table.

H.2. Compaction

All fills should be placed in lifts adjusted to the compactor being used and the material being compacted. We recommend limiting lifts to no more than 1-foot – assuming large, self-propelled, or tow-behind compactors are used. Thinner lifts would be required for lighter compaction equipment.

H.3. Cold Weather

If earthwork occurs during freezing temperatures, good winter construction practices should be used. No frozen fill should be used, and filling should not take place on frozen subgrades. Footing and slab areas should be completely thawed prior to placing concrete.

H.4. Construction Testing and Documentation

Grading and excavations should be evaluated and documented by qualified geotechnical personnel to assess the remaining soil. Any fill placed below building areas should be evaluated for conformance to the project gradation recommendations and should be tested for compaction. If filling proceeds during periods of freezing weather, full-time testing should be considered to help confirm that imported fill is thawed prior to and during compaction, and that all snow has been removed before placement of the fill.

Although our firm offers testing services relating to civil and structural components of the structure (such as concrete testing, reinforcement observations, etc.), specifications of such services are beyond our work scope and the designer should be consulted as to such requirements.

L. Level of Care

The services provided for this project have been conducted in a manner consistent with that level of care and skill ordinarily exercised by members of the profession currently practicing in this area, under similar budget and time constraints. This is our professional responsibility. No other warranty, expressed or implied, is made.

Appendix

Boring Location Sketch

Log of Boring # 1-8

Legend to Soil Description

C V T

Chosen Valley Testing, Inc.

Legend

Boring Locations

N

Boring Location Sketch

Water Treatment Plant

Southwest Quadrant of 21st Ave. NE and John Russell Road

Menomonie, Wisconsin

CVT Project 25712.25.WIL



LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-01** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
854.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			Elevations estimated using the Beacon program for Dunn County and should be considered approximate.
852.0	2.0		**FILL**, Clayey Silty Sand, fine-to-medium grained, dark brown, moist.	8		MC=10.4%
850.0	4.0	OL	**BURIED TOPSOIL**, Slightly Organic Silty Sand, trace Roots, black, moist.	9		MC=12.9%
847.5	6.5	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, brown, moist to 7 feet then water bearing, medium dense.	12		MC=6.2%
842.5	11.5		trace Gravel	15	▽	MC=10.3%
840.0	14.0	SM	**SILTY SAND**, fine-to-medium grained, yellow tan, wet, medium dense. (Residual Sandstone)	17		MC=14.4%
837.5	16.5	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, yellow tan, water bearing, very dense. (Residual Sandstone)	53		MC=14.0%
834.1	19.9	Wx	**WEATHERED SANDSTONE**	*		50 Blows over 4 inches (Set), MC=14.3%
			Boring terminated early due to auger refusal presumably on sandstone. Water was observed at 10 feet during drilling. Boring was sealed upon completion.			

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-02** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
854.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			
852.0	2.0		**FILL**, Poorly Graded Sand with Silt, fine grained, dark brown, moist.	7		MC=8.7%
850.0	4.0	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, brown, moist to 7 feet then water bearing, loose. (Glacial Outwash)	9		MC=3.2%
				9		MC=7.5%
				10	▽	MC=11.8%
842.5	11.5	SM	**SILTY SAND**, fine-to-medium grained, seams of Lean Clay, yellow tan, wet, medium dense to very dense. (Residual Sandstone) Seams of Lean Clay	14		MC=13.3%
				69		MC=14.1%
837.5	16.5	WX	**WEATHERED SANDSTONE**			
834.1	19.9			*		
			Boring terminated early due to auger refusal presumably on sandstone. Water was observed at 10 feet during drilling. Boring was sealed upon completion.			50 Blows over 4 inches (Set), MC=17.9%

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-03** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
854.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			
852.0	2.0		**FILL**, Silty Sand, fine-to-medium grained, dark brown, moist.	6		MC=16.2%
				7		MC=11.7%
847.5	6.5	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, brown, moist to 7 feet then water bearing, loose. (Glacial Outwash)	10		MC=13.5%
				8	▽	MC=13.3%
842.5	11.5	SM	**SILTY SAND**, fine-to-medium grained, yellow tan, wet, dense to very dense. (Residual Sandstone)	40		MC=16.6%
				56		MC=17.1%
837.5	16.5	Wx	**WEATHERED SANDSTONE**			
834.3	19.7			*		
			End Boring. Water was observed at 10 feet during drilling. Boring was sealed upon completion.			MC=13.3% *=50 Blows over 2 inches (set)

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-04** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
854.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			
852.0	2.0		**FILL**, Silty Sand, fine-to-medium grained, dark brown, moist.	9		MC=13%
850.0	4.0	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, brown, moist. (Possible Fill)	8		MC=10.1%
847.5	6.5	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, trace Gravel, brown, moist to 10 feet then water bearing, medium dense. (Glacial Outwash)	11		MC=8.7%
842.5	11.5			11	▽	MC=12.4%
840.0	14.0	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, yellow tan, water bearing, medium dense. (Residual Sandstone)	24		MC=15.4%
834.3	19.7	Wx	**WEATHERED SANDSTONE**	*		*= 50 blows over 5 inches (Set), MC=19.4%
			End Boring. Water was observed at 10 feet during drilling. Boring was sealed upon completion. Seams of Sandy Lean Clay	*		*= 50 blows over 2 inches (Set), MC=17.9%

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-05** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
856.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			
854.0	2.0		**FILL**, Silty Sand, fine-to-medium grained, seams of Lean Clay, dark brown, moist.	6		MC=11.2%
852.0	4.0	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, dark brown, moist. (Possible Fill)	8		MC=9.0%
849.5	6.5	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, trace, brown, moist, loose. (Glacial Outwash)	8		MC=5.7%
847.0	9.0	SP	**POORLY GRADED SAND**, fine-to-medium grained, trace Gravel, brown, water bearing, loose to medium dense. (Glacial Outwash)	6	▽	MC=12.4%
				9		MC=15.0%
841.0	15.0			12		
			End Boring. Water was observed at 10 feet during drilling. Boring was sealed upon completion.			MC=19.5%

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-06** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
854.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			
852.0	2.0		**FILL**, Poorly Graded Sand with Silt, fine-to-medium grained, dark brown, moist.	8		MC=6.9%
850.0	4.0	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, trace Gravel, brown, moist, loose to medium dense. (Glacial Outwash)	11		MC=8.0%
				9		MC=4.0%
845.0	9.0	SP	**POORLY GRADED SAND**, fine-to-medium grained, trace Gravel, brown, water bearing, loose to medium dense. (Glacial Outwash)	12	▽	MC=11.0%
				9		MC=18.6%
839.0	15.0			10		
			End Boring. Water was observed at 10 feet during drilling. Boring was sealed upon completion.			MC=12.8%

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-07** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
856.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silt, trace Roots, dark brown, moist.			
854.0	2.0		**FILL**, Poorly Graded Sand with Silt, fine-to-medium grained, trace Gravel, seams of lean clay, dark brown, moist.	13		MC=5.1%
				11		MC=3.5%
849.5	6.5	SP SM	**POORLY GRADED SAND**, fine-to-medium grained, trace Gravel, brown, moist, medium dense. (Glacial Outwash)	12		MC=12.1%
847.0	9.0	SP	**POORLY GRADED SAND**, fine-to-medium grained, trace Gravel, yellowish tan, moist to 12 feet then water bearing, medium dense to dense. (Residual Sandstone)	25		MC=11.1%
				49	▽	MC=14.1%
842.5	13.5	Wx	**WEATHERED SANDSTONE**	*		
841.0	15.0		End Boring. Water was observed at 12 feet during drilling. Boring was sealed upon completion.			*= 50 blows over 4 inches (Set), MC=14.3%

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

LOG OF BORING

CHOSEN VALLEY TESTING CVT

PROJECT: 25712.25.WIL Design Phase Geotechnical Evaluation Well #9 / Water Treatment Plant Southwest quadrant of 21st Ave N. E. and John Russell Road Menomonie, Wisconsin	BORING: **B-08** LOCATION: See Attatched Sketch. DATE: 6/16/2025 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
856.0	0.0	OL	**TOPSOIL**, Poorly Graded Sand with Silty trace Roots, dark brown, moist.			
854.0	2.0		**Fill**, Poorly Graded Sand with Silt, fine grained, dark brown, moist.	6		MC=8.0%
			fine-to-medium grained, trace Gravel	19		MC=3.9%
849.5	6.5	SP SM	**POORLY GRADED SAND with SILT**, fine-to-medium grained, seams of Lean Clay, yellowish tan, moist, medium dense. (Residual Sandstone)	15		MC=9.2%
847.0	9.0	SP	**POORLY GRADED SAND**, fine-to-medium grained, trace Sandstone rock, yellow tan, moist, very dense. (Residual Sandstone)	63		MC=12.1%
844.5	11.5	WX	**WEATHERED SANDSTONE**	*	▽	*= 50 blows over 5 inches (Set), MC=14.4%
841.0	15.0		End Boring. Water was observed at 12 feet during drilling. Boring was sealed upon completion.	*		*= 50 blows over 2 inches (Set), MC=14.3%

CVT STANDARD 25712.25.WIL (WELL 9 WATER TREATMENT PLANT).GPJ LOG A GNNN06.GDT 7/24/25

CITY OF MENOMONIE CONTRACTOR MINIMUM SAFETY RULES

All contractors and subcontractors shall comply with the following minimum safety rules while working for the City of Menomonie:

1. All contractor personnel must wear appropriate work apparel including personal protective equipment, as required.
2. Hazardous chemicals are present at City of Menomonie property in certain buildings and operations. Contractor personnel must familiarize themselves with the City safety procedures and emergency evacuation plans for the area(s) they are working in.
3. No hazardous or flammable chemicals may be brought on to City of Menomonie property without approval from the City of Menomonie. Safety Data Sheets are required, for any chemicals that are permitted on City property.
4. Possession of alcohol, illegal drugs or firearms on City of Menomonie property is prohibited.
5. Frayed or damaged extension cords/power cords are not permitted on City of Menomonie work sites.
6. The contractor is responsible for maintaining good housekeeping in and around their work area.
7. The contractor will not discharge any chemicals, paints, oils, etc. substance to any drain without approval from the City of Menomonie.
8. Any contractor personal or property accidents or cases of job-related injuries/illnesses must be immediately reported to the City of Menomonie.
9. Contractors/subcontractors shall know the location of the nearest fire extinguisher; pull station alarm and first aid equipment. In the event of a fire/emergency notify the nearest City of Menomonie employee.
10. Contractor safety meetings must be held as needed to communicate job-site safety information for all contractors regularly working on City of Menomonie property for extended periods of time.
11. Contractor work will be periodically monitored by the Safety Contractor or Designee to City of Menomonie requirements.
12. Depending on the nature of the contractor's activities, the following permits must be issued prior to beginning work: Confine Space Entry Permit, Roof-Top/Ceiling Permit and Excavation/Trenching.
13. It is the contractor's responsibility to supply their own confined space entry/rescue equipment. The contractor will meet all Federal, State and County regulations pertaining to Confined Space Entry and have a rescue plan in place prior to entry.
14. When performing Excavation/Trenching or any other work that takes place in traffic areas, contractors/subcontractors shall follow all Federal, State and County regulations.
15. Contractor safety rules may exceed these minimum rules.

CONTRACTOR ACKNOWLEDGEMENT: The Undersigned hereby acknowledge receipt of the City of Menomonie Contractor Minimum Safety Rules and will ensure that all employees and subcontractors comply.

Project: _____

Contractor: _____

_____	_____	_____
Print Name	Signature	Date

City of MENOMONIE

City of Menomonie
Building Inspection/Zoning
800 Wilson Avenue
Menomonie, WI 54751
715-232-2221
www.menomonie-wi.gov

Commercial Building Permit Application

Date: _____

Owner: _____

Project Address: _____

Description of proposed work:

_____

_____

_____

Estimated Project Cost: _____

This estimated cost does not include land cost, furniture, equipment, or primary subcontractor costs such as plumbing, mechanical, electrical and sprinkler contractors.

General Contractor: _____

E-mail: _____ **Telephone** _____

Mailing Address: _____

Mail check and application to: **City of Menomonie Inspection Department**
800 Wilson Ave
Menomonie, WI 54751

You may submit an application by email to inspection@menomonie-wi.gov if preferred.

Please submit the application with two full size printed copies of the building plans.

STRUCTURAL TESTING & SPECIAL INSPECTION SCHEDULE

Project Name Menomonie Well #9 Project. No. 05323007

Location City of Menomonie, WI

CONCRETE

TABLE 1705.3

REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

	TYPE	FREQUENCY		REFERENCED STANDARD	IBC REFERENCE	REMARKS
		CONTINUOUS	PERIODIC			
1	INSPECT REINFORCEMENT, INCLUDING PRESTRESSING TENDONS, AND VERIFY PLACEMENT	-	X	ACI 318: Ch. 20, 25.2, 25.3, 26.6.1-26.6.3	-	
2	REINFORCING BAR WELDING					
	a VERIFY WELDABILITY OF REINFORCING BARS OTHER THAN ASTM A 706	-	X	AWS D1.4 ACI 318: SECTION 26.6.4	-	
	b INSPECT SINGLE-PASS FILLET WELDS, MAXIMUM 5/16"; AND	-	X			
	c INSPECT ALL OTHER WELDS	X				
3	INSPECT ANCHORS CAST IN CONCRETE	-	X	ACI 318: 17.8.2	-	
4	INSPECT ANCHORS POST-INSTALLED IN HARDENED CONCRETE MEMBERS					
	a ADHESIVE ANCHORS INSTALLED IN HORIZONTALLY OR UPWARDLY INCLINED ORIENTATIONS TO RESIST SUSTAINED TENSION LOADS.	X	-	ACI 318: 17.8.2.4	-	
	b MECHANICAL ANCHORS AND ADHESIVE ANCHORS NOT DEFINED IN 4.a.	-	X	ACI 318: 17.8.2		
5	VERIFY USE OF REQUIRED DESIGN MIX	-	X	ACI 318: Ch. 19, 26.4.3, 26.4.4	1904.1, 1904.2	
6	PRIOR TO CONCRETE PLACEMENT, FABRICATE SPECIMENS FOR STRENGTH TESTS, PERFORM SLUMP AND AIR CONTENT TESTS, AND DETERMINE THE TEMPERATURE OF THE CONCRETE.	X	-	ASTM C31 ASTM C172 ACI 318: 26.5, 26.12	-	
7	INSPECT CONCRETE AND SHOTCRETE PLACEMENT FOR PROPER APPLICATION TECHNIQUES	X	-	ASCE 9, CHAPTER 3	-	
8	VERIFY MAINTENANCE OF SPECIFIED CURING TEMPERATURE AND TECHNIQUES	-	X	ACI 318: 1.3.2d ACI 318: 5.11-5.13	-	
9	INSPECT PRESTRESSED CONCRETE FOR:					
	a APPLICATION OF PRESTRESSING FORCES; AND	X	-	ACI 318: 26.10	-	
	b GROUTING OF BONDED PRESTRESSING TENDONS	X	-			
10	INSPECT ERECTION OF PRECAST CONCRETE MEMBERS	-	X	ACI 318: 26.9	-	
11	FOR PRECAST CONCRETE DIAPHRAGM CONNECTIONS OR REINFORCEMENT AT JOINTS CLASSIFIED AS MODERATE OR HIGH DEFORMABILITY ELEMENTS (MDE OR HDE) IN STRUCTURES ASSIGNED TO SEISMIC DESIGN CATEGORY C, D, E, OR F, INSPECT					
	a INSTALLATION OF THE EMBEDDED PARTS	X	-	ACI 318: 26.13.1.3	-	
	b COMPLETION OF THE CONTINUITY OF REINFORCEMENT ACROSS JOINTS.	X	-	ACI 550.5		
	c COMPLETION OF CONNECTIONS IN THE FIELD.	X	-			
12	INSPECT INSTALLATION TOLERANCES OF PRECAST CONCRETE DIAPHRAGM CONNECTIONS FOR COMPLIANCE WITH ACI 550.5.	-	X	ACI 318: 26.13.1.3	-	
13	VERIFY IN-SITU CONCRETE STRENGTH, PRIOR TO STRESSING OF TENDONS IN POST-TENSIONED CONCRETE AND PRIOR TO REMOVAL OF SHORES AND FORMS FROM BEAMS AND STRUCTURAL SLABS.	-	X	ACI 318: 26.11.2	-	
14	INSPECT FORMWORK FOR SHAPE, LOCATION AND DIMENSIONS OF THE CONCRETE MEMBER BEING FORMED.	-	X	ACI 318: 26.11.1.2(b)	-	

MASONRY

TABLE 4

MINIMUM SPECIAL INSPECTION REQUIREMENTS

INSPECTION TASK	FREQUENCY			REFERENCE FOR CRITERIA	
	LEVEL 1	LEVEL 2	LEVEL 3	TMS 402	TMS 602
1 AS MASONRY CONSTRUCTION BEGINS, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE:					
a PROPORTIONS OF SITE-PREPARED MORTAR	NR	PERIODIC	PERIODIC		Art. 2.1, 2.6 A, & 2.6 C
b GRADE AND SIZE OF PRESTRESSING TENDONS AND ANCHORAGES	NR	PERIODIC	PERIODIC		Art. 2.4 B & 2.4 H
c GRADE, TYPE AND SIZE OF REINFORCEMENT, CONNECTORS, ANCHOR BOLTS, AND PRESTRESSING TENDONS AND ANCHORAGES	NR	PERIODIC	PERIODIC		Art. 3.4 & 3.6 A
d PRESTRESSING TECHNIQUE	NR	PERIODIC	PERIODIC		Art. 3.6 B
e PROPERTIES OF THIN-BED MORTAR FOR AAC MASONRY	NR	CONTINUOUS/ PERIODIC	CONTINUOUS		Art. 2.1 C.1
f SAMPLE PANEL CONSTRUCTION	NR	CONTINUOUS	CONTINUOUS		Art. 1.6 D
2 PRIOR TO GROUTING, VERIFY THAT THE FOLLOWING ARE IN COMPLIANCE:					
a GROUT SPACE	NR	PERIODIC	PERIODIC		Art. 3.2 D & 3.2 F
b PLACEMENT OF PRESTRESSING TENDONS AND ANCHORAGES	NR	PERIODIC	PERIODIC	Sec. 10.8 & 10.9	Art. 2.4 & 3.6
c PLACEMENT OF REINFORCEMENT, CONNECTORS, AND ANCHOR BOLTS	NR	PERIODIC	CONTINUOUS	Sec. 6.1, 6.3.1, 6.3.6, & 6.3.7	Art. 3.2 E & 3.4
d PROPORTIONS OF SITE-PREPARED GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS	NR	PERIODIC	PERIODIC		Art. 2.6 B & 2.4 G.1.b
3 VERIFY COMPLIANCE OF THE FOLLOWING DURING CONSTRUCTION:					
a MATERIALS AND PROCEDURES WITH THE APPROVED SUBMITTALS	NR	PERIODIC	PERIODIC		Art. 2.1, 2.6 A, & 2.6 C
b PLACEMENT OF MASONRY UNITS AND MORTAR JOINT CONSTRUCTION	NR	PERIODIC	PERIODIC		Art. 2.4 B & 2.4 H
c SIZE AND LOCATION OF STRUCTURAL MEMBERS	NR	PERIODIC	PERIODIC		Art. 3.4 & 3.6 A
d TYPE, SIZE, AND LOCATION OF ANCHORS, INCLUDING OTHER DETAILS OF ANCHORAGE OF MASONRY TO STRUCTURAL MEMBERS, FRAMES, OR OTHER CONSTRUCTION	NR	PERIODIC	CONTINUOUS		Art. 3.6 B
e WELDING OF REINFORCEMENT	NR	CONTINUOUS	CONTINUOUS		Art. 2.1 C.1
f PREPARATION, CONSTRUCTION, AND PROTECTION OF MASONRY DURING COLD WEATHER (TEMPERATURE BELOW 40°F (4.4°C)) OR HOT WEATHER (TEMPERATURE ABOVE 90°F (32.2°C))	NR	PERIODIC	PERIODIC		Art. 3.4 & 3.6 A
g APPLICATION AND MEASUREMENT OF PRESTRESSING FORCE	NR	CONTINUOUS	CONTINUOUS		Art. 3.6 B
h PLACEMENT OF GROUT AND PRESTRESSING GROUT FOR BONDED TENDONS IS IN COMPLIANCE	NR	CONTINUOUS	CONTINUOUS		Art. 2.1 C.1
i PLACEMENT OF AAC MASONRY UNITS AND CONSTRUCTION OF THIN-BED MORTAR JOINTS	NR	CONTINUOUS/ PERIODIC	CONTINUOUS		Art. 1.6 D
4 OBSERVE PREPARATION OF GROUT SPECIMENS, MORTAR SPECIMENS, AND/OR PRISMS	NR	PERIODIC	CONTINUOUS		Art. 1.4 B.2.a.3, 1.4 B.2.b.3, 1.4 B.2.c.3, 1.4 B.3, & 1.4 B.4

SOILS

TABLE 1705.6

REQUIRED SPECIAL INSPECTIONS AND TESTS OF SOILS

	TYPE	FREQUENCY		REFERENCED STANDARD	IBC REFERENCE	REMARKS
		CONTINUOUS	PERIODIC			
1	Verify materials below shallow foundations are adequate to achieve the design bearing capacity.	-	X			
2	Verify excavations are extended to proper depth and have reached proper material.	-	X			
3	Perform classification and testing of compacted fill materials.	-	X			
4	During fill placement, verify use of proper materials and procedures in accordance with the provisions of the approved geotechnical report. Verify densities and lift thicknesses during placement and compaction of compacted fill.	X	-			
5	Prior to placement of compacted fill, inspect subgrade and verify that site has been prepared properly.	-	X			

Each appropriate representative shall sign below:

Owner:		Firm	City of Menomonie	Date	
Contractor:		Firm		Date	
Architect:		Firm	MSA Professional Services	Date	
Strucutal Eningeer	 Daniel M George	Firm	MSA Professional Services	Date	12/17/2025
Special Inspector		Firm		Date	
Special Inspector		Firm		Date	
Special Inspector		Firm		Date	
Special Inspector		Firm		Date	
Testing Agency		Firm		Date	

Accepted for the Building Department by:_____ Date _____

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BIDDER:_____

BID

WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING
CITY OF MENOMONIE
DUNN COUNTY, WI

PROJECT #05323007.1

TABLE OF ARTICLES

Article Number	Article
1	Owner and Bidder
2	Attachments to this Bid
3	Basis of Bid – Lump Sum, and Unit Prices
4	Time of Completion
5	Bidders Acknowledgements: Acceptance Period, Instructions, and Receipt of Addenda
6	Bidder's Representations and Certifications

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BID FORM PROVIDED ON QUESTvBID

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ARTICLE 1 - OWNER AND BIDDER

1.01 This Bid is submitted to:

Quest CDN/vBID (www.QuestCDN.com)

Access the electronic bid form by downloading the project documents, and select the online bidding button at the top of the advertisement. Contact Quest at (952) 233-1632 if you have questions on how to upload your bid.

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - ATTACHMENTS TO THIS BID

2.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security _____

B. List of Proposed Subcontractors

Electrical

Masonry

Plumbing

HVAC

Site/Utility

_____

_____

_____

C. List of Proposed Suppliers

_____

_____

_____

D. Evidence of authority to do business in the state of the Project; or a written covenant to obtain such authority within the time for acceptance of Bids;

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E. Contractor's license number as evidence of Bidder's State Contractor's License or a covenant by Bidder to obtain said license within the time for acceptance of Bids;

F. The following forms are required if there are **no anticipated subcontractors**:

1. No Anticipated Use of Subcontractors

G. The following DBE forms are required if there **are anticipated subcontractors**:

1. DBE Solicitation Requirements:

Environmental Improvement Fund (EIF) MBE/WBE/SBRA Contacts Worksheet Form 8700-294A (or equivalent list, with results) **OR**

Copy of Class I Advertisement soliciting DBE subcontractors for the project and list of utilized DBEs

H. The following form is required if American Iron & Steel (AIS) applies;

1. Contractor AIS Acknowledgement Form, Consolidated Appropriations Act, 2014

ARTICLE 3 - BASIS OF BID – LUMP SUM AND UNIT PRICES

3.01 Unit Price Bids

A. Bidder will perform the following Work at the indicated unit prices:

ITEM NO.	ITEM DESCRIPTION	EST. QTY	UNITS	UNIT PRICE	TOTAL PRICE
BASE BID					
1	Water Treatment Plant, Complete	1	L.S.	$_____	$_____
ALLOWANCES					
2	Contingency	1	L.S.	$ 100,000.00	$ 100,000.00
3	Natural Gas Service Allowance	1	L.S.	$ 5,000.00	$ 5,000.00
4	Fiber Service Allowance	1	L.S.	$ 3,000.00	$ 3,000.00
5	Electrical Service Allowance	1	L.S.	$ 82,000.00	$ 82,000.00
SELECT UNIT PRICE ITEMS NOT INCLUDED IN ABOVE					
6	Test Well Abandonment	385	L.F.	$_____	$_____
7	24-inch Temporary Surface Casing	40	L.F.	$_____	$_____
8	23-inch Upper Drillhole	150	L.F.	$_____	$_____
9	18-inch I.D. Well Casing	153	L.F.	$_____	$_____
10	Neat Cement Grout Seal	300	Bags	$_____	$_____
11	17-inch Lower Drillhole	220	L.F.	$_____	$_____
12	Well Development	16	Hr.	$_____	$_____
13	Grout Seal Bottom 20 feet, Complete	1	Ea.	$_____	$_____
14	Granular Subbase	850	C.Y.	$_____	$_____
15	Aggregate Base Course, 1 1/4-inch	600	C.Y.	$_____	$_____

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ITEM NO.	ITEM DESCRIPTION	EST. QTY	UNITS	UNIT PRICE	TOTAL PRICE
16	Asphaltic Pavement, Binder & Surface	420	Tons	$_____	$_____
17	Concrete Curb & Gutter, 24-inch	380	L.F.	$_____	$_____
18	Concrete Flatwork, 6-inch	700	S.F.	$_____	$_____
19	Concrete Equipment Pad	200	S.F.	$_____	$_____
20	Concrete Surface Drain	35	S.F.	$_____	$_____
21	Rip Rap, Medium	5	C.Y.	$_____	$_____
22	Turf Restoration	1	L.S.	$_____	$_____
23	Storm Sewer, 12-inch, RCP	252	L.F.	$_____	$_____
24	Apron Endwall, 12-inch	1	EA	$_____	$_____
25	Connect to Exist Storm Structure	1	EA	$_____	$_____
26	PVC Sanitary Sewer, 4-inch	22	L.F.	$_____	$_____
27	PVC Sanitary Sewer, 6-inch	84	L.F.	$_____	$_____
28	PVC Sanitary Sewer, 8-inch, C900	240	L.F.	$_____	$_____
29	PVC Sanitary Sewer, 8-inch, SDR 35	220	L.F.	$_____	$_____
30	PVC Sanitary Sewer, 14-inch, DI	80	L.F.	$_____	$_____
31	Overflow Pipes, 12-inch, DI	40	L.F.	$_____	$_____
32	Plug Valve, 8-inch	2	EA	$_____	$_____
33	Plug Valve, 14-inch	3	EA	$_____	$_____
34	Sanitary Manhole	3	EA	$_____	$_____
35	Sanitary Cleanout	1	EA	$_____	$_____
36	Sanitary Drop Connection	1	EA	$_____	$_____
37	Backwash Tanks	2	EA	$_____	$_____
38	Water Service, 2-inch	50	L.F.	$_____	$_____
39	Water Main, 6-inch, DI	4	L.F.	$_____	$_____
40	Water Main, 8-inch, DI	22	L.F.	$_____	$_____
41	Water Main, 10-inch, DI	5	L.F.	$_____	$_____
42	Water Main, 10-inch, C900	93	L.F.	$_____	$_____
43	Water Main, 14-inch, C905	528	L.F.	$_____	$_____
44	Water Main, 14-inch, DI	55	L.F.	$_____	$_____
45	Gate Valve, 8-inch	2	EA	$_____	$_____
46	Gate Valve, 14-inch	4	EA	$_____	$_____
47	Hydrant	2	EA	$_____	$_____
48	Dewatering	1	L.S.	$_____	$_____
	TOTAL: Items #1-#48				**$_____**

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B. Bidder acknowledges that:

1. each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and

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2. estimated quantities are not guaranteed, are solely for the purpose of comparison of Bids, and final payment for all Unit Price Work will be based on actual quantities, determined as provided in the Contract Documents.

3.02 BID ALTERNATES

Required Alternate Bid Items are listed below. Owner shall have the right to accept either the Base Bid Items or the corresponding alternate. **Failure to supply Alternate Bids may invalidate Bid.**

Equipment Listing and Alternate Bid Schedule

A. BID EVALUATION

Bids are to be evaluated on the basis of the base bid manufacturers, and any combination of bid alternates.

B. BASE BID MANUFACTURERS

It is understood that the total lump sum price above includes only products and equipment of manufacturers specifically named under Column A, Base Bid Manufacturer, within the "Schedule of Equipment Suppliers" shown on Page 00 41 00-X.

The base bid equipment cost shall be listed in Column B for each piece of equipment listed in Column A. This cost shall be for the equipment only and shall include any contractor markup. Where more than one manufacturer is listed under Column A, the Bidder must circle the name of the manufacturer for which a cost is supplied.

C. ALTERNATE MANUFACTURERS

1. Engineer Designated Alternates

Where one or more ENGINEER Designated Alternates are listed in Column C for an equipment item, the Bidder must fill in Column D indicating the add or deduct from the base bid for each piece of equipment listed in Column C. The add or deduct cost for the equipment shall account for differences in the equipment cost, contractor markup and any additional work to be performed which is not shown on the contract drawings, but which is required as a result of selection of the alternate equipment. **Failure to supply costs for ENGINEER Designated Alternates may invalidate the bid.**

2. Contractor Designated Alternates

Bidders desiring to quote on alternate products; i.e., pieces of equipment not listed under Columns A or C may, at their option, write in a manufacturer's name in Column C and an add or deduct to the base bid in Column D. The add or deduct for the equipment shall account for differences in the equipment cost, contractor markup and any additional work to be performed which is not shown on the drawings, but which is required as a result of selection of the alternate equipment.

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SCHEDULE OF EQUIPMENT SUPPLIERS

Document Location	Products and Materials	COLUMN A	COLUMN B	COLUMN C	COLUMN D
Specification Section	Equipment Item	Base Bid Manufacturer	Base Bid Equipment Cost	Alternate Manufacturer	Add or Deduct $ from Base Bid
26 32 10 26 30 00	Engine Generator and Transfer Switch	Caterpillar/Olympian			
44 42 76.30	Mechanical Lift Slide Gate	Waterman			
44 44 16.10	Chlorination System	Hydro Series 300			

Bidder accepts that Adjustment prices are subject to acceptance by Owner, and rejection of one or more Adjustment prices shall not relinquish acceptance of the Bid.

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ARTICLE 4 - TIME OF COMPLETION

4.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

4.02 Bidder agrees that the Work will be substantially complete on or before **August 31, 2027,** and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before **May 1, 2028**.

4.03 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 5 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

5.01 Bid Acceptance Period

A. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

5.02 Instructions to Bidders

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A. Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security.

5.03 Receipt of Addenda

A. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	**Addendum Date**

ARTICLE 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 Bidder's Representations

A. In submitting this Bid, Bidder represents the following:

1. Bidder has examined and carefully studied the Bidding Documents, including Addenda.

2. Bidder has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Bidder is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

4. Bidder has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Bidder has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, if selected as Contractor; and (c) Bidder's (Contractor's) safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraph, Bidder agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

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8. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

9. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. The submission of this Bid constitutes an incontrovertible representation by Bidder that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

6.02 Bidder's Certifications

A. The Bidder certifies the following:

1. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation.

2. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.

3. Bidder has not solicited or induced any individual or entity to refrain from bidding.

4. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 8.02.A:

a. Corrupt practice means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process.

b. Fraudulent practice means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition.

c. Collusive practice means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels.

d. Coercive practice means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

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BIDDER hereby submits this Bid as set forth above:

Bidder:

_____

(typed or printed name of organization)

By: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

If Bidder is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.

Attest: _____

(individual's signature)

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Date: _____

(typed or printed)

Address for giving notices:

_____

_____

Bidder's Contact:

Name: _____

(typed or printed)

Title: _____

(typed or printed)

Phone: _____

Email: _____

Address:

_____

_____

_____

Bidder's Contractor License No.: (if applicable) _____

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BID BOND (PENAL SUM FORM)

Bidder	**Surety**
Name: **[Full formal name of Bidder]** Address *(principal place of business)*: **[Address of Bidder's principal place of business]**	Name: **[Full formal name of Surety]** Address *(principal place of business)*: **[Address of Surety's principal place of business]**
Owner	**Bid**
Name: **[Full formal name of Owner]** Address *(principal place of business)*: **[Address of Owner's principal place of business]**	Project *(name and location)*: **[Owner project/contract name, and location of the project]** Bid Due Date: **[Enter date bid is due]**
Bond Penal Sum: **[Amount]** Date of Bond: **[Date]**	

Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth in this Bid Bond, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.

Bidder	Surety
_____ *(Full formal name of Bidder)*	_____ *(Full formal name of Surety) (corporate seal)*
By: _____ *(Signature)*	By: _____ *(Signature) (Attach Power of Attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title: _____	Title: _____
Attest: _____ *(Signature)*	Attest: _____ *(Signature)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title:	Title:

Notes: (1) Note: Addresses are to be used for giving any required notice. (2) Provide execution by any additional parties, such as joint venturers, if necessary.

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1. Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond will be Owner's sole and exclusive remedy upon default of Bidder.
2. Default of Bidder occurs upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
3. This obligation will be null and void if:
    3.1. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
    3.2. All Bids are rejected by Owner, or
    3.3. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
4. Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
5. Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions does not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
6. No suit or action will be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety, and in no case later than one year after the Bid due date.
7. Any suit or action under this Bond will be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
8. Notices required hereunder must be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by personal delivery, commercial courier, or by United States Postal Service registered or certified mail, return receipt requested, postage pre-paid, and will be deemed to be effective upon receipt by the party concerned.
9. Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
10. This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond will be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute governs and the remainder of this Bond that is not in conflict therewith continues in full force and effect.
11. The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

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NOTICE OF AWARD

Date of Issuance:

Owner: Owner's Contract No.:

Engineer: Engineer's Project No.:

Contract:

Bidder:

Bidder's Address:

You are notified that your Bid dated **[Bid Date]** for the above Contract, and that you are the Successful Bidder and are awarded a Contract for **[Project Name]**

[Describe Work, alternates, or sections of Work awarded.]

The Contract Price of your Contract is $**(Contract Price).** Contract Price is subject to adjustment based on the provisions of the Contract, including but not limited to those governing changes, Unit Price Work, and Work performed on a cost-plus-fee basis, as applicable.

[Number of copies sent] unexecuted counterparts of the Agreement accompany this Notice of Award, and one copy of the Contract Documents accompanies this Notice of Award, or has been transmitted or made available to Bidder electronically.

☐ Drawings will be delivered separately from the other Contract Documents.

You must comply with the following conditions precedent within 15 days of the date of receipt of this Notice of Award:

1. Deliver to Owner **[number of copies sent]** counterparts of the Agreement, signed by Bidder (as Contractor).

2. Deliver with the signed Agreement(s) the Contract security (such as required performance and payment bonds) and insurance documentation, as specified in the Instructions to Bidders and in the General Conditions, Articles 2 and 6.

3. Other conditions precedent (if any): **[Describe other conditions that require Successful Bidder's compliance]**

Failure to comply with these conditions within the time specified will entitle Owner to consider you in default, annul this Notice of Award, and declare your Bid security forfeited.

Within 10 days after you comply with the above conditions, Owner will return to you one fully signed counterpart of the Agreement, together with any additional copies of the Contract Documents as indicated in Paragraph 2.02 of the General Conditions.

Owner: **[OWNER]**_____

By *(signature)*:_____

Name (printed):_____

Title: _____

Copy to Engineer

EJCDC® C-510, Notice of Award.
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AGREEMENT

THIS AGREEMENT is by and between CITY OF MENOMONIE ("OWNER") and _____ ("CONTRACTOR").

Terms used in this Agreement have the meanings stated in the General Conditions and the Supplementary Conditions.

OWNER and CONTRACTOR, hereby agree as follows:

ARTICLE 1 - WORK

1.01 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING, CITY OF MENOMONIE, DUNN COUNTY, WI.

ARTICLE 2 - THE PROJECT

2.01 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING, CITY OF MENOMONIE, DUNN COUNTY, WI.

ARTICLE 3 - ENGINEER

3.01 The Owner has retained MSA Professional Services, Inc. ("Engineer") to act as Owner's representative, assume all duties and responsibilities, and have the rights and authority assigned to Engineer in the Contract.

3.02 The part of the Project that pertains to the Work has been designed by Engineer.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of the Essence

A. All time limits for Milestones, if any, Substantial Completion, and completion and readiness for final payment as stated in the Contract Documents are of the essence of the Contract.

4.02 Contract Times: Dates

A. The Work will complete Milestone #1 by September 15, 2026, be substantially completed on or before August 31, 2027, and completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before May 1, 2028.

4.03 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial loss if the Work is not completed [and Milestones not achieved] within the times specified in Paragraph 4.02 above, plus any extensions thereof allowed in accordance with the Contract. The parties also recognize the delays, expense and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the

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Work is not completed on time. Accordingly, instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty):

1. Substantial Completion: Contractor shall pay Owner $2,185.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for Substantial Completion until the Work is substantially complete.

2. Completion of Remaining Work: After Substantial Completion, if Contractor shall neglect, refuse or fail to complete the remaining Work within the Contract Time (as duly adjusted pursuant to the Contract) for completion and readiness for final payment, Contractor shall pay OWNER $2,185.00 for each day that expires after such time until the Work is completed and ready for final payment.

3. Milestones: Contractor shall pay Owner $2,185.00 for each day that expires after the time (as duly adjusted pursuant to the Contract) specified above for achievement of Milestone 1, until Milestone 1 is achieved, or until the time specified for Substantial Completion is reached, at which time the rate indicated in Paragraph 4.05.A.1 will apply, rather than the Milestone rate.

4. Liquidated damages for failing to timely attain Milestones, Substantial Completion, and final completion are not additive, and will not be imposed concurrently.

B. If Owner recovers liquidated damages for a delay in completion by Contractor, then such liquidated damages are Owner's sole and exclusive remedy for such delay, and Owner is precluded from recovering any other damages, whether actual, direct, excess, or consequential, for such delay, except for special damages (if any) specified in this Agreement.

ARTICLE 5 - CONTRACT PRICE

5.01 Owner shall pay Contractor for completion of the Work in accordance with the Contract Documents the amounts that follow, subject to adjustment under the Contract:

A. For all Unit Price Work, an amount equal to the sum of the extended prices (established for each separately identified item of Unit Price Work by multiplying the unit price times the actual quantity of that item).

The extended prices for Unit Price Work set forth as of the Effective Date of the Contract are based on estimated quantities. As provided in Paragraph 13.03 of the General Conditions, estimated quantities are not guaranteed, and determinations of actual quantities and classifications are to be made by Engineer.

B. For all Work, at the prices stated in Contractor's Bid, attached hereto as an exhibit.

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

A. Contractor shall submit Applications for Payment not more than once per month in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

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B. Contractor shall submit an updated American Iron and Steel (AIS) checklist and Product Certificates with all pay requests that include AIS products and/or materials. Payment for AIS products and materials will only be approved with a completed AIS Checklist and AIS certification.

6.02 Progress Payments; Retainage

A. Owner shall make progress payments on the basis of Contractor's Applications for Payment once each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as Owner may withhold, including but not limited to liquidated damages, in accordance with the Contract.

a. 95% of Work completed (with the balance being retainage). If the Work has been 50% completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to Owner and ENGINEER, then as long as the character and progress of the Work remain satisfactory to Owner and ENGINEER, there will be no additional retainage; and

b. Estimates may include any fabricated or manufactured materials and components specified, previously paid for by the Contractor and delivered to the work or properly stored and suitable for incorporation in the work embraced in the contract. Invoices showing the amount of the fabricated or manufactured materials and components specified must be submitted with proof of payment by the Contractor prior to being considered for payment. Retainage shall be as outlined in paragraph 6.02.A.1.a. above.

B. Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to 97.5% of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less 100% of Engineer's estimate of the value of Work to be completed or corrected as shown on the punch list of items to be completed or corrected prior to final payment.

C. Contractor shall submit an updated American Iron and Steel (AIS) checklist and Product Certificates with all pay requests that include AIS products and/or materials. Payment for AIS products and materials will only be approved with a completed AIS Checklist and AIS certification.

6.03 Final Payment

A. Upon final completion and acceptance of the Work, Owner shall pay the remainder of the Contract Price in accordance with Paragraph 15.06 of the General Conditions.

6.04 Consent of Surety

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A. Owner will not make final payment, or return or release retainage at Substantial Completion or any other time, unless Contractor submits written consent of the surety to such payment, return, or release.

6.05 Interest

A. All amounts not paid when due will bear interest at the rate of five (5) percent per annum.

ARTICLE 7 - CONTRACT DOCUMENTS

7.01 Contents

A. The Contract Documents consist of all of the following:

1. This Agreement.

2. Bonds:

   a. Performance bond (together with power of attorney).

   b. Payment bond (together with power of attorney).

3. Contractor's Bid

4. General Conditions.

5. Supplementary Conditions.

6. Safe Drinking Water Loan Program and Clean Water Fund Program Contract Packet for DBE Compliance.

7. Employee Rights Under the Davis-Bacon Act

8. Complying with Davis-Bacon Requirements for SDWLP/CWFP Projects.

9. Federal Wage Rate Determinations for DUNN COUNTY, WI; Construction Type(s) –

   WI08-Heavy (Sewer and Water Line and Tunnel), WI15-Heavy (Excluding Tunnel, Sewer, and Water Lines) and WI11-Building, current as of the bid date.

10. Specifications as listed in the table of contents of the project manual (copy of list attached).

11. Drawings (not attached but incorporated by reference) consisting of 97 sheets with each sheet bearing the following general title: WELL #9 WATER TREATMENT FACILITY - PHASE 1 WELL AND BUILDING.

12. Addenda (numbers _____ to _____, inclusive).

13. Exhibits to this Agreement (enumerated as follows):

    a. N/A

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14. List other required attachments (if any), such as documents required by funding or lending agencies.

    a. Utilization of DBE Subcontractors Documentation

        i. No Anticipated Use of Subcontractors Form (if applicable)

        OR

        ii. MBE/WBE Contacts Worksheet Form 8700-294A

        iii. Contractor Acknowledgement Form for Use of American Iron and Steel Requirement

15. The following which may be delivered or issued on or after the Effective Date of the Contract and are not attached hereto:

    a. Notice to Proceed.

    b. Work Change Directives.

    c. Change Orders.

    d. Field Orders.

    e. Warranty Bond, if any.

B. The Contract Documents listed in Paragraph 7.01.A are attached to this Agreement (except as expressly noted otherwise above).

C. There are no Contract Documents other than those listed above in this Article 7.

D. The Contract Documents may only be amended, modified, or supplemented as provided in the Contract.

ARTICLE 8 - REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.01 Contractor's Representations

A. In order to induce Owner to enter into this Contract, Contractor makes the following representations:

1. Contractor has examined and carefully studied the Contract Documents, including Addenda.

2. Contractor has visited the Site, conducted a thorough visual examination of the Site and adjacent areas, and become familiar with the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

3. Contractor is familiar with all Laws and Regulations that may affect cost, progress, and performance of the Work.

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4. Contractor has carefully studied the reports of explorations and tests of subsurface conditions at or adjacent to the Site and the drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, with respect to the Technical Data in such reports and drawings.

5. Contractor has carefully studied the reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, with respect to Technical Data in such reports and drawings.

6. Contractor has considered the information known to Contractor itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Contract Documents; and the Technical Data identified in the Supplementary Conditions or by definition, with respect to the effect of such information, observations, and Technical Data on (a) the cost, progress, and performance of the Work; (b) the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor; and (c) Contractor's safety precautions and programs.

7. Based on the information and observations referred to in the preceding paragraphs, Contractor agrees that no further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price, within the Contract Times, and in accordance with the other terms and conditions of the Contract.

8. Contractor is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Contract Documents.

9. Contractor has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Contractor has discovered in the Contract Documents, and of discrepancies between Site conditions and the Contract Documents, and the written resolution thereof by Engineer is acceptable to Contractor.

10. The Contract Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performance and furnishing of the Work.

11. Contractor's entry into this Contract constitutes an incontrovertible representation by Contractor that without exception all prices in the Agreement are premised upon performing and furnishing the Work required by the Contract Documents.

8.02 Contractor's Certifications

A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 8.02:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of Owner,

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(b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

8.03 Standard General Conditions

A. Owner stipulates that if the General Conditions that are made a part of this Contract are EJCDC® C-700, Standard General Conditions for the Construction Contract (2018), published by the Engineers Joint Contract Documents Committee, and if Owner is the party that has furnished said General Conditions, then Owner has plainly shown all modifications to the standard wording of such published document to the Contractor, through a process such as highlighting or "track changes" (redline/strikeout), or in the Supplementary Conditions.

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IN WITNESS WHEREOF, Owner and Contractor have signed this Agreement.

This Agreement will be effective on _____ (which is the Effective Date of the Contract).

Owner:	Contractor:
City of Menomonie *(typed or printed name of organization)*	_____ *(typed or printed name of organization)*
By: _____ *(individual's signature)*	By: _____ *(individual's signature)*
Name: Randy Knaack *(typed or printed)*	Name: _____ *(typed or printed)*
Title: Mayor *(typed or printed)*	Title: _____ *(typed or printed)*
Date: _____ *(date signed)*	Date: _____ *(date signed)* *(If Contractor is a corporation, a partnership, or a joint venture, attach evidence of authority to sign.)*
Attest: _____ *(individual's signature)*	Attest: _____ *(individual's signature)*
Title: Kate Martin, City Clerk *(typed or printed)*	Title: _____ *(typed or printed)*
Address for giving notices: 800 Wilson Avenue Menomonie, WI 54751	Address for giving notices: _____ _____
Phone: (715) 232-2221	Phone: _____
Email: kmartin@menomonie-wi.gov *(If Owner is a corporation, attach evidence of authority to sign. If Owner is a public body, attach evidence of authority to sign and resolution or other documents authorizing execution of this Agreement.)*	Email: _____ License No.: _____ *(where applicable)* State: _____

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NOTICE TO PROCEED

Owner:	_____	Owner's Project No.:	_____
Engineer:	_____	Engineer's Project No.:	_____
Contractor:	_____	Contractor's Project No.:	_____
Project:	_____		
Contract Name:	_____		
Effective Date of Contract:	_____		

Owner hereby notifies Contractor that the Contract Times under the above Contract will commence to run on **[date Contract Times are to start]** pursuant to Paragraph 4.01 of the General Conditions.

On that date, Contractor shall start performing its obligations under the Contract Documents. No Work will be done at the Site prior to such date.

In accordance with the Agreement: **[Select one of the following two alternatives, insert dates or number of days, and delete the other alternative.]**

The date by which Substantial Completion must be achieved is **[date for Substantial Completion, from Agreement]**, and the date by which readiness for final payment must be achieved is **[date for readiness, from Agreement]**.

[or]

The number of days to achieve Substantial Completion is **[number of days, from Agreement]** from the date stated above for the commencement of the Contract Times, resulting in a date for Substantial Completion of **[date, calculated from commencement date above]**; and the number of days to achieve readiness for final payment is **[number of days, from Agreement]** from the commencement date of the Contract Times, resulting in a date for readiness for final payment of **[date, calculated from commencement date above]**.

Before starting any Work at the Site, Contractor must comply with the following:

[Note any access limitations, security procedures, or other restrictions]

Owner:	**[Full formal name of Owner]**
By *(signature)*:	_____
Name *(printed)*:	_____
Title:	_____
Date Issued:	_____

Copy: Engineer

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PERFORMANCE BOND

CONTRACTOR (*Name and Address*): Name: [Contractor] Address: [Contractor's Address] [Contractor's City], [Contractor's State] [Contractor's Zip]	SURETY (*Name and Address of Principal Place of Business*): Name: Address:
OWNER (*Name and Address*): Name: [Owner] Mailing Address: [Owner's Address] [Owner's City], [Owner's State] [Owner's Zip]	Contract Description (*Name and Location*): [Project Name] [Owner], [Owner's State] Contract Price: $ [Bid Amount] Effective Date of the Agreement

BOND
Bond Amount : [Bid Amount]
Date of Bond DATE
(Date of bond cannot be earlier than Effective Date of the Agreement):

Modifications to this Bond Form
: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Performance Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(Full formal name of Contractor)*	_____ *(full formal name of Surety) (Corporate Seal)*
By: _____ *(Signature)*	By: _____ *Signature (attach power of attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title _____	Title _____
Attest: _____ *Signature*	Attest: _____ *Signature*
Name _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

2. If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Paragraph 3.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond will arise after:

   3.1. The Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice may indicate whether the Owner is requesting a conference among the Owner, Contractor, and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Paragraph 3.1 will be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor, and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement does not waive the Owner's right, if any, subsequently to declare a Contractor Default;

   3.2. The Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and

   3.3. The Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

4. Failure on the part of the Owner to comply with the notice requirement in Paragraph 3.1 does not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

5. When the Owner has satisfied the conditions of Paragraph 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

   5.1. Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

   5.2. Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

   5.3. Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owners concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Paragraph 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

   5.4. Waive its right to perform and complete, arrange for completion, or obtain a new contractor, and with reasonable promptness under the circumstances:

      5.4.1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or

      5.4.2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

6. If the Surety does not proceed as provided in Paragraph 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Paragraph 5.4, and the Owner refuses the

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payment, or the Surety has denied liability, in whole or in part, without further notice, the Owner shall be entitled to enforce any remedy available to the Owner.

7. If the Surety elects to act under Paragraph 5.1, 5.2, or 5.3, then the responsibilities of the Surety to the Owner will not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety will not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication for:

   7.1. the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;

   7.2. additional legal, design professional, and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Paragraph 5; and

   7.3. liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

8. If the Surety elects to act under Paragraph 5.1, 5.3, or 5.4, the Surety's liability is limited to the amount of this Bond.

9. The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price will not be reduced or set off on account of any such unrelated obligations. No right of action will accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors, and assigns.

10. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

11. Any proceeding, legal or equitable, under this Bond must be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and must be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this paragraph are void or prohibited by law, the minimum periods of limitations available to sureties as a defense in the jurisdiction of the suit will be applicable.

12. Notice to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears.

13. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted therefrom and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

14. Definitions

   14.1. *Balance of the Contract Price*—The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made including allowance for the Contractor for any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

   14.2. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

   14.3. *Contractor Default*—Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

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14.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

14.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

15. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

16. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

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PAYMENT BOND

CONTRACTOR (*Name and Address*): Name: [Contractor] Address: [Contractor's Address] [Contractor's City], [Contractor's State] [Contractor's Zip]	SURETY (*Name and Address of Principal Place of Business*): Name: Address:
OWNER (*Name and Address*): Name: [Owner] Mailing Address: [Owner's Address] [Owner's City], [Owner's State] [Owner's Zip]	Contract Description (*Name and Location*): [Project Name] [Owner], [Owner's State] Contract Price: $ [Bid Amount] Effective Date of the Agreement

BOND
Bond Amount : [Bid Amount]
Date of Bond DATE
(Date of bond cannot be earlier than Effective Date of the Agreement):

Modifications to this Bond Form
: ☐ None ☐ See Paragraph 16

Surety and Contractor, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Payment Bond to be duly executed by an authorized officer, agent, or representative.

CONTRACTOR AS PRINCIPAL	**SURETY**
_____ *(Full formal name of Contractor)*	_____ *(full formal name of Surety) (Corporate Seal)*
By: _____ *(Signature)*	By: _____ *Signature (attach power of attorney)*
Name: _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title _____	Title _____
Attest: _____ *Signature*	Attest: _____ *Signature*
Name _____ *(Printed or typed)*	Name: _____ *(Printed or typed)*
Title	Title

Notes: (1) Provide supplemental execution by any additional parties, such as joint venturers. (2) Any singular reference to Contractor, Surety, Owner, or other party shall be considered plural where applicable.

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1. The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to the Owner to pay for labor, materials, and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

2. If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies, and holds harmless the Owner from claims, demands, liens, or suits by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

3. If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond will arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Paragraph 13) of claims, demands, liens, or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials, or equipment furnished for use in the performance of the Construction Contract, and tendered defense of such claims, demands, liens, or suits to the Contractor and the Surety.

4. When the Owner has satisfied the conditions in Paragraph 3, the Surety shall promptly and at the Surety's expense defend, indemnify, and hold harmless the Owner against a duly tendered claim, demand, lien, or suit.

5. The Surety's obligations to a Claimant under this Bond will arise after the following:

   5.1. Claimants who do not have a direct contract with the Contractor

      15..1. have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and

      15..2. have sent a Claim to the Surety (at the address described in Paragraph 13).

   5.2. Claimants who are employed by or have a direct contract with the Contractor have sent a Claim to the Surety (at the address described in Paragraph 13).

6. If a notice of non-payment required by Paragraph 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Paragraph 5.1.1.

7. When a Claimant has satisfied the conditions of Paragraph 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

   7.1. Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

   7.2. Pay or arrange for payment of any undisputed amounts.

   7.3. The Surety's failure to discharge its obligations under Paragraph 7.1 or 7.2 will not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Paragraph 7.1 or 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

8. The Surety's total obligation will not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Paragraph 7.3, and the amount of this Bond will be credited for any payments made in good faith by the Surety.

9. Amounts owed by the Owner to the Contractor under the Construction Contract will be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the

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Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfying obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

10. The Surety shall not be liable to the Owner, Claimants, or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to or give notice on behalf of Claimants, or otherwise have any obligations to Claimants under this Bond.

11. The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders, and other obligations.

12. No suit or action will be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Paragraph 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit will be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor must be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, will be sufficient compliance as of the date received.

14. When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement will be deemed deleted here from and provisions conforming to such statutory or other legal requirement will be deemed incorporated herein. When so furnished, the intent is that this Bond will be construed as a statutory bond and not as a common law bond.

15. Upon requests by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

16. Definitions

16.1. *Claim*—A written statement by the Claimant including at a minimum:

116..1. The name of the Claimant;

116..2. The name of the person for whom the labor was done, or materials or equipment furnished;

116..3. A copy of the agreement or purchase order pursuant to which labor, materials, or equipment was furnished for use in the performance of the Construction Contract;

116..4. A brief description of the labor, materials, or equipment furnished;

116..5. The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;

116..6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;

116..7. The total amount of previous payments received by the Claimant; and

116..8. The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.

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16.2. *Claimant*—An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials, or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond is to include without limitation in the terms of "labor, materials, or equipment" that part of the water, gas, power, light, heat, oil, gasoline, telephone service, or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials, or equipment were furnished.

16.3. *Construction Contract*—The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

16.4. *Owner Default*—Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

16.5. *Contract Documents*—All the documents that comprise the agreement between the Owner and Contractor.

17. If this Bond is issued for an agreement between a contractor and subcontractor, the term Contractor in this Bond will be deemed to be Subcontractor and the term Owner will be deemed to be Contractor.

18. Modifications to this Bond are as follows: **[Describe modification or enter "None"]**

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Contractor's Application for Payment

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			
Application No.:		**Application Date:**	
Application Period:	**From**	**to**	

1. Original Contract Price		$ -
2. Net change by Change Orders		$ -
3. Current Contract Price (Line 1 + Line 2)		$ -
4. Total Work completed and materials stored to date (Sum of Column G Lump Sum Total and Column J Unit Price Total)		$ -
5. Retainage		
a. _____ X $ - Work Completed		$ -
b. _____ X $ - Stored Materials		$ -
c. Total Retainage (Line 5.a + Line 5.b)		$ -
6. Amount eligible to date (Line 4 - Line 5.c)		$ -
7. Less previous payments (Line 6 from prior application)		
8. Amount due this application		$ -
9. Balance to finish, including retainage (Line 3 - Line 4)		$ -

Contractor's Certification

The undersigned Contractor certifies, to the best of its knowledge, the following:

(1) All previous progress payments received from Owner on account of Work done under the Contract have been applied on account to discharge Contractor's legitimate obligations incurred in connection with the Work covered by prior Applications for Payment;

(2) Title to all Work, materials and equipment incorporated in said Work, or otherwise listed in or covered by this Application for Payment, will pass to Owner at time of payment free and clear of all liens, security interests, and encumbrances (except such as are covered by a bond acceptable to Owner indemnifying Owner against any such liens, security interest, or encumbrances); and

(3) All the Work covered by this Application for Payment is in accordance with the Contract Documents and is not defective.

Contractor: _____

Signature: _____ **Date:** _____

Recommended by Engineer		**Approved by Owner**	
By:		**By:**	
Title:		**Title:**	
Date:		**Date:**	
Approved by Funding Agency			
By:		**By:**	
Title:		**Title:**	
Date:		**Date:**	

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Progress Estimate - Lump Sum Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: **Application Period:** **From** **to** **Application Date:**

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
			Original Contract					
			-			-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
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						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
	Original Contract Totals	$ -	$ -	$ -	$ -	$ -		$ -

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Progress Estimate - Lump Sum Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I
			Work Completed					
Item No.	Description	Scheduled Value ($)	(D + E) From Previous Application ($)	This Period ($)	Materials Currently Stored (not in D or E) ($)	Work Completed and Materials Stored to Date (D + E + F) ($)	% of Scheduled Value (G / C) (%)	Balance to Finish (C - G) ($)
Change Orders								
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
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						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
						-		-
	Change Order Totals	$ -	$ -	$ -	$ -	$ -		$ -
Original Contract and Change Orders								
	Project Totals	$ -	$ -	$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Original Contract											
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
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					-		-		-		-
					-		-		-		-
					-		-		-		-
				Original Contract Totals	$ -		$ -	$ -	$ -		$ -

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Progress Estimate - Unit Price Work **Contractor's Application for Payment**

Owner:		**Owner's Project No.:**	
Engineer:		**Engineer's Project No.:**	
Contractor:		**Contractor's Project No.:**	
Project:			
Contract:			

Application No.: _____ **Application Period:** **From** _____ **to** _____ **Application Date:** _____

A	B	C	D	E	F	G	H	I	J	K	L
		Contract Information				Work Completed					
Bid Item No.	Description	Item Quantity	Units	Unit Price ($)	Value of Bid Item (C X E) ($)	Estimated Quantity Incorporated in the Work	Value of Work Completed to Date (E X G) ($)	Materials Currently Stored (not in G) ($)	Work Completed and Materials Stored to Date (H + I) ($)	% of Value of Item (J / F) (%)	Balance to Finish (F - J) ($)
Change Orders											
					-		-		-		-
					-		-		-		-
					-		-		-		-
					-		-		-		-
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					-		-		-		-
					-		-		-		-
					-		-		-		-
				Change Order Totals	$ -		$ -	$ -	$ -		$ -
Original Contract and Change Orders											
				Project Totals	$ -		$ -	$ -	$ -		$ -

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Stored Materials Summary **Contractor's Application for Payment**

Owner: _____
Engineer: _____
Contractor: _____
Project: _____
Contract: _____

Owner's Project No.: _____
Engineer's Project No.: _____
Contractor's Project No.: _____

Application No.: _____ Application Period: From _____ to _____ Application Date: _____

A	B	C	D	E	F	G	H	I	J	K	L	M
						Materials Stored			Incorporated in Work			
Item No. (Lump Sum Tab) or Bid Item No. (Unit Price Tab)	Supplier Invoice No.	Submittal No. (with Specification Section No.)	Description of Materials or Equipment Stored	Storage Location	Application No. When Materials Placed in Storage	Previous Amount Stored ($)	Amount Stored this Period ($)	Amount Stored to Date (G+H) ($)	Amount Previously Incorporated in the Work ($)	Amount Incorporated in the Work this Period ($)	Total Amount Incorporated in the Work (J+K) ($)	Materials Remaining in Storage (I-L) ($)
								-			-	-
								-			-	-
								-			-	-
								-			-	-
								-			-	-
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								-			-	-
								-			-	-
								-			-	-
								-			-	-
					Totals	$ -	$ -	$ -	$ -	$ -	$ -	$ -

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FIELD ORDER NO.: [Number of Field Order]

Owner:	Owner's Project No.:
Engineer:	Engineer's Project No.:
Contractor:	Contractor's Project No.:
Project:	
Contract Name:	
Date Issued:	Effective Date of Field Order:

Contractor is hereby directed to promptly perform the Work described in this Field Order, issued in accordance with Paragraph 11.04 of the General Conditions, for minor changes in the Work without changes in Contract Price or Contract Times. If Contractor considers that a change in Contract Price or Contract Times is required, submit a Change Proposal before proceeding with this Work.

Reference:

Specification Section(s):

Drawing(s) / Details (s):

Description:

[Description of the change to the Work]

Attachments:

[List documents supporting change]

Issued by Engineer

By: _____

Title: _____

Date: _____

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WORK CHANGE DIRECTIVE NO.: [Number of Work Change Directive]

Owner:	Owner's Project No.:
Engineer:	Engineer's Project No.:
Contractor:	Contractor's Project No.:
Project:	
Contract Name:	
Date Issued:	Effective Date of Work Change Directive:

Contractor is directed to proceed promptly with the following change(s):

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

Directive to proceed promptly with the Work described herein, prior to agreeing to change in Contract Price and Contract Time, is issued due to:

Notes to User—Check one or both of the following

☐ Non-agreement on pricing of proposed change. ☐ Necessity to proceed for schedule or other reasons.

Estimated Change in Contract Price and Contract Times (non-binding, preliminary):

Contract Price: $ _____ [increase] [decrease] [not yet estimated].

Contract Time: _____ days [increase] [decrease] [not yet estimated].

Basis of estimated change in Contract Price:

☐ Lump Sum ☐ Unit Price ☐ Cost of the Work ☐ Other

	Recommended by Engineer	Authorized by Owner
By:		
Title:		
Date:		

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CHANGE ORDER NO.: [Number of Change Order]

Owner: Owner's Project No.:
Engineer: Engineer's Project No.:
Contractor: Contractor's Project No.:
Project:
Contract Name:
Date Issued: Effective Date of Change Order:

The Contract is modified as follows upon execution of this Change Order:

Description:

[Description of the change]

Attachments:

[List documents related to the change]

Change in Contract Price	Change in Contract Times [State Contract Times as either a specific date or a number of days]
Original Contract Price: $ _____	Original Contract Times: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] from previously approved Change Orders No. 1 to No. [Number of previous Change Order]: $ _____	[Increase] [Decrease] from previously approved Change Orders No.1 to No. [Number of previous Change Order]: Substantial Completion: _____ Ready for final payment: _____
Contract Price prior to this Change Order: $ _____	Contract Times prior to this Change Order: Substantial Completion: _____ Ready for final payment: _____
[Increase] [Decrease] this Change Order: $ _____	[Increase] [Decrease] this Change Order: Substantial Completion: _____ Ready for final payment: _____
Contract Price incorporating this Change Order: $ _____	Contract Times with all approved Change Orders: Substantial Completion: _____ Ready for final payment: _____

Recommended by Engineer (if required)	Accepted by Contractor
By: _____	_____
Title: _____	_____
Date: _____	_____
Authorized by Owner	Approved by Funding Agency (if applicable)
By: _____	_____
Title: _____	_____
Date: _____	_____

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CERTIFICATE OF SUBSTANTIAL COMPLETION

Owner:
Engineer:
Contractor:
Project:
Contract Name:

Owner's Project No.:
Engineer's Project No.:
Contractor's Project No.:

This ☐ Preliminary ☐ Final Certificate of Substantial Completion applies to:

☐ All Work ☐ The following specified portions of the Work:

[Describe the portion of the work for which Certificate of Substantial Completion is issued]

Date of Substantial Completion: **[Enter date, as determined by Engineer]**

The Work to which this Certificate applies has been inspected by authorized representatives of Owner, Contractor, and Engineer, and found to be substantially complete. The Date of Substantial Completion of the Work or portion thereof designated above is hereby established, subject to the provisions of the Contract pertaining to Substantial Completion. The date of Substantial Completion in the final Certificate of Substantial Completion marks the commencement of the contractual correction period and applicable warranties required by the Contract.

A punch list of items to be completed or corrected is attached to this Certificate. This list may not be all-inclusive, and the failure to include any items on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Amendments of contractual responsibilities recorded in this Certificate should be the product of mutual agreement of Owner and Contractor; see Paragraph 15.03.D of the General Conditions.

The responsibilities between Owner and Contractor for security, operation, safety, maintenance, heat, utilities, insurance, and warranties upon Owner's use or occupancy of the Work must be as provided in the Contract, except as amended as follows:

Amendments to Owner's Responsibilities: ☐ None ☐ As follows:

[List amendments to Owner's Responsibilities]

Amendments to Contractor's Responsibilities: ☐ None ☐ As follows:

[List amendments to Contractor's Responsibilities]

The following documents are attached to and made a part of this Certificate:

[List attachments such as punch list; other documents]

This Certificate does not constitute an acceptance of Work not in accordance with the Contract Documents, nor is it a release of Contractor's obligation to complete the Work in accordance with the Contract Documents.

Engineer

By *(signature)*: _____

Name *(printed)*: _____

Title: _____

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This document has important legal consequences; consultation with an attorney is encouraged with respect to its use or modification. This document should be adapted to the particular circumstances of the contemplated Project and the controlling Laws and Regulations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS
OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.

1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.

3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.

4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.

5. *Bidder*—An individual or entity that submits a Bid to Owner.

6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.

7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.

8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.

9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.

10. *Claim*

a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract

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Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; contesting Engineer's decision regarding a Change Proposal; seeking resolution of a contractual issue that Engineer has declined to address; or seeking other relief with respect to the terms of the Contract.

b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.

c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.

d. A demand for money or services by a third party is not a Claim.

11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.

12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.

13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.

14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.

15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.

16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.

17. *Cost of the Work*—See Paragraph 13.01 for definition.

18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.

19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.

20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.

21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions,

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including sending and receipt; (c) printing of the transmitted Electronic Document by the recipient; (d) the storage and archiving of the Electronic Document by sender and recipient; and (e) the use by recipient of the Electronic Document for purposes permitted by this Contract. Electronic Means does not include the use of text messaging, or of Facebook, Twitter, Instagram, or similar social media services for transmission of Electronic Documents.

22. *Engineer*—The individual or entity named as such in the Agreement.

23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.

24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.

    a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.

    b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.

    c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.

25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.

26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.

27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.

28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.

29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.

30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.

31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.

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32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.

34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.

35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer's review of the submittals.

36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.

38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.

39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.

40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.

41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers' instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.

42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part

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thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms "substantially complete" and "substantially completed" as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.

44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.

45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.

46. *Technical Data*

    a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.

    b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.

    c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.

47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.

48. *Unit Price Work*—Work to be paid for on the basis of unit prices.

49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.

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50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 *Terminology*

A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.

B. *Intent of Certain Terms or Adjectives*: The Contract Documents include the terms "as allowed," "as approved," "as ordered," "as directed" or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives "reasonable," "suitable," "acceptable," "proper," "satisfactory," or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.

C. *Day*: The word "day" means a calendar day of 24 hours measured from midnight to the next midnight.

D. *Defective*: The word "defective," when modifying the word "Work," refers to Work that is unsatisfactory, faulty, or deficient in that it:

1. does not conform to the Contract Documents;

2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or

3. has been damaged prior to Engineer's recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).

E. *Furnish, Install, Perform, Provide*

1. The word "furnish," when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.

2. The word "install," when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.

3. The words "perform" or "provide," when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.

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4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words "furnish," "install," "perform," or "provide," then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

F. *Contract Price or Contract Times*: References to a change in "Contract Price or Contract Times" or "Contract Times or Contract Price" or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term "or both" is not expressed.

G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

2.01 *Delivery of Performance and Payment Bonds; Evidence of Insurance*

A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).

B. *Evidence of Contractor's Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.

C. *Evidence of Owner's Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.

B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

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2.03 *Before Starting Construction*

A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:

1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;

2. a preliminary Schedule of Submittals; and

3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.

B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.

1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.

2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.

3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.

4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

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2.06 *Electronic Transmittals*

A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.

B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.

C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.

B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.

C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.

D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.

E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.

F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.

G. Nothing in the Contract Documents creates:

1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or

2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

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3.02 *Reference Standards*

A. *Standards Specifications, Codes, Laws and Regulations*

1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.

2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements*: Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

2. *Contractor's Review of Contract Documents*: If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.

3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in

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resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:

a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or

b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

A. During the performance of the Work and until final payment, Contractor and Owner shall submit to the Engineer in writing all matters in question concerning the requirements of the Contract Documents (sometimes referred to as requests for information or interpretation—RFIs), or relating to the acceptability of the Work under the Contract Documents, as soon as possible after such matters arise. Engineer will be the initial interpreter of the requirements of the Contract Documents, and judge of the acceptability of the Work.

B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.

C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

A. Contractor and its Subcontractors and Suppliers shall not:

1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or

2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.

B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

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ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

A. The Contract Times will commence to run on the 30th day after the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 30 days after the Effective Date of the Contract. In no event will the Contract Times commence to run later than the 60th day after the day of Bid opening or the 30th day after the Effective Date of the Contract, whichever date is earlier.

4.02 *Starting the Work*

A. Contractor shall start to perform the Work on the date when the Contract Times commence to run. No Work may be done at the Site prior to such date.

4.03 *Reference Points*

A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.

1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.

2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.

B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.

B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption,

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and interference attributable to and within the control of a Subcontractor or Supplier shall be deemed to be within the control of Contractor.

C. If Contractor's performance or progress is delayed, disrupted, or interfered with by unanticipated causes not the fault of and beyond the control of Owner, Contractor, and those for which they are responsible, then Contractor shall be entitled to an equitable adjustment in Contract Times. Such an adjustment will be Contractor's sole and exclusive remedy for the delays, disruption, and interference described in this paragraph. Causes of delay, disruption, or interference that may give rise to an adjustment in Contract Times under this paragraph include but are not limited to the following:

   1. Severe and unavoidable natural catastrophes such as fires, floods, epidemics, and earthquakes;

   2. Abnormal weather conditions;

   3. Acts or failures to act of third-party utility owners or other third-party entities (other than those third-party utility owners or other third-party entities performing other work at or adjacent to the Site as arranged by or under contract with Owner, as contemplated in Article 8); and

   4. Acts of war or terrorism.

D. Contractor's entitlement to an adjustment of Contract Times or Contract Price is limited as follows:

   1. Contractor's entitlement to an adjustment of the Contract Times is conditioned on the delay, disruption, or interference adversely affecting an activity on the critical path to completion of the Work, as of the time of the delay, disruption, or interference.

   2. Contractor shall not be entitled to an adjustment in Contract Price for any delay, disruption, or interference if such delay is concurrent with a delay, disruption, or interference caused by or within the control of Contractor. Such a concurrent delay by Contractor shall not preclude an adjustment of Contract Times to which Contractor is otherwise entitled.

   3. Adjustments of Contract Times or Contract Price are subject to the provisions of Article 11.

E. Each Contractor request or Change Proposal seeking an increase in Contract Times or Contract Price must be supplemented by supporting data that sets forth in detail the following:

   1. The circumstances that form the basis for the requested adjustment;

   2. The date upon which each cause of delay, disruption, or interference began to affect the progress of the Work;

   3. The date upon which each cause of delay, disruption, or interference ceased to affect the progress of the Work;

   4. The number of days' increase in Contract Times claimed as a consequence of each such cause of delay, disruption, or interference; and

   5. The impact on Contract Price, in accordance with the provisions of Paragraph 11.07.

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Contractor shall also furnish such additional supporting documentation as Owner or Engineer may require including, where appropriate, a revised progress schedule indicating all the activities affected by the delay, disruption, or interference, and an explanation of the effect of the delay, disruption, or interference on the critical path to completion of the Work.

F. Delays, disruption, and interference to the performance or progress of the Work resulting from the existence of a differing subsurface or physical condition, an Underground Facility that was not shown or indicated by the Contract Documents, or not shown or indicated with reasonable accuracy, and those resulting from Hazardous Environmental Conditions, are governed by Article 5, together with the provisions of Paragraphs 4.05.D and 4.05.E.

G. Paragraph 8.03 addresses delays, disruption, and interference to the performance or progress of the Work resulting from the performance of certain other work at or adjacent to the Site.

ARTICLE 5—SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

5.01 *Availability of Lands*

A. Owner shall furnish the Site. Owner shall notify Contractor in writing of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work.

B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.

C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

A. *Limitation on Use of Site and Other Areas*

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.

2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b)

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promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.

B. *Removal of Debris During Performance of the Work*: During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.

C. *Cleaning*: Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

D. *Loading of Structures*: Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent structures or land to stresses or pressures that will endanger them.

5.03 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. Those reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data;

2. Those drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface or subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data; and

3. Technical Data contained in such reports and drawings.

B. *Underground Facilities*: Underground Facilities are shown or indicated on the Drawings, pursuant to Paragraph 5.05, and not in the drawings referred to in Paragraph 5.03.A. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data.

C. *Reliance by Contractor on Technical Data*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely upon the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b.

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D. *Limitations of Other Data and Documents*: Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings;

3. the contents of other Site-related documents made available to Contractor, such as record drawings from other projects at or adjacent to the Site, or Owner's archival documents concerning the Site; or

4. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions, or information.

5.04 *Differing Subsurface or Physical Conditions*

A. *Notice by Contractor*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed at the Site:

1. is of such a nature as to establish that any Technical Data on which Contractor is entitled to rely as provided in Paragraph 5.03 is materially inaccurate;

2. is of such a nature as to require a change in the Drawings or Specifications;

3. differs materially from that shown or indicated in the Contract Documents; or

4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing about such condition. Contractor shall not further disturb such condition or perform any Work in connection therewith (except with respect to an emergency) until receipt of a written statement permitting Contractor to do so.

B. *Engineer's Review*: After receipt of written notice as required by the preceding paragraph, Engineer will promptly review the subsurface or physical condition in question; determine whether it is necessary for Owner to obtain additional exploration or tests with respect to the condition; conclude whether the condition falls within any one or more of the differing site condition categories in Paragraph 5.04.A; obtain any pertinent cost or schedule information from Contractor; prepare recommendations to Owner regarding the Contractor's resumption of Work in connection with the subsurface or physical condition in question and the need for any change in the Drawings or Specifications; and advise Owner in writing of Engineer's findings, conclusions, and recommendations.

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C. *Owner's Statement to Contractor Regarding Site Condition*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the subsurface or physical condition in question, addressing the resumption of Work in connection with such condition, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations, in whole or in part.

D. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the subsurface or physical condition in question may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the condition in question has been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

E. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;

    b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,

    c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:

    a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;

    b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or

    c. Contractor failed to give the written notice required by Paragraph 5.04.A.

3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.

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F. *Underground Facilities; Hazardous Environmental Conditions*: Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

A. *Contractor's Responsibilities*: Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:

1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;

2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;

4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and

5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.

B. *Notice by Contractor*: If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.

C. *Engineer's Review*: Engineer will:

1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;

2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;

3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and

4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.

During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.

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D. *Owner's Statement to Contractor Regarding Underground Facility*: After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.

E. *Early Resumption of Work*: If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.

F. *Possible Price and Times Adjustments*

1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

    a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;

    b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and

    c. Contractor gave the notice required in Paragraph 5.05.B.

2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.

3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.

4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

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5.06 *Hazardous Environmental Conditions at Site*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;

2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and

3. Technical Data contained in such reports and drawings.

B. *Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the Technical Data expressly identified in the Supplementary Conditions with respect to such reports and drawings, but such reports and drawings are not Contract Documents. If no such express identification has been made, then Contractor may rely on the accuracy of the Technical Data as defined in Paragraph 1.01.A.46.b. Except for such reliance on Technical Data, Contractor may not rely upon or make any claim against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, with respect to:

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto;

2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or

3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.

C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.

D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.

E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely

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obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.

F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.

G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.

H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to

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indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.

K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.

B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.

C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or Regulations, and must be issued and signed by a surety named in "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual's authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.

E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.

F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner's termination rights under Article 16.

G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.

H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

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6.02 *Insurance—General Provisions*

A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.

B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.

C. Alternative forms of insurance coverage, including but not limited to self-insurance and "Occupational Accident and Excess Employer's Indemnity Policies," are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.

D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.

F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.

G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.

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H. Contractor shall require:

1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and

2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.

I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.

K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.

M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.

N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

A. *Required Insurance*: Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.

B. *General Provisions*: The policies of insurance required by this Paragraph 6.03 as supplemented must:

1. include at least the specific coverages required;

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2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;

3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;

4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and

5. include all necessary endorsements to support the stated requirements.

C. *Additional Insureds*: The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:

1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;

2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;

3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and

5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.

B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.

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C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.

D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.

E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

A. The builder's risk insurance policy purchased and maintained in accordance with Paragraph 6.04 (or an installation floater policy if authorized by the Supplementary Conditions), will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.

2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.

B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to

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Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.

1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.

C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.

D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.

B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.

C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

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ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

A. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. If the Contract Documents note, or Contractor determines, that professional engineering or other design services are needed to carry out Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures, or for Site safety, then Contractor shall cause such services to be provided by a properly licensed design professional, at Contractor's expense. Such services are not Owner-delegated professional design services under this Contract, and neither Owner nor Engineer has any responsibility with respect to (1) Contractor's determination of the need for such services, (2) the qualifications or licensing of the design professionals retained or employed by Contractor, (3) the performance of such services, or (4) any errors, omissions, or defects in such services.

7.02 *Supervision and Superintendence*

A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.

B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents. Contractor shall maintain good discipline and order at the Site.

B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.

C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.

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B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

A. *Contractor's Request; Governing Criteria*: Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.

1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:

a. in the exercise of reasonable judgment Engineer determines that the proposed item:

1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;

3) has a proven record of performance and availability of responsive service; and

4) is not objectionable to Owner.

b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:

1) there will be no increase in cost to the Owner or increase in Contract Times; and

2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.

B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.

C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete

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and Engineer determines that the proposed item is an "or-equal," which will be evidenced by an approved Shop Drawing or other written communication. Engineer will advise Contractor in writing of any negative determination.

D. *Effect of Engineer's Determination*: Neither approval nor denial of an "or-equal" request will result in any change in Contract Price. The Engineer's denial of an "or-equal" request will be final and binding, and may not be reversed through an appeal under any provision of the Contract.

E. *Treatment as a Substitution Request*: If Engineer determines that an item of equipment or material proposed by Contractor does not qualify as an "or-equal" item, Contractor may request that Engineer consider the item a proposed substitute pursuant to Paragraph 7.06.

7.06 *Substitutes*

A. *Contractor's Request; Governing Criteria*: Unless the specification or description of an item of equipment or material required to be furnished under the Contract Documents contains or is followed by words reading that no substitution is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material under the circumstances described below. To the extent possible such requests must be made before commencement of related construction at the Site.

1. Contractor shall submit sufficient information as provided below to allow Engineer to determine if the item of material or equipment proposed is functionally equivalent to that named and an acceptable substitute therefor. Engineer will not accept requests for review of proposed substitute items of equipment or material from anyone other than Contractor.

2. The requirements for review by Engineer will be as set forth in Paragraph 7.06.B, as supplemented by the Specifications, and as Engineer may decide is appropriate under the circumstances.

3. Contractor shall make written application to Engineer for review of a proposed substitute item of equipment or material that Contractor seeks to furnish or use. The application:

   a. will certify that the proposed substitute item will:

      1) perform adequately the functions and achieve the results called for by the general design;

      2) be similar in substance to the item specified; and

      3) be suited to the same use as the item specified.

   b. will state:

      1) the extent, if any, to which the use of the proposed substitute item will necessitate a change in Contract Times;

      2) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with Owner for other work on the Project) to adapt the design to the proposed substitute item; and

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3) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty.

c. will identify:

1) all variations of the proposed substitute item from the item specified; and

2) available engineering, sales, maintenance, repair, and replacement services.

d. will contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including but not limited to changes in Contract Price, shared savings, costs of redesign, and claims of other contractors affected by any resulting change.

B. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each substitute request, and to obtain comments and direction from Owner. Engineer may require Contractor to furnish additional data about the proposed substitute item. Engineer will be the sole judge of acceptability. No substitute will be ordered, furnished, installed, or utilized until Engineer's review is complete and Engineer determines that the proposed item is an acceptable substitute. Engineer's determination will be evidenced by a Field Order or a proposed Change Order accounting for the substitution itself and all related impacts, including changes in Contract Price or Contract Times. Engineer will advise Contractor in writing of any negative determination.

C. *Special Guarantee*: Owner may require Contractor to furnish at Contractor's expense a special performance guarantee or other surety with respect to any substitute.

D. *Reimbursement of Engineer's Cost*: Engineer will record Engineer's costs in evaluating a substitute proposed or submitted by Contractor. Whether or not Engineer approves a substitute so proposed or submitted by Contractor, Contractor shall reimburse Owner for the reasonable charges of Engineer for evaluating each such proposed substitute. Contractor shall also reimburse Owner for the reasonable charges of Engineer for making changes in the Contract Documents (or in the provisions of any other direct contract with Owner) resulting from the acceptance of each proposed substitute.

E. *Contractor's Expense*: Contractor shall provide all data in support of any proposed substitute at Contractor's expense.

F. *Effect of Engineer's Determination*: If Engineer approves the substitution request, Contractor shall execute the proposed Change Order and proceed with the substitution. The Engineer's denial of a substitution request will be final and binding, and may not be reversed through an appeal under any provision of the Contract. Contractor may challenge the scope of reimbursement costs imposed under Paragraph 7.06.D, by timely submittal of a Change Proposal.

7.07 *Concerning Subcontractors and Suppliers*

A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.

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B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.

D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.

E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.

F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.

G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.

I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.

K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.

L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.

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M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.

B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.

C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

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7.11 *Laws and Regulations*

A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.

B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.

C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.

B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.

C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:

1. all persons on the Site or who may be affected by the Work;

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2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and

3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.

D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).

E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.

G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.

H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).

J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

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7.15 *Emergencies*

A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

1. Before submitting a Shop Drawing or Sample, Contractor shall:

a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;

b. determine and verify:

1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;

2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and

3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;

c. confirm that the Submittal is complete with respect to all related data included in the Submittal.

2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.

B. *Submittal Procedures for Shop Drawings and Samples*: Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.

1. *Shop Drawings*

a. Contractor shall submit the number of copies required in the Specifications.

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b. Data shown on the Shop Drawings must be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show Engineer the services, materials, and equipment Contractor proposes to provide, and to enable Engineer to review the information for the limited purposes required by Paragraph 7.16.C.

2. *Samples*

a. Contractor shall submit the number of Samples required in the Specifications.

b. Contractor shall clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as Engineer may require to enable Engineer to review the Submittal for the limited purposes required by Paragraph 7.16.C.

3. Where a Shop Drawing or Sample is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to Engineer's review and approval of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *Engineer's Review of Shop Drawings and Samples*

1. Engineer will provide timely review of Shop Drawings and Samples in accordance with the accepted Schedule of Submittals. Engineer's review and approval will be only to determine if the items covered by the Submittals will, after installation or incorporation in the Work, comply with the requirements of the Contract Documents, and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.

2. Engineer's review and approval will not extend to means, methods, techniques, sequences, or procedures of construction, or to safety precautions or programs incident thereto.

3. Engineer's review and approval of a separate item as such will not indicate approval of the assembly in which the item functions.

4. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Paragraph 7.16.A.3 and Engineer has given written approval of each such variation by specific written notation thereof incorporated in or accompanying the Shop Drawing or Sample. Engineer will document any such approved variation from the requirements of the Contract Documents in a Field Order or other appropriate Contract modification.

5. Engineer's review and approval of a Shop Drawing or Sample will not relieve Contractor from responsibility for complying with the requirements of Paragraphs 7.16.A and B.

6. Engineer's review and approval of a Shop Drawing or Sample, or of a variation from the requirements of the Contract Documents, will not, under any circumstances, change the Contract Times or Contract Price, unless such changes are included in a Change Order.

7. Neither Engineer's receipt, review, acceptance, or approval of a Shop Drawing or Sample will result in such item becoming a Contract Document.

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8. Contractor shall perform the Work in compliance with the requirements and commitments set forth in approved Shop Drawings and Samples, subject to the provisions of Paragraph 7.16.C.4.

D. *Resubmittal Procedures for Shop Drawings and Samples*

1. Contractor shall make corrections required by Engineer and shall return the required number of corrected copies of Shop Drawings and submit, as required, new Samples for review and approval. Contractor shall direct specific attention in writing to revisions other than the corrections called for by Engineer on previous Submittals.

2. Contractor shall furnish required Shop Drawing and Sample submittals with sufficient information and accuracy to obtain required approval of an item with no more than two resubmittals. Engineer will record Engineer's time for reviewing a third or subsequent resubmittal of a Shop Drawing or Sample, and Contractor shall be responsible for Engineer's charges to Owner for such time. Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges.

3. If Contractor requests a change of a previously approved Shop Drawing or Sample, Contractor shall be responsible for Engineer's charges to Owner for its review time, and Owner may impose a set-off against payments due Contractor to secure reimbursement for such charges, unless the need for such change is beyond the control of Contractor.

E. *Submittals Other than Shop Drawings, Samples, and Owner-Delegated Designs*

1. The following provisions apply to all Submittals other than Shop Drawings, Samples, and Owner-delegated designs:

a. Contractor shall submit all such Submittals to the Engineer in accordance with the Schedule of Submittals and pursuant to the applicable terms of the Contract Documents.

b. Engineer will provide timely review of all such Submittals in accordance with the Schedule of Submittals and return such Submittals with a notation of either Accepted or Not Accepted. Any such Submittal that is not returned within the time established in the Schedule of Submittals will be deemed accepted.

c. Engineer's review will be only to determine if the Submittal is acceptable under the requirements of the Contract Documents as to general form and content of the Submittal.

d. If any such Submittal is not accepted, Contractor shall confer with Engineer regarding the reason for the non-acceptance, and resubmit an acceptable document.

2. Procedures for the submittal and acceptance of the Progress Schedule, the Schedule of Submittals, and the Schedule of Values are set forth in Paragraphs 2.03. 2.04, and 2.05.

F. Owner-delegated Designs: Submittals pursuant to Owner-delegated designs are governed by the provisions of Paragraph 7.19.

7.17 *Contractor's General Warranty and Guarantee*

A. Contractor warrants and guarantees to Owner that all Work will be in accordance with the Contract Documents and will not be defective. Engineer is entitled to rely on Contractor's warranty and guarantee.

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B. Owner's rights under this warranty and guarantee are in addition to, and are not limited by, Owner's rights under the correction period provisions of Paragraph 15.08. The time in which Owner may enforce its warranty and guarantee rights under this Paragraph 7.17 is limited only by applicable Laws and Regulations restricting actions to enforce such rights; provided, however, that after the end of the correction period under Paragraph 15.08:

1. Owner shall give Contractor written notice of any defective Work within 60 days of the discovery that such Work is defective; and

2. Such notice will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the notice.

C. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:

1. abuse, or improper modification, maintenance, or operation, by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.

D. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents is absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents, a release of Contractor's obligation to perform the Work in accordance with the Contract Documents, or a release of Owner's warranty and guarantee rights under this Paragraph 7.17:

1. Observations by Engineer;

2. Recommendation by Engineer or payment by Owner of any progress or final payment;

3. The issuance of a certificate of Substantial Completion by Engineer or any payment related thereto by Owner;

4. Use or occupancy of the Work or any part thereof by Owner;

5. Any review and approval of a Shop Drawing or Sample submittal;

6. The issuance of a notice of acceptability by Engineer;

7. The end of the correction period established in Paragraph 15.08;

8. Any inspection, test, or approval by others; or

9. Any correction of defective Work by Owner.

E. If the Contract requires the Contractor to accept the assignment of a contract entered into by Owner, then the specific warranties, guarantees, and correction obligations contained in the assigned contract will govern with respect to Contractor's performance obligations to Owner for the Work described in the assigned contract.

7.18 *Indemnification*

A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses,

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damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.

B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 *Delegation of Professional Design Services*

A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.

B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.

C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.

E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:

1. Checking for conformance with the requirements of this Paragraph 7.19;

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2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and

3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.

F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.

G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.

B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.

C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.

D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.

F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay,

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disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:

1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;

2. An itemization of the specific matters to be covered by such authority and responsibility; and

3. The extent of such authority and responsibilities.

B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.

1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.

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2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.

C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

A. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 *Replacement of Engineer*

A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 *Lands and Easements; Reports, Tests, and Drawings*

A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.

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9.06 *Insurance*

A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.

9.07 *Change Orders*

A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 *Inspections, Tests, and Approvals*

A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.

9.09 *Limitations on Owner's Responsibilities*

A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

9.10 *Undisclosed Hazardous Environmental Condition*

A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 *Evidence of Financial Arrangements*

A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).

9.12 *Safety Programs*

A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.

B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is

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proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.

B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.

B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

A. Engineer has the authority to reject Work in accordance with Article 14.

B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.

C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.

D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

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10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.

C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

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11.02 *Change Orders*

A. Owner and Contractor shall execute appropriate Change Orders covering:

1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;

2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;

3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and

4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.

B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

B. If Owner has issued a Work Change Directive and:

1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.

2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract

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Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.

B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.

B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.

C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.

B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);

2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or

3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).

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C. *Contractor's Fee*: When applicable, the Contractor's fee for overhead and profit will be determined as follows:

1. A mutually acceptable fixed fee; or

2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:

   a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;

   b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;

   c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;

   d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;

   e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and

   f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.

B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

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11.09 *Change Proposals*

A. *Purpose and Content*: Contractor shall submit a Change Proposal to Engineer to request an adjustment in the Contract Times or Contract Price; contest an initial decision by Engineer concerning the requirements of the Contract Documents or relating to the acceptability of the Work under the Contract Documents; challenge a set-off against payment due; or seek other relief under the Contract. The Change Proposal will specify any proposed change in Contract Times or Contract Price, or other proposed relief, and explain the reason for the proposed change, with citations to any governing or applicable provisions of the Contract Documents. Each Change Proposal will address only one issue, or a set of closely related issues.

B. *Change Proposal Procedures*

1. *Submittal*: Contractor shall submit each Change Proposal to Engineer within 30 days after the start of the event giving rise thereto, or after such initial decision.

2. *Supporting Data*: The Contractor shall submit supporting data, including the proposed change in Contract Price or Contract Time (if any), to the Engineer and Owner within 15 days after the submittal of the Change Proposal.

    a. Change Proposals based on or related to delay, interruption, or interference must comply with the provisions of Paragraphs 4.05.D and 4.05.E.

    b. Change proposals related to a change of Contract Price must include full and detailed accounts of materials incorporated into the Work and labor and equipment used for the subject Work.

    The supporting data must be accompanied by a written statement that the supporting data are accurate and complete, and that any requested time or price adjustment is the entire adjustment to which Contractor believes it is entitled as a result of said event.

3. *Engineer's Initial Review*: Engineer will advise Owner regarding the Change Proposal, and consider any comments or response from Owner regarding the Change Proposal. If in its discretion Engineer concludes that additional supporting data is needed before conducting a full review and making a decision regarding the Change Proposal, then Engineer may request that Contractor submit such additional supporting data by a date specified by Engineer, prior to Engineer beginning its full review of the Change Proposal.

4. *Engineer's Full Review and Action on the Change Proposal*: Upon receipt of Contractor's supporting data (including any additional data requested by Engineer), Engineer will conduct a full review of each Change Proposal and, within 30 days after such receipt of the Contractor's supporting data, either approve the Change Proposal in whole, deny it in whole, or approve it in part and deny it in part. Such actions must be in writing, with a copy provided to Owner and Contractor. If Engineer does not take action on the Change Proposal within 30 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of Engineer's inaction the Change Proposal is deemed denied, thereby commencing the time for appeal of the denial under Article 12.

5. *Binding Decision*: Engineer's decision is final and binding upon Owner and Contractor, unless Owner or Contractor appeals the decision by filing a Claim under Article 12.

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C. *Resolution of Certain Change Proposals*: If the Change Proposal does not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters, then Engineer will notify the parties in writing that the Engineer is unable to resolve the Change Proposal. For purposes of further resolution of such a Change Proposal, such notice will be deemed a denial, and Contractor may choose to seek resolution under the terms of Article 12.

D. *Post-Completion*: Contractor shall not submit any Change Proposals after Engineer issues a written recommendation of final payment pursuant to Paragraph 15.06.B.

11.10 *Notification to Surety*

A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:

1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;

2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;

3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and

4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.

B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.

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D. *Mediation*

1. At any time after initiation of a Claim, Owner and Contractor may mutually agree to mediation of the underlying dispute. The agreement to mediate will stay the Claim submittal and response process.

2. If Owner and Contractor agree to mediation, then after 60 days from such agreement, either Owner or Contractor may unilaterally terminate the mediation process, and the Claim submittal and decision process will resume as of the date of the termination. If the mediation proceeds but is unsuccessful in resolving the dispute, the Claim submittal and decision process will resume as of the date of the conclusion of the mediation, as determined by the mediator.

3. Owner and Contractor shall each pay one-half of the mediator's fees and costs.

E. *Partial Approval*: If the party receiving a Claim approves the Claim in part and denies it in part, such action will be final and binding unless within 30 days of such action the other party invokes the procedure set forth in Article 17 for final resolution of disputes.

F. *Denial of Claim*: If efforts to resolve a Claim are not successful, the party receiving the Claim may deny it by giving written notice of denial to the other party. If the receiving party does not take action on the Claim within 90 days, then either Owner or Contractor may at any time thereafter submit a letter to the other party indicating that as a result of the inaction, the Claim is deemed denied, thereby commencing the time for appeal of the denial. A denial of the Claim will be final and binding unless within 30 days of the denial the other party invokes the procedure set forth in Article 17 for the final resolution of disputes.

G. *Final and Binding Results*: If the parties reach a mutual agreement regarding a Claim, whether through approval of the Claim, direct negotiations, mediation, or otherwise; or if a Claim is approved in part and denied in part, or denied in full, and such actions become final and binding; then the results of the agreement or action on the Claim will be incorporated in a Change Order or other written document to the extent they affect the Contract, including the Work, the Contract Times, or the Contract Price.

ARTICLE 13—COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 *Cost of the Work*

A. *Purposes for Determination of Cost of the Work*: The term Cost of the Work means the sum of all costs necessary for the proper performance of the Work at issue, as further defined below. The provisions of this Paragraph 13.01 are used for two distinct purposes:

1. To determine Cost of the Work when Cost of the Work is a component of the Contract Price, under cost-plus-fee, time-and-materials, or other cost-based terms; or

2. When needed to determine the value of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price. When the value of any such adjustment is determined on the basis of Cost of the Work, Contractor is entitled only to those additional or incremental costs required because of the change in the Work or because of the event giving rise to the adjustment.

B. *Costs Included*: Except as otherwise may be agreed to in writing by Owner, costs included in the Cost of the Work will be in amounts no higher than those commonly incurred in the

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locality of the Project, will not include any of the costs itemized in Paragraph 13.01.C, and will include only the following items:

1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by Owner and Contractor in advance of the subject Work. Such employees include, without limitation, superintendents, foremen, safety managers, safety representatives, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work will be apportioned on the basis of their time spent on the Work. Payroll costs include, but are not limited to, salaries and wages plus the cost of fringe benefits, which include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, sick leave, and vacation and holiday pay applicable thereto. The expenses of performing Work outside of regular working hours, on Saturday, Sunday, or legal holidays, will be included in the above to the extent authorized by Owner.
2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith. All cash discounts accrue to Contractor unless Owner deposits funds with Contractor with which to make payments, in which case the cash discounts will accrue to Owner. All trade discounts, rebates, and refunds and returns from sale of surplus materials and equipment will accrue to Owner, and Contractor shall make provisions so that they may be obtained.
3. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by Owner, Contractor shall obtain competitive bids from subcontractors acceptable to Owner and Contractor and shall deliver such bids to Owner, which will then determine, with the advice of Engineer, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee will be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 13.01.
4. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed or retained for services specifically related to the Work.
5. Other costs consisting of the following:
    a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
    b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
        1) In establishing included costs for materials such as scaffolding, plating, or sheeting, consideration will be given to the actual or the estimated life of the material for use on other projects; or rental rates may be established on the basis of purchase or salvage value of such items, whichever is less. Contractor will not

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be eligible for compensation for such items in an amount that exceeds the purchase cost of such item.

c. *Construction Equipment Rental*

1) Rentals of all construction equipment and machinery, and the parts thereof, in accordance with rental agreements approved by Owner as to price (including any surcharge or special rates applicable to overtime use of the construction equipment or machinery), and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs will be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts must cease when the use thereof is no longer necessary for the Work.

2) Costs for equipment and machinery owned by Contractor or a Contractor-related entity will be paid at a rate shown for such equipment in the equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.

3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.

d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.

e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.

f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

g. The cost of utilities, fuel, and sanitary facilities at the Site.

h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.

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i. The costs of premiums for all bonds and insurance that Contractor is required by the Contract Documents to purchase and maintain.

C. *Costs Excluded*: The term Cost of the Work does not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals, general managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.

2. The cost of purchasing, renting, or furnishing small tools and hand tools.

3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.

4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.

5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.

6. Expenses incurred in preparing and advancing Claims.

7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.

D. *Contractor's Fee*

1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:

a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.

b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:

1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.

2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.

2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

E. *Documentation and Audit*: Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish

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and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 *Allowances*

A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.

B. *Cash Allowances*: Contractor agrees that:

1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and

2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.

C. *Owner's Contingency Allowance*: Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.

D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 *Unit Price Work*

A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.

B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.

C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.

D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of

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Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and

b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.

B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.

C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

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D. Contractor shall be responsible for arranging, obtaining, and paying for all inspections and tests required:

1. by the Contract Documents, unless the Contract Documents expressly allocate responsibility for a specific inspection or test to Owner;

2. to attain Owner's and Engineer's acceptance of materials or equipment to be incorporated in the Work;

3. by manufacturers of equipment furnished under the Contract Documents;

4. for testing, adjusting, and balancing of mechanical, electrical, and other equipment to be incorporated into the Work; and

5. for acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work.

Such inspections and tests will be performed by independent inspectors, testing laboratories, or other qualified individuals or entities acceptable to Owner and Engineer.

E. If the Contract Documents require the Work (or part thereof) to be approved by Owner, Engineer, or another designated individual or entity, then Contractor shall assume full responsibility for arranging and obtaining such approvals.

F. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of Engineer, Contractor shall, if requested by Engineer, uncover such Work for observation. Such uncovering will be at Contractor's expense unless Contractor had given Engineer timely notice of Contractor's intention to cover the same and Engineer had not acted with reasonable promptness in response to such notice.

14.03 *Defective Work*

A. *Contractor's Obligation*: It is Contractor's obligation to assure that the Work is not defective.

B. *Engineer's Authority*: Engineer has the authority to determine whether Work is defective, and to reject defective Work.

C. *Notice of Defects*: Prompt written notice of all defective Work of which Owner or Engineer has actual knowledge will be given to Contractor.

D. *Correction, or Removal and Replacement*: Promptly after receipt of written notice of defective Work, Contractor shall correct all such defective Work, whether or not fabricated, installed, or completed, or, if Engineer has rejected the defective Work, remove it from the Project and replace it with Work that is not defective.

E. *Preservation of Warranties*: When correcting defective Work, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee, if any, on said Work.

F. *Costs and Damages*: In addition to its correction, removal, and replacement obligations with respect to defective Work, Contractor shall pay all claims, costs, losses, and damages arising out of or relating to defective Work, including but not limited to the cost of the inspection, testing, correction, removal, replacement, or reconstruction of such defective Work, fines levied against Owner by governmental authorities because the Work is defective, and the costs of repair or replacement of work of others resulting from defective Work. Prior to final

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payment, if Owner and Contractor are unable to agree as to the measure of such claims, costs, losses, and damages resulting from defective Work, then Owner may impose a reasonable set-off against payments due under Article 15.

14.04 *Acceptance of Defective Work*

A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.

B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.

C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.

1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.

2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

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14.06 *Owner May Stop the Work*

A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 *Owner May Correct Defective Work*

A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.

B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.

C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.

D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 *Progress Payments*

A. *Basis for Progress Payments*: The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.

B. *Applications for Payments*

1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work

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completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.

2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.

4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. *Review of Applications*

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.

2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:

   a. the Work has progressed to the point indicated;

   b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and

   c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.

3. By recommending any such payment Engineer will not thereby be deemed to have represented that:

   a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress,

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or involved detailed inspections of the Work beyond the responsibilities specifically assigned to Engineer in the Contract; or

b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by Owner or entitle Owner to withhold payment to Contractor.

4. Neither Engineer's review of Contractor's Work for the purposes of recommending payments nor Engineer's recommendation of any payment, including final payment, will impose responsibility on Engineer:

   a. to supervise, direct, or control the Work;

   b. for the means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto;

   c. for Contractor's failure to comply with Laws and Regulations applicable to Contractor's performance of the Work;

   d. to make any examination to ascertain how or for what purposes Contractor has used the money paid by Owner; or

   e. to determine that title to any of the Work, materials, or equipment has passed to Owner free and clear of any Liens.

5. Engineer may refuse to recommend the whole or any part of any payment if, in Engineer's opinion, it would be incorrect to make the representations to Owner stated in Paragraph 15.01.C.2.

6. Engineer will recommend reductions in payment (set-offs) necessary in Engineer's opinion to protect Owner from loss because:

   a. the Work is defective, requiring correction or replacement;

   b. the Contract Price has been reduced by Change Orders;

   c. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

   d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible; or

   e. Engineer has actual knowledge of the occurrence of any of the events that would constitute a default by Contractor and therefore justify termination for cause under the Contract Documents.

D. *Payment Becomes Due*

1. Ten days after presentation of the Application for Payment to Owner with Engineer's recommendation, the amount recommended (subject to any Owner set-offs) will become due, and when due will be paid by Owner to Contractor.

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E. *Reductions in Payment by Owner*

1. In addition to any reductions in payment (set-offs) recommended by Engineer, Owner is entitled to impose a set-off against payment based on any of the following:

    a. Claims have been made against Owner based on Contractor's conduct in the performance or furnishing of the Work, or Owner has incurred costs, losses, or damages resulting from Contractor's conduct in the performance or furnishing of the Work, including but not limited to claims, costs, losses, or damages from workplace injuries, adjacent property damage, non-compliance with Laws and Regulations, and patent infringement;

    b. Contractor has failed to take reasonable and customary measures to avoid damage, delay, disruption, and interference with other work at or adjacent to the Site;

    c. Contractor has failed to provide and maintain required bonds or insurance;

    d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;

    e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;

    f. The Work is defective, requiring correction or replacement;

    g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;

    h. The Contract Price has been reduced by Change Orders;

    i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;

    j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;

    k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or

    l. Other items entitle Owner to a set-off against the amount recommended.

2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.

3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

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15.02 *Contractor's Warranty of Title*

A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.

C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.

D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.

E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.

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F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.

2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.

3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.

4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.

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2. The final Application for Payment must be accompanied (except as previously delivered) by:

    a. all documentation called for in the Contract Documents;

    b. consent of the surety, if any, to final payment;

    c. satisfactory evidence that all title issues have been resolved such that title to all Work, materials, and equipment has passed to Owner free and clear of any Liens or other title defects, or will so pass upon final payment.

    d. a list of all duly pending Change Proposals and Claims; and

    e. complete and legally effective releases or waivers (satisfactory to Owner) of all Lien rights arising out of the Work, and of Liens filed in connection with the Work.

3. In lieu of the releases or waivers of Liens specified in Paragraph 15.06.A.2 and as approved by Owner, Contractor may furnish receipts or releases in full and an affidavit of Contractor that: (a) the releases and receipts include all labor, services, material, and equipment for which a Lien could be filed; and (b) all payrolls, material and equipment bills, and other indebtedness connected with the Work for which Owner might in any way be responsible, or which might in any way result in liens or other burdens on Owner's property, have been paid or otherwise satisfied. If any Subcontractor or Supplier fails to furnish such a release or receipt in full, Contractor may furnish a bond or other collateral satisfactory to Owner to indemnify Owner against any Lien, or Owner at its option may issue joint checks payable to Contractor and specified Subcontractors and Suppliers.

B. *Engineer's Review of Final Application and Recommendation of Payment*: If, on the basis of Engineer's observation of the Work during construction and final inspection, and Engineer's review of the final Application for Payment and accompanying documentation as required by the Contract Documents, Engineer is satisfied that the Work has been completed and Contractor's other obligations under the Contract have been fulfilled, Engineer will, within 10 days after receipt of the final Application for Payment, indicate in writing Engineer's recommendation of final payment and present the final Application for Payment to Owner for payment. Such recommendation will account for any set-offs against payment that are necessary in Engineer's opinion to protect Owner from loss for the reasons stated above with respect to progress payments. Otherwise, Engineer will return the Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application for Payment.

C. *Notice of Acceptability*: In support of its recommendation of payment of the final Application for Payment, Engineer will also give written notice to Owner and Contractor that the Work is acceptable, subject to stated limitations in the notice and to the provisions of Paragraph 15.07.

D. *Completion of Work*: The Work is complete (subject to surviving obligations) when it is ready for final payment as established by the Engineer's written recommendation of final payment and issuance of notice of the acceptability of the Work.

E. *Final Payment Becomes Due*: Upon receipt from Engineer of the final Application for Payment and accompanying documentation, Owner shall set off against the amount recommended by

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Engineer for final payment any further sum to which Owner is entitled, including but not limited to set-offs for liquidated damages and set-offs allowed under the provisions of this Contract with respect to progress payments. Owner shall pay the resulting balance due to Contractor within 30 days of Owner's receipt of the final Application for Payment from Engineer.

15.07 *Waiver of Claims*

A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim, appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:

1. correct the defective repairs to the Site or such adjacent areas;

2. correct such defective Work;

3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and

4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.

B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.

C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under

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Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.

D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.

E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:

1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);

2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;

3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or

4. Contractor's repeated disregard of the authority of Owner or Engineer.

B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:

1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and

2. enforce the rights available to Owner under any applicable performance bond.

C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take

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possession of the Work, incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and complete the Work as Owner may deem expedient.

D. Owner may not proceed with termination of the Contract under Paragraph 16.02.B if Contractor within 7 days of receipt of notice of intent to terminate begins to correct its failure to perform and proceeds diligently to cure such failure.

E. If Owner proceeds as provided in Paragraph 16.02.B, Contractor shall not be entitled to receive any further payment until the Work is completed. If the unpaid balance of the Contract Price exceeds the cost to complete the Work, including all related claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals) sustained by Owner, such excess will be paid to Contractor. If the cost to complete the Work including such related claims, costs, losses, and damages exceeds such unpaid balance, Contractor shall pay the difference to Owner. Such claims, costs, losses, and damages incurred by Owner will be reviewed by Engineer as to their reasonableness and, when so approved by Engineer, incorporated in a Change Order. When exercising any rights or remedies under this paragraph, Owner shall not be required to obtain the lowest price for the Work performed.

F. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue, or any rights or remedies of Owner against Contractor or any surety under any payment bond or performance bond. Any retention or payment of money due Contractor by Owner will not release Contractor from liability.

G. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 6.01.A, the provisions of that bond will govern over any inconsistent provisions of Paragraphs 16.02.B and 16.02.D.

16.03 *Owner May Terminate for Convenience*

A. Upon 7 days' written notice to Contractor and Engineer, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for (without duplication of any items):

1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and

3. other reasonable expenses directly attributable to termination, including costs incurred to prepare a termination for convenience cost proposal.

B. Contractor shall not be paid for any loss of anticipated profits or revenue, post-termination overhead costs, or other economic loss arising out of or resulting from such termination.

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16.04 *Contractor May Stop Work or Terminate*

A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.

B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

A. *Disputes Subject to Final Resolution*: The following disputed matters are subject to final resolution under the provisions of this article:

1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and

2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.

B. *Final Resolution of Disputes*: For any dispute subject to resolution under this article, Owner or Contractor may:

1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;

2. agree with the other party to submit the dispute to another dispute resolution process; or

3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

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ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:

1. in person, by a commercial courier service or otherwise, to the recipient's place of business;

2. by registered or certified mail, postage prepaid, to the recipient's place of business; or

3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

A. This Contract is to be governed by the law of the state in which the Project is located.

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18.08 *Assignment of Contract*

A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SUPPLEMENTARY CONDITIONS OF THE CONSTRUCTION CONTRACT

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SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement EJCDC® C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added thereto.

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

No suggested Supplementary Conditions in this Article.

ARTICLE 2 - PRELIMINARY MATTERS

SC-2.02 Copies of Documents

SC-2.02.A. Amend the first sentence of Paragraph 2.02.A. to read as follows:

A. Owner shall furnish to Contractor up to one (1) printed copies of the Contract Documents (including one fully executed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional copies will be furnished upon request at the cost of reproduction.

2.06 ARTICLE 3 - DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

SC-3.01 Delete Paragraph 3.01.C. in its entirety.

ARTICLE 5 - SITE; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

SC 5.06 Delete Paragraphs 5.06.A and 5.06.B in their entirety and insert the following:

A. No reports or drawings related to Hazardous Environmental Conditions at the Site are known to Owner.

B. Not Used.

ARTICLE 6 - BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

SC-6.01 Add the following paragraphs immediately after Paragraph 6.01.A:

1. *Required Performance Bond Form:* The performance bond that Contractor furnishes will be in the form of EJCDC® C-610, Performance Bond (2018 edition).

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2. *Required Payment Bond Form:* The payment bond that Contractor furnishes will be in the form of EJCDC® C-615, Payment Bond (2018 edition).

6.03 Contractor's Insurance

SC-6.03 Add the following new paragraph immediately after Paragraph 603.C:

D. Other Additional Insureds: As a supplement to the provisions of Paragraph 6.03.C of the General Conditions, the commercial general liability, automobile liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies must include as additional insureds (in addition to Owner and Engineer) the following:

1. City of Menomonie - (*Owner listed as Certificate Holder*)

2. MSA Professional Services, Inc.

E. Workers' Compensation and Employer's Liability: Contractor shall purchase and maintain workers' compensation and employer's liability insurance, including, as applicable, United States Longshoreman and Harbor Workers' Compensation Act, Jones Act, stop-gap employer's liability coverage for monopolistic states, and foreign voluntary workers' compensation (from available sources, notwithstanding the jurisdictional requirement of Paragraph 6.02.B of the General Conditions).

Workers' Compensation and Related Policies	Policy limits of not less than:
Workers' Compensation	
State	Statutory
Applicable Federal (e.g., Longshoreman's)	Statutory
Foreign voluntary workers' compensation (employer's responsibility coverage), if applicable	Statutory
Employer's Liability	
Bodily injury by accident—each accident	$100,000
Bodily injury by disease—Each Employee	$100,000
Bodily Injury by Disease – Policy Limit	$500,000

F. Commercial General Liability—Claims Covered: Contractor shall purchase and maintain commercial general liability insurance, covering all operations by or on behalf of Contractor, on an occurrence basis, against claims for:

1. damages because of bodily injury, sickness or disease, or death of any person other than Contractor's employees,

2. damages insured by reasonably available personal injury liability coverage, and

3. damages because of injury to or destruction of tangible property wherever located, including loss of use resulting therefrom.

G. *Commercial General Liability—Form and Content:* Contractor's commercial liability policy must be written on a 1996 (or later) Insurance Services Organization, Inc. (ISO) commercial general liability form (occurrence form) and include the following coverages and endorsements:

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1. Products and completed operations coverage.

    a. Such insurance must be maintained for three years after final payment.

    b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.

2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.

3. Severability of interests and no insured-versus-insured or cross-liability exclusions.

4. Underground, explosion, and collapse coverage.

5. Personal injury coverage.

6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.

7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

H. *Commercial General Liability—Excluded Content*: The commercial general liability insurance policy, including its coverages, endorsements, and incorporated provisions, must not include any of the following:

1. Any modification of the standard definition of "insured contract" (except to delete the railroad protective liability exclusion if Contractor is required to indemnify a railroad or others with respect to Work within 50 feet of railroad property).

2. Any exclusion for water intrusion or water damage.

3. Any provisions resulting in the erosion of insurance limits by defense costs other than those already incorporated in ISO form CG 00 01.

4. Any exclusion of coverage relating to earth subsidence or movement.

5. Any exclusion for the insured's vicarious liability, strict liability, or statutory liability (other than worker's compensation).

6. Any limitation or exclusion based on the nature of Contractor's work.

7. Any professional liability exclusion broader in effect than the most recent edition of ISO form CG 22 79.

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I. *Commercial General Liability—Minimum Policy Limits*

Commercial General Liability	Policy limits of not less than:
General Aggregate	$2,000,000
Products—Completed Operations Aggregate	$2,000,000
Personal and Advertising Injury	$1,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

J. *Automobile Liability:* Contractor shall purchase and maintain automobile liability insurance for damages because of bodily injury or death of any person or property damage arising out of the ownership, maintenance, or use of any motor vehicle. The automobile liability policy must be written on an occurrence basis.

Automobile Liability	Policy limits of not less than:
Bodily Injury	
Property Damage	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$1,000,000

K. *Umbrella or Excess Liability:* Contractor shall purchase and maintain umbrella or excess liability insurance written over the underlying employer's liability, commercial general liability, and automobile liability insurance described in the Paragraphs above. The coverage afforded must be at least as broad as that of each and every one of the underlying policies.

Excess or Umbrella Liability	Policy limits of not less than:
Each Occurrence	$5,000,000
General Aggregate	$5,000,000

L. *Contractor's Pollution Liability Insurance:* Contractor shall purchase and maintain a policy covering third-party injury and property damage, including cleanup costs, as a result of pollution conditions arising from Contractor's operations and completed operations. This insurance must be maintained for no less than three years after final completion.

Contractor's Pollution Liability	Policy limits of not less than:
Each Occurrence/Claim	$1,000,000
General Aggregate	$1,000,000

M. *Contractor's Professional Liability Insurance:* If Contractor will provide or furnish professional services under this *Contract*, through a delegation of professional design services or otherwise, then Contractor shall be responsible for purchasing and maintaining applicable professional liability insurance. This insurance must cover negligent acts, errors, or omissions in the performance of professional design or related services by the insured or others for whom the insured is legally liable. The insurance must be maintained throughout the duration of the Contract and for a minimum of two years after Substantial Completion. The retroactive date on the policy must pre-date the commencement of furnishing services on the Project.

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Contractor's Professional Liability	Policy limits of not less than:
Each Claim	$1,000,000
Annual Aggregate	$1,000,000

6.04 Builder's Risk and Other Property Insurance

SC-6.04 Supplement Paragraph 6.04 of the General Conditions with the following provisions:

F. *Builder's Risk Requirements:* The builder's risk insurance must:

1. be written on a builder's risk "all risk" policy form that at a minimum includes insurance for physical loss or damage to the Work, temporary buildings, falsework, and materials and equipment stored and in transit, and must not exclude the coverage of the following risks: fire; windstorm; hail; flood; earthquake, volcanic activity, and other earth movement; lightning; riot; civil commotion; terrorism; vehicle impact; aircraft; smoke; theft; vandalism and malicious mischief; mechanical breakdown, boiler explosion, and artificially generated electric current; collapse; explosion; debris removal; demolition occasioned by enforcement of Laws and Regulations; and water damage (other than that caused by flood).

    a. Such policy will include an exception that results in coverage for ensuing losses from physical damage or loss with respect to any defective workmanship, methods, design, or materials exclusions.

    b. If insurance against mechanical breakdown, boiler explosion, and artificially generated electric current; earthquake, volcanic activity, and other earth movement; or flood, are not commercially available under builder's risk policies, by endorsement or otherwise, such insurance will be provided through other insurance policies acceptable to Owner and Contractor.

2. cover, as insured property, at least the following: (a) the Work and all materials, supplies, machinery, apparatus, equipment, fixtures, and other property of a similar nature that are to be incorporated into or used in the preparation, fabrication, construction, erection, or completion of the Work, including Owner-furnished or assigned property; (b) spare parts inventory required within the scope of the Contract; and (c) temporary works which are not intended to form part of the permanent constructed Work but which are intended to provide working access to the Site, or to the Work under construction, or which are intended to provide temporary support for the Work under construction, including scaffolding, form work, fences, shoring, falsework, and temporary structures.

3. cover expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of contractors, engineers, and architects).

4. extend to cover damage or loss to insured property while in temporary storage at the Site or in a storage location outside the Site (but not including property stored at the premises of a manufacturer or Supplier).

5. extend to cover damage or loss to insured property while in transit.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

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7. allow for partial occupancy or use by Owner by endorsement, and without cancellation or lapse of coverage.

8. include performance/hot testing and start-up, if applicable.

9. be maintained in effect until the Work is complete, as set forth in Paragraph 15.06.D of the General Conditions, or until written confirmation of Owner's procurement of property insurance following Substantial Completion, whichever occurs first.

10. include as named insureds the Owner, Contractor, Subcontractors (of every tier), and any other individuals or entities required by this Contract to be insured under such builder's risk policy. For purposes of Paragraphs 6.04, 6.05, and 6.06 of the General Conditions, and this and all other corresponding Supplementary Conditions, the parties required to be insured will be referred to collectively as "insureds." In addition to Owner, Contractor, and Subcontractors of every tier, include as insureds the following:

    a. Not applicable

11. include, in addition to the Contract Price amount, the value of the following equipment and materials to be installed by the Contractor but furnished by the Owner or third parties:

    a. Not applicable

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

7.02 Supervision and Superintendence

SC-7.02 Add the following paragraphs immediately after Paragraph 7.02.B.

7.02.C. Character of Workers

(1) Provide personnel necessary to supervise and complete all contract work as specified. Ensure workers have the experience and skills necessary to perform assigned work.

(2) Contractor will address non-compliance with Conduct expectations (paragraph 7.20(A)) and will take all reasonable action as is necessary to prevent and correct violations of the Conduct expectations, including and up to removal of workers from assigned work.

7.03 Labor; Working Hours

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be 6am to 10pm Monday through Friday.

2. No Sundays. No Federal Holidays

7.10 Taxes

SC 7.10 Add a new paragraph immediately after Paragraph 7.10.A:

B. Owner represents that it is a qualifying exempt entity under section 77.54(9m), Wis. Stats. (as created by 2015 Wis. Act 126) with respect to exemption from Wisconsin sales and use tax of

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certain items that become part of eligible facilities owned by the qualifying exempt entity. The contract price accounts for such sales and use tax exemptions, to the extent applicable. Contractor shall not be entitled to an increase in contract price if Contractor is not successful in obtaining an anticipated sales and use tax exemption, unless the reason for the inability to obtain the anticipated exemption is a formal determination by the State of Wisconsin that Owner is not a qualifying exempt entity.

1. OWNER's exemption does not apply to construction tools, machinery, equipment, or other property purchased by or leased by CONTRACTOR, or to supplies or materials not incorporated into the Work.

7.13 Safety and Protection

SC-7.13 Insert the following after the second sentence of Paragraph 7.13.G:

The following Owner safety programs are applicable to the Work: City of Menomonie Contractor Minimum Safety Rules (See Section 00 31 32).

7.20 Conduct Expectations

SC-7.20 Add the following immediately following Paragraph 7.19 of the General Conditions.

7.20 Conduct Expectations

A. Contractor understands their obligations to provide a safe, respectful work environment for their employees, for the Owner's employees, for the Engineer's employees and the general public. The Contractor agrees that harassment on the job (unwelcome verbal, physical or other behavior that is related to sex, race, age, or protected class status) will not be tolerated and will be addressed timely and in compliance with anti-harassment laws.

ARTICLE 9 - OWNER'S RESPONSIBILITIES

9.14 Conduct Expectations

SC-9.14 Add the following new paragraph immediately after Paragraph 9.12 of the General Conditions:

9.14 Conduct Expectations

A. Owner understands their obligations to provide a safe, respectful work environment for their employees, for the Contractor's employees, for the Engineer's employees and the general public. The Owner agrees that harassment on the job (unwelcome verbal, physical or other behavior that is related to sex, race, age, or protected class status) will not be tolerated and will be addressed timely and in compliance with anti-harassment laws.

ARTICLE 10 – ENGINEER'S STATUS DURING CONSTRUCTION

10.03 Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. RPR's dealings in matters pertaining to the Work in general will be with Engineer and Contractor. RPR's

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dealings with Subcontractors will only be through or with the full knowledge or approval of Contractor. The RPR will:

1. *Conferences and Meetings:* Attend meetings with Contractor, such as preconstruction conferences, progress meetings, job conferences, and other Project-related meetings (but not including Contractor's safety meetings), and as appropriate prepare and circulate copies of minutes thereof.

2. *Safety Compliance:* Comply with Site safety programs, as they apply to RPR, and if required to do so by such safety programs, receive safety training specifically related to RPR's own personal safety while at the Site.

3. *Liaison*

    a. Serve as Engineer's liaison with Contractor. Working principally through Contractor's authorized representative or designee, assist in providing information regarding the provisions and intent of the Contract Documents.

    b. Assist Engineer in serving as Owner's liaison with Contractor when Contractor's operations affect Owner's on-Site operations.

    c. Assist in obtaining from Owner additional details or information, when required for Contractor's proper execution of the Work.

4. *Review of Work; Defective Work*

    a. Conduct on-Site observations of the Work to assist Engineer in determining, to the extent set forth in Paragraph 10.02, if the Work is in general proceeding in accordance with the Contract Documents.

    b. Observe whether any Work in place appears to be defective.

    c. Observe whether any Work in place should be uncovered for observation, or requires special testing, inspection or approval.

5. *Inspections and Tests*

    a. Observe Contractor-arranged inspections required by Laws and Regulations, including but not limited to those performed by public or other agencies having jurisdiction over the Work.

    b. Accompany visiting inspectors representing public or other agencies having jurisdiction over the Work.

6. *Payment Requests:* Review Applications for Payment with Contractor.

7. *Completion*

    a. Participate in Engineer's visits regarding Substantial Completion.

    b. Assist in the preparation of a punch list of items to be completed or corrected.

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c. Participate in Engineer's visit to the Site in the company of Owner and Contractor regarding completion of the Work, and prepare a final punch list of items to be completed or corrected by Contractor.

d. Observe whether items on the final punch list have been completed or corrected.

D. The RPR will not:

1. Authorize any deviation from the Contract Documents or substitution of materials or equipment (including "or-equal" items).

2. Exceed limitations of Engineer's authority as set forth in the Contract Documents.

3. Undertake any of the responsibilities of Contractor, Subcontractors, or Suppliers.

4. Advise on, issue directions relative to, or assume control over any aspect of the means, methods, techniques, sequences or procedures of construction.

5 Advise on, issue directions regarding, or assume control over security or safety practices, precautions, and programs in connection with the activities or operations of Owner or Contractor.

6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

10.09 Character of Work

SC-10.09 Add the following new paragraph immediately after Paragraph 10.08 of the General Conditions:

10.09 Character of Workers

A. The Engineer may suspend the work in writing, withhold progress payments due the contractor, or both for the following reasons:

(1) The Contractor does not furnish suitable and sufficient personnel to perform the work.

(2) The Contractor fails to take sufficient actions to prevent and correct violations of the Conduct expectations (paragraph 7.20(A)), including and up to removal of workers from assigned work.

10.10 Conduct Expectations

SC-10.10 Add the following new paragraph immediately after Paragraph 10.09 of the General Conditions:

10.11 Conduct Expectations

A. Engineer understands their obligations to provide a safe, respectful work environment for their employees, for the Contractor's employees, for the Owner's employees and the general public. The Engineer agrees that harassment on the job (unwelcome verbal, physical or other behavior that is related to sex, race, age, or protected class status) will not be tolerated and will be addressed timely and in compliance with anti-harassment laws.

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ARTICLE 13 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK

13.01 Cost of the Work

SC-13.01 Supplement Paragraph 13.01.B.5.c.(2) by adding the following sentence:

The equipment rental rate book that governs the included costs for the rental of machinery and equipment owned by Contractor (or a related entity) under the Cost of the Work provisions of this Contract is the most current edition of RS Means Data (www.rsmeans.com).

SC-13.01 Supplement Paragraph 13.01.C.2 by adding the following definition of small tools and hand tools:

a. For purposes of this paragraph, "small tools and hand tools" means any tool or equipment whose current price if it were purchased new at retail would be less than $500. [or insert other threshold price.]

13.03 Unit Price Work

SC-13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:

   a. the extended price of a particular item of Unit Price Work amounts to 10 percent or more of the Contract Price (based on estimated quantities at the time of Contract formation) and the variation in the quantity of that particular item of Unit Price Work actually furnished or performed by Contractor differs by more than 25 percent from the estimated quantity of such item indicated in the Agreement; and

   b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.

2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.

3. Adjusted unit prices will apply to all units of that item.

ARTICLE 15 – PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

SC-15.01 Add the following new Paragraph 15.01.F:

F. For contracts in which the Contract Price is based on the Cost of Work, if Owner determines that progress payments made to date substantially exceed the actual progress of the Work (as measured by reference to the Schedule of Values), or present a potential conflict with the Guaranteed Maximum Price, then Owner may require that Contractor prepare and submit a plan for the remaining anticipated Applications for Payment that will bring payments and progress into closer alignment

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and take into account the Guaranteed Maximum Price (if any), through reductions in billings, increases in retainage, or other equitable measures. Owner will review the plan, discuss any necessary modifications, and implement the plan as modified for all remaining Applications for Payment.

15.03 Substantial Completion

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

ARTICLE 17—FINAL RESOLUTIONS OF DISPUTES

Add the following after 17.01

17.02 *Arbitration*

A. All matters subject to final resolution under this Article will be settled by arbitration administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules (subject to the conditions and limitations of this Paragraph SC-17.02). Any controversy or claim in the amount of $100,000 or less will be settled in accordance with the American Arbitration Association's supplemental rules for Fixed Time and Cost Construction Arbitration. This agreement to arbitrate will be specifically enforceable under the prevailing law of any court having jurisdiction.

B. The demand for arbitration will be filed in writing with the other party to the Contract and with the selected arbitration administrator, and a copy will be sent to Engineer for information. The demand for arbitration will be made within the specific time required in Article 17, or if no specified time is applicable within a reasonable time after the matter in question has arisen, and in no event will any such demand be made after the date when institution of legal or equitable proceedings based on such matter in question would be barred by the applicable statute of limitations.

C. The arbitrator(s) must be licensed engineers, contractors, attorneys, or construction managers. Hearings will take place pursuant to the standard procedures of the Construction Arbitration Rules that contemplate in-person hearings. The arbitrators will have no authority to award punitive or other damages not measured by the prevailing party's actual damages, except as may be required by statute or the Contract. Any award in an arbitration initiated under this clause will be limited to monetary damages and include no injunction or direction to any party other than the direction to pay a monetary amount.

D. The Arbitrators will have the authority to allocate the costs of the arbitration process among the parties, but will only have the authority to allocate attorneys' fees if a specific Law or Regulation or this Contract permits them to do so.

E. The award of the arbitrators must be accompanied by a reasoned written opinion and a concise breakdown of the award. The written opinion will cite the Contract provisions deemed applicable and relied on in making the award.

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F. The parties agree that failure or refusal of a party to pay its required share of the deposits for arbitrator compensation or administrative charges will constitute a waiver by that party to present evidence or cross-examine witness. In such event, the other party shall be required to present evidence and legal argument as the arbitrator(s) may require for the making of an award. Such waiver will not allow for a default judgment against the non-paying party in the absence of evidence presented as provided for above.

G. No arbitration arising out of or relating to the Contract will include by consolidation, joinder, or in any other manner any other individual or entity (including Engineer, and Engineer's consultants and the officers, directors, partners, agents, employees or consultants of any of them) who is not a party to this Contract unless:

1. the inclusion of such other individual or entity will allow complete relief to be afforded among those who are already parties to the arbitration;

2. such other individual or entity is substantially involved in a question of law or fact which is common to those who are already parties to the arbitration, and which will arise in such proceedings;

3. such other individual or entity is subject to arbitration under a contract with either Owner or Contractor, or consents to being joined in the arbitration; and

4. the consolidation or joinder is in compliance with the arbitration administrator's procedural rules.

H. The award will be final. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Laws and Regulations relating to vacating or modifying an arbitral award.

I. Except as may be required by Laws or Regulations, neither party nor an arbitrator may disclose the existence, content, or results of any arbitration hereunder without the prior written consent of both parties, with the exception of any disclosure required by Laws and Regulations or the Contract. To the extent any disclosure is allowed pursuant to the exception, the disclosure must be strictly and narrowly limited to maintain confidentiality to the extent possible.

17.03 *Attorneys' Fees*

SC-17.03 Add the following new paragraph immediately after Paragraph 17.02.

17.03 *Attorneys' Fees*

A. For any matter subject to final resolution under this Article, the prevailing party shall be entitled to an award of its attorneys' fees incurred in the final resolution proceedings, in an equitable amount to be determined in the discretion of the court, arbitrator, arbitration panel, or other arbiter of the matter subject to final resolution, taking into account the parties' initial demand or defense positions in comparison with the final result.

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Federal Department of Labor (DOL) Davis-Bacon Wage Determination

DUNN COUNTY, WI
Type(s):

WI08-Heavy (Sewer and Water Line and Tunnel)

WI15-Heavy (Excluding Tunnel, Sewer, and Water Lines).

WI11-Building

Applicable Federal wage rate determination will be current as of the date of the bid opening

Federal wage rates are available at https://sam.gov/content/wage-determinations.

All payroll submissions will be processed through eComply.

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"General Decision Number: WI20250008 12/12/2025

Superseded General Decision Number: WI20240008

State: Wisconsin

Construction Types: Heavy (Sewer and Water Line and Tunnel)

Counties: Wisconsin Statewide.

TUNNEL, SEWER & WATER LINE CONSTRUCTION PROJECTS

Modification Number	Publication Date
0	01/03/2025
1	02/07/2025
2	02/21/2025
3	05/23/2025
4	06/06/2025
5	06/27/2025
6	07/04/2025
7	07/11/2025
8	08/15/2025
9	08/29/2025
10	09/12/2025
11	09/19/2025
12	12/05/2025
13	12/12/2025

BRWI0001-002 06/01/2025

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.09	28.10

BRWI0002-002 06/01/2025

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 48.60	29.31

BRWI0002-005 06/01/2025

ADAMS, BARRON, BROWN, CALUMET, CHIPPEWA, CLARK, COLUMBIA, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, JEFFERSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA, OUTAGAMIE, POLK, PORTAGE, RUSK, SAUK, SHAWANO, SHEBOYGAN, ST. CROIX, TAYLOR, VILAS, WALWORTH, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 46.01	29.31

BRWI0003-002 06/01/2024

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0004-002 06/01/2025

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.71	28.90

BRWI0006-002 06/01/2025

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.36	28.83

BRWI0007-002 06/01/2025

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.34	29.49

BRWI0008-002 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 45.72	27.42

BRWI0009-001 06/01/2024

GREEN LAKE, MARQUETTE, OUTAGAMIE, SHAWANO, WAUPACA, WASHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0011-002 06/01/2024

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0013-002 06/01/2025

DANE, GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.17	28.66

BRWI0019-002 06/01/2025

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.50	28.69

BRWI0021-002 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.14	29.67

BRWI0034-002 06/01/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.17	28.66

CARP0068-011 05/05/2025

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	$ 47.57	31.17
PILEDRIVERMAN	$ 47.71	30.98

CARP0231-002 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
CARPENTER	$ 45.46	31.52

CARP0310-002 06/01/2025

ADAMS, ASHLAND, BAYFIELD (Eastern 2/3), FOREST, IRON, JUNEAU, LANGLADE, LINCOLN, MARATHON, ONEIDA, PORTAGE, PRICE, SHAWANO (Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP0314-001 06/02/2025

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, ROCK, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Carpenter	$ 42.45	28.78
Piledrivermen	$ 44.45	28.78

CARP0361-004 05/05/2025

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 46.82	31.92

CARP0731-002 06/03/2024

CALUMET (Eastern Portion of the County), FOND DU LAC (Eastern Portion of the County), MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
Carpenter	$ 42.44	28.44
Piledriver	$ 42.44	28.44

CARP0955-002 06/02/2025

CALUMET (Western Portion of the County), FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, OUTAGAMIE, WAUPACA, WAUSHARA, AND WINNEBAGO

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP1056-002 06/01/2024

ADAMS, ASHLAND, BARRON, BAYFIELD , BROWN, BUFFALO, BURNETT ,CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST. CROIX (E. of Hwy. 65), TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes

MILLWRIGHT.....$ 42.00 28.85

CARP1074-002 06/02/2025

BARRON, BURNETT, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), RUSK, SAWYER, ST. CROIX (E. of Hwy. 65), AND WASHBURN

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP1143-002 06/02/2025

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPEALEAU AND VERNON COUNTIES

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP1146-002 06/02/2025

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP2337-009 06/02/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
PILEDRIVERMAN	$ 44.39	34.79

CARP2337-010 06/02/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
MILLWRIGHT	$ 44.03	32.94

ELEC0014-002 05/25/2025

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:	$ 44.29	25.21

ELEC0127-002 06/01/2025

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 50.01	28.4

ELEC0158-002 05/25/2025

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	$ 42.00	23.93

ELEC0159-003 05/26/2024

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	$ 48.55	25.91

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 06/01/2025

DOUGLAS COUNTY

	Rates	Fringes
Electricians:	$ 47.46	33.34

ELEC0388-002 06/01/2024

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:	$ 40.19	26%+12.45

ELEC0430-002 06/01/2024

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 48.50	26.25

ELEC0494-005 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 50.86	28.26

ELEC0494-006 06/01/2025

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 45.20	25.27

ELEC0577-003 06/01/2025

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:	$ 41.76	23.65

ELEC0890-003 06/01/2024

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 43.65	25.95%+12.26

ENGI0139-003 06/02/2025

REMAINING COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 50.53	27.89
Group 2	$ 49.28	27.89
Group 3	$ 45.73	27.89
Group 4	$ 45.20	27.89
Group 5	$ 43.13	27.89
Group 6	$ 41.60	27.89

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

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 06/02/2025

DODGE, FOND DU LAC, JEFFERSON, KENOSHA, MILWAUKEE, OZAUKEE, RACINE, SHEBOYGAN, WALWORTH, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 47.19	28.15
Group 2	$ 46.41	28.15
Group 3	$ 45.46	28.15
Group 4	$ 44.41	28.15
Group 5	$ 43.01	28.15

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 06/01/2025

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 44.66	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 47.52	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/01/2025

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	$ 44.00	32.66

IRON0498-005 06/01/2025

GREEN (S.E. 1/3), ROCK (South of Edgerton and Milton), and WALWORTH (S.W. 1/3) COUNTIES:

	Rates	Fringes
IRONWORKER	$ 48.74	49.65

IRON0512-008 05/01/2025

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 46.35	36.86

IRON0512-021 05/01/2025

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA,
PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 42.89	36.86

LABO0113-004 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Open Cut)		
Group 1	$ 19.99	24.42
Group 2	$ 22.54	24.42
Group 3	$ 26.53	24.42
Group 4	$ 37.05	24.42
Group 5	$ 37.23	24.42
Group 6	$ 37.29	24.42
Group 7	$ 41.62	24.42
Group 8	$ 44.78	24.42
Group 9	$ 45.51	24.42

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 06/01/2025

SEWER, TUNNEL & UNDERGROUND

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
Laborers:		
Group 1	$ 27.49	24.42
Group 2	$ 34.17	24.42
Group 3	$ 38.89	24.42
Group 4	$ 40.88	24.42

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 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel-Free Air)		
Group 1	$ 26.53	24.42
Group 2	$ 37.23	24.42
Group 3	$ 37.29	24.42
Group 4	$ 41.62	24.42
Group 5	$ 41.77	24.42
Group 6	$ 44.78	24.42
Group 7	$ 45.51	24.42

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 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON & WAUKESHA COUNTIES

	Rates	Fringes
Laborers: (Tunnel - *COMPRESSED AIR 0 - 15 lbs.)		
Group 1	$ 26.53	24.42
Group 2	$ 37.23	24.42
Group 3	$ 42.22	24.42
Group 4	$ 43.12	24.42
Group 5	$ 43.27	24.42
Group 6	$ 46.30	24.42
Group 7	$ 46.99	24.42

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 06/01/2025

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, KEWAUNEE, 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	$ 36.98	19.97
Group 2	$ 38.83	19.97
Group 3	$ 39.13	19.97
Group 4	$ 39.78	19.97

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 06/01/2025

DANE AND DOUGLAS COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 36.88	19.97
Group 2	$ 39.08	19.97
Group 3	$ 39.38	19.97
Group 4	$ 40.03	19.97

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 06/01/2025

BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Laborers: (SEWER & WATER)		
Group 1	$ 36.67	19.97
Group 2	$ 38.73	19.97
Group 3	$ 39.03	19.97
Group 4	$ 39.68	19.97

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

PLAS0599-002 06/01/2025

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area A	$ 47.22	31.90
Area C	$ 40.06	28.65
Area D	$ 42.28	26.43
Area E	$ 41.16	27.54
Area F	$ 37.33	31.38

AREA DESCRIPTIONS:

AREA A: ASHLAND, BURNETT, BAYFIELD, DOUGLAS, IRON, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA C: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE, MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA D: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA E: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA F: KENOSHA AND RACINE COUNTIES

TEAM0039-001 06/01/2025

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axles	$ 39.57	28.70
3 or more Axles; Euclids, Dumptor & Articulated, Truck Mechanic	$ 39.72	28.70

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.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.30 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 2025. The applicable Executive Order minimum wage rate will be adjusted annually.   Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate 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. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates
in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the 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. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail 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 an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail 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 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.

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END OF GENERAL DECISION"

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"General Decision Number: WI20250011 12/12/2025

Superseded General Decision Number: WI20240011

State: Wisconsin

Construction Type: Building

Counties: Adams, Ashland, Barron, Bayfield, Buffalo, Burnett, Clark, Columbia, Crawford, Dodge, Door, Dunn, Florence, Fond Du Lac, Forest, Grant, Green, Green Lake, Iowa, Iron, Jackson, Jefferson, Juneau, Kewaunee, Lafayette, Langlade, Lincoln, Manitowoc, Marinette, Marquette, Menominee, Monroe, Oconto, Oneida, Pepin, Polk, Portage, Price, Richland, Rusk, Sauk, Sawyer, Shawano, Taylor, Trempealeau, Vernon, Vilas, Walworth, Washburn, Waupaca, Waushara and Wood Counties in Wisconsin.

BUILDING CONSTRUCTION PROJECTS (does not include residential construction consisting of single family homes and apartments up to and including 4 stories)

Modification Number	Publication Date
0	01/03/2025
1	02/28/2025
2	05/30/2025
3	06/06/2025
4	06/27/2025
5	07/11/2025
6	07/25/2025
7	08/08/2025
8	08/15/2025
9	08/22/2025
10	08/29/2025
11	09/05/2025
12	09/12/2025
13	12/05/2025
14	12/12/2025

ASBE0019-002 06/01/2025

COLUMBIA, CRAWFORD, DODGE, GRANT, GREEN, IOWA, JEFFERSON, JUNEAU, LAFAYETTE, MARQUETTE, MONROE, RICHLAND, SAUK, VERNON, AND WALWORTH COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials, protective coverings, coatings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 45.88	38.15

ASBE0034-005 06/09/2025

BARRON, BUFFALO, DUNN, PEPIN, AND POLK COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials; protective coatings, coverings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 55.34	34.03

ASBE0049-003 05/01/2025

ASHLAND, BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
Asbestos Workers/Insulator (Includes the application of all insulating materials; protective coverings, coatings, and finishes to all types of mechanical systems. Includes preparation, wetting, stripping, removal, scrapping, vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 49.17	23.83

ASBE0127-002 06/01/2025

ADAMS, CLARK, DOOR, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, JACKSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARINETTE, MENOMINEE, OCONTO, ONEIDA, PORTAGE, PRICE, RUSK, SHAWANO, TAYLOR, TREMPEALEAU, VILAS, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
Heat and Frost Insulator (Includes the application of all insulating materials, protective coverings, coatings and finishes to all types of mechanical systems; and the application of firestopping material in walls, floors, ceilings. Includes preparation, wetting, stripping, removal, scrapping vacuuming, bagging and disposing of all insulation materials from mechanical systems whether they contain asbestos or not)	$ 45.24	30.56

BOIL0107-001 01/01/2025

	Rates	Fringes
BOILERMAKER		
Boilermaker	$ 46.52	34.63

BRWI0001-003 06/01/2025

CRAWFORD,JUNEAU, MONROE,TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
Bricklayer & Tile Setter	$ 40.09	28.10

BRWI0002-003 06/01/2025

ASHLAND, BURNETT, IRON, WASHBURN

	Rates	Fringes
BRICKLAYER		
Bricklayer, Tile Setter	$ 48.60	29.31
Cement Mason/Concrete Finisher	$ 46.01	29.31

BRWI0002-004 06/01/2025

BAYFIELD COUNTY

	Rates	Fringes
BRICKLAYER		
Bricklayer & Tile Setter	$ 48.60	29.31

BRWI0003-001 06/01/2024

DOOR, KEWAUNEE, FLORENCE, FOND DU LAC, GREEN LAKE, MANITOWOC, MARINETTE, MARQUETTE, OCONTO, SHAWANO, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Setter	$ 38.45	27.41

BRWI0004-003 06/01/2025

WALWORTH COUNTY

	Rates	Fringes
BRICKLAYER	$ 44.71	28.90
CEMENT MASON/CONCRETE FINISHER	$ 40.50	28.90
TILE SETTER	$ 39.19	28.90

BRWI0006-001 06/01/2025

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MENOMINEE, ONEIDA, PORTAGE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer,Cement Mason,Tile Setter	$ 39.36	28.83

BRWI0006-004 06/01/2025

PRICE COUNTY

	Rates	Fringes
Bricklayer & Tile Setter	$ 39.36	28.83

BRWI0007-003 06/01/2025

GREEN AND LAFAYETTE COUNTIES

	Rates	Fringes
Bricklayer & Tile Setter	$ 40.34	29.49

BRWI0013-003 06/01/2025

GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
Bricklayer	$ 41.17	28.66
Tile Layer	$ 38.39	29.79

BRWI0019-004 06/01/2025

BARRON, BURNETT (Southern half), DUNN, PEPIN, POLK, RUSK, AND WASHBURN (Southern half) COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 39.50	28.69

BRWI0019-005 06/01/2025

SAWYER COUNTY

	Rates	Fringes
Bricklayer & Tile Setter	$ 39.50	28.69

BRWI0021-001 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 40.14	29.67

BRWI0034-001 06/01/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER		
Bricklayer, Cement Mason, Tile Layer	$ 41.17	28.66

CARP0068-013 05/05/2025

BURNETT (West of highway 48) AND POLK(West of Highways 35, 48 & 65) COUNTIES

	Rates	Fringes
CARPENTER (Including Drywall Hanging, Acoustical work)	$ 48.54	28.84

CARP0310-007 06/01/2025

ADAMS, BAYFIELD (Eastern 2/3), FOREST, IRON, ONEIDA, PORTAGE, PRICE, SHAWANO (Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging)	$ 41.43	29.99
PILEDRIVERMAN	$ 41.43	29.99

CARP0310-008 06/01/2025

ASHLAND COUNTY

	Rates	Fringes
CABINET INSTALLER (Including Acoustical Work & Drywall Hanging)	$ 41.43	29.99

CARP0314-006 06/02/2025

COLUMBIA, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Carpenter (Including Drywall Hanging, Acoustical Work)	$ 42.45	28.78
Piledriverman	$ 44.45	28.78

CARP0361-006 05/05/2025

BAYFIELD COUNTY (West of Hwy 63)

	Rates	Fringes
Carpenters: (Including Drywall Hanging, Acoustical work)	$ 40.79	27.90

CARP0731-006 06/01/2025

FOND DU LAC (Eastern Portion of the County) AND MANITOWOC COUNTIES

	Rates	Fringes
CARPENTER (Including		

Acoustical Work & Drywall
Hanging).....$ 41.43 29.99
PILEDRIVERMAN.....$ 41.43 29.99

CARP0955-004 06/01/2025

FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging)	$ 41.43	29.99
PILEDRIVERMAN	$ 41.43	29.99

CARP1056-004 06/01/2024

ADAMS, ASHLAND, BARRON, BAYFIELD (Eastern 2/3), BUFFALO, BURNETT, CLARK, COLUMBIA, CRAWFORD, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO, ONEIDA, PEPIN, POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, RUSK, SAUK, SAWYER, SHAWANO, TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 42.00	28.85

CARP1074-009 06/01/2025

BARRON, BURNETT (East of Hwy 48), CLARK, DUNN, POLK (East of Hwy 35, 48, 65), RUSK, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging)	$ 41.43	29.99
PILEDRIVERMAN	$ 41.43	29.99

CARP1143-006 06/01/2025

BUFALO, CRAWFORD, JACKSON, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging)	$ 41.43	29.99
PILEDRIVERMAN	$ 41.43	29.99

CARP1146-006 06/01/2025

DOOR, FLORENCE (Except area bordering Michigan), KEWAUNEE, MARINETTE (Except N.E. corner), MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
CARPENTER (Including Acoustical Work & Drywall Hanging)	$ 41.43	29.99
PILEDRIVERMAN	$ 41.43	29.99

CARP1348-006 05/01/2025

BAYFIELD COUNTY (Western 1/3)

	Rates	Fringes
MILLWRIGHT	$ 41.90	29.51

ELEC0014-001 05/25/2025

ASHLAND, BARRON, BAYFIELD, BUFFALO, BURNETT, CHIPPEWA, CLARK (Except Colby, Fremont, Lynn, Maryville, Sherman, Sherwood, Unity), CRAWFORD, DUNN, GRANT, IRON, JACKSON, MONROE, PEPIN, POLK, PRICE, RICHLAND, RUSK, SAWYER, TAYLOR, TREMPEALEAU, VERNON, AND WASHBURN COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 44.29	25.21

ELEC0014-005 05/25/2025

	Rates	Fringes
Electricians (Teledata System Installer/Technician)	$ 31.17	20.08

Low voltage construction, installation, maintenance and removal of teledata facilities (voice, data, and video) including outside plant, telephone and data inside wire, interconnect, terminal equipment, central offices, PABX, fiber optic cable and equipment, micro waves, V-SAT, bypass, CATV, WAN (wide area networks), LAN (local area networks), and ISDN (integrated systems digital network).

ELEC0158-007 05/25/2025

DOOR, KEWAUNEE, MANITOWOC (except Schleswig), MARINETTE(Wausuakee and area South thereof), OCONTO, MENOMINEE (East of a ine 6 miles West of the West boundary of Oconto County), SHAWANO (Except Area North of Townships of Aniwa and Hutchins) COUNTIES

	Rates	Fringes
Electricians:	$ 42.00	23.93

ELEC0159-001 05/26/2024

COLUMBIA, DODGE (West of Hwy 26 except Chester and Emmet Twps), GREEN LAKE COUNTY (Except Townships of Berlin, Seneca & St. Marie), IOWA, MARQUETTE COUNTY (Except Townships of Neshkoka, Crystal Lake, Newton, and Springfield), AND SAUK COUNTIES

	Rates	Fringes
Electricians:	$ 48.55	25.91

ELEC0219-006 06/01/2019

FLORENCE COUNTY (Townships of Aurora, Commonwealth, Fern, Florence and Homestead) AND MARINETTE COUNTY (Township of Niagara)

	Rates	Fringes
ELECTRICIAN		
Electrical contracts over $180,000	$ 33.94	21.80
Electrical contracts under $180,000	$ 31.75	21.73

ELEC0388-004 06/01/2024

ADAMS, CLARK (Colby, Freemont, Lynn, Mayville, Sherman, Sherwood, Unity), FOREST, JUNEAU, LANGLADE, LINCOLN, MARINETTE (Beecher, Dunbar, Goodman & Pembine), MENOMINEE (Area West of a line 6 miles West of the West boundary of Oconto County), ONEIDA, PORTAGE, SHAWANO (Aniwa and Hutchins), VILAS AND WOOD COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 40.19	26%+12.45

ELEC0494-010 06/01/2025

DODGE COUNTY (Area East of Hwy 26 including all of Chester Township, but excluding Emmet Township), FOND DU LAC (except Waupun), AND MANITOWOC (Schleswig) COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 45.20	25.27

ELEC0494-014 06/01/2025

DODGE (Area East of Hwy 26 including Chester Twp but excluding Emmet Twp), FOND DU LAC (Except Waupun), AND MANITOWOC (Schleswig) COUNTIES

	Rates	Fringes
Sound & Communications		
Installer	$ 37.13	21.58
Technician	$ 37.13	21.58

Installation, testing, maintenance, operation and servicing of all sound, intercom, telephone interconnect, closed circuit TV systems, radio systems, background music systems, language laboratories, electronic carillion, antenna distribution systems, clock and program systems and low-voltage systems such as visual nurse call, audio/visual nurse call systems, doctors entrance register systems. Includes all wire and cable carrying audio, visual, data, light and radio frequency signals. Includes the installation of conduit, wiremold, or raceways in existing structures that have been occupied for six months or more where required for the protection of the wire or cable, but does not mean a complete conduit or raceway system. work covered does not include the installation of conduit, wiremold or any raceways in any new construction, or the installation of power supply outlets by means of which external electric power is supplied to any of the foregoing equipment or products

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ELEC0577-001 06/01/2025

GREEN LAKE (N. Part including Twps of Berlin, St Marie, and Seneca), MARQUETTE (N. part including Twps of Crystal Lake, Neshkoro, Newton, and Springfield), WAUPACA, AND WAUSHARA COUNTIES,

	Rates	Fringes
ELECTRICIAN	$ 41.76	23.65

ELEC0890-005 06/01/2024

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE, AND WALWORTH COUNTIES

	Rates	Fringes
ELECTRICIAN	$ 43.65	25.95%+12.26

ENGI0139-004 06/02/2025

	Rates	Fringes
OPERATOR: Power Equipment		
(1) Cranes, Tower Cranes with or w/o attachments over 100 tons; Cranes, tower Cranes with boom, leads and or jib length 176 ft or longer	$ 50.53	27.89
(2) Cranes, Tower Cranes with or w/o attachments 100 tons or less; Cranes, Tower Cranes with boom, leads, and or jib lengths 175 ft or less	$ 49.28	27.89
(3) Travelling Crane		

(bridge type).....$ 45.73 27.89
(4) Hydraulic Crane, 10
tons or less.....$ 45.20 27.89
(6) Forklift.....$ 41.60 27.89

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

IRON0008-012 06/01/2025

CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMIE, SHAWANO AND WALWORTH (Northeastern part) COUNTIES

	Rates	Fringes
IRONWORKER	$ 44.66	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-004 06/01/2025

ADAMS, COLUMBIA, CRAWFORD, DODGE, FLORENCE, FOREST, GRANT, GREENE (Except S.E. tip), GREEN LAKE, IOWA, JEFFERSON, JUNEAU, LAFAYETTE, LANGLADE, MARATHON, MARQUETTE, MENOMINEE, MONROE, PORTAGE, RICHLAND, SAUK, VERNON, WAUPACA, WAUSHARA, AND WOOD COUNTIES

	Rates	Fringes
IRONWORKER	$ 44.00	32.66

IRON0498-007 06/01/2025

GREEN (S.E. 1/3) AND WALWORTH (Except N.E. part) COUNTIES

	Rates	Fringes
IRONWORKER	$ 48.74	49.65

IRON0512-009 05/01/2025

BARRON, BUFFALO, CLARK, DUNN, JACKSON, PEPIN, POLK, RUSK, TAYLOR AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 46.35	36.86

IRON0512-023 05/01/2025

ASHLAND, BAYFIELD, BURNETT, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 42.89	36.86

LABO0140-003 06/01/2025

BUFFALO, CRAWFORD, GRANT, JACKSON, JUNEAU, MONROE, RICHLAND, TREMPEALEAU (Southern part), AND VERNON COUNTIES

	Rates	Fringes
Laborer, General	$ 37.70	19.97
Laborer: Asbestos/hazardous material remover (Preparation, Removal and Encapsulation of Hazardous Materials from Non-Mechanical Systems)	$ 36.65	19.97

NOTE: Mason Tender $1.00 over general laborer scale;
Pipelayer $1.00 over general laborer scale

LABO0268-005 06/02/2025

AREA 1: BARRON, CLARK (West 1/3), DUNN, PEPIN, POLK, RUSK
TAYLOR (West 1/3)

AREA 2: CLARK (East 2/3), LANGLADE, LINCOLN, ONEIDA, PRICE,
TAYLOR (East 2/3), VILAS, WOOD

AREA 3: BURNETT, IRON, SAWYER, WASHBURN

	Rates	Fringes
Laborer, General		
Area 1	$ 37.70	19.97
Area 2	$ 37.05	19.97
Area 3	$ 36.35	19.97
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)		
Area 1, 2, and 3	$ 36.65	19.97

NOTE: Mason Tender $1.00 over general laborer. Burnett, Iron,
Sawyer & Washburn $.70 over general laborer.

LABO0330-001 06/01/2025

DODGE, DOOR, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE,
KEWAUNEE, MANITOWOC, MARINETTE, MARQUETTE, MENOMINEE, OCONTO,
PORTAGE, SHAWANO, WAUPACA,WAUSHARA

	Rates	Fringes
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 36.65	19.97
Laborers, General	$ 37.05	19.97

NOTE: Mason Tender $1.00 over general laborer.

LABO0464-005 06/01/2025

ADAMS, COLUMBIA, GREEN, IOWA, JEFFERSON, LAFAYETTE, SAUK, AND
WALWORTH COUNTIES

	Rates	Fringes
Laborer, General		
Adams County	$ 37.05	19.97
Remaining Area	$ 37.70	19.97
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous Materials from Non-mechanical Systems)		
Adams County	$ 36.65	19.97
Remaining Area	$ 36.65	19.97

LABO0464-008 06/01/2025

	Rates	Fringes
Landscape Laborer	$ 21.52	18.94

LABO1091-001 05/01/2025

BAYFIELD (West of County Trunk A including the Iron River
National Fish Hatchery and Great Lakes Transmission Co.,
Station 6) COUNTY

	Rates	Fringes
Laborer, General	$ 36.04	23.47
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 37.04	23.47

LABO1091-002 05/01/2025

ASHLAND & BAYFIELD (East of County Trunk A exclusive of the Iron River National Fish Hatchery and Great Lakes Transmission Co., Station 6) COUNTIES

	Rates	Fringes
Laborer, General	$ 34.59	23.47
Laborer: Asbestos/hazardous material remover (Preparation, Removal, Encapsulation of Hazardous materials from Non-mechanical Systems)	$ 35.59	23.47

PLAS0599-003 06/01/2025

PEPIN COUNTY

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 37.25	27.84
PLASTERER	$ 39.75	25.10

PLAS0599-007 06/01/2025

BUFFALO, CRAWFORD, JACKSON, JUNEAU, MONROE, POLK, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 37.25	27.84
PLASTERER	$ 39.75	25.10

PLAS0599-011 06/01/2025

GRANT, GREEN, IOWA, AND LAFAYETTE COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 43.27	25.69
PLASTERER	$ 39.89	28.04

PLAS0633-046 06/01/2025

BAYFIELD, PRICE, AND SAWYER COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 47.22	31.90
PLASTERER	$ 40.84	25.66

PLUM0011-009 05/06/2024

ASHLAND BAYFIELD, BURNETT, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)	$ 49.32	27.18

PLUM0075-006 06/01/2025

DODGE (Watertown), GREEN, JEFFERSON, AND LAFAYETTE COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC work)	$ 60.05	27.90

PLUM0075-008 06/01/2025

COLUMBIA, IOWA, MARQUETTE, RICHLAND, AND SAUK COUNTIES

	Rates	Fringes
PLUMBER (Including HVAC work)....	$ 60.57	27.34

PLUM0118-003 06/01/2025

WALWORTH COUNTY

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work).....	$ 57.35	29.37

PLUM0400-002 06/01/2025

ADAMS, CALUMET, DODGE (Except Watertown), DOOR, FOND DU LAC, GREEN LAKE, KEWAUNEE, MANITOWOC, MARINETTE (Except Niagara), MENOMINEE, OCONTO, OUTAGAMIE, SHAWANO, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work)		
(1) Small buildings (except industrial and power plants) where plumbing or heating is $50,000 or less.....	$ 50.02	23.29
(2) All other work.....	$ 53.23	23.40

PLUM0434-004 06/01/2025

BARRON, BUFFALO, CLARK, CRAWFORD, DUNN, FLORENCE, FOREST, GRANT, JACKSON, JUNEAU, LANGLADE, LINCOLN, MONROE, ONEIDA, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RUSK, TAYLOR, TREMPEALEAU, VERNON, VILAS, AND WOOD COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER (Including HVAC work).....	$ 50.94	25.98

PLUM0601-006 06/01/2025

DODGE (Watertown), GREEN, JEFFERSON, AND LAFAYETTE COUNTIES

	Rates	Fringes
PIPEFITTER (Including HVAC work).....	$ 58.92	31.34

PLUM0601-008 06/01/2025

COLUMBIA, IOWA, MARQUETTE, RICHLAND, AND SAUK COUNTIES

	Rates	Fringes
PIPEFITTER (Including HVAC work).....	$ 60.13	30.16

SHEE0010-031 05/01/2025

ASHLAND, BAYFIELD AND IRON COUNTIES

	Rates	Fringes
SHEET METAL WORKER.....	$ 40.43	29.99

SHEE0010-035 06/05/2023

	Rates	Fringes
SHEET METAL WORKER (HVAC Duct Installation Only).....	$ 31.97	20.67

SHEE0018-003 06/01/2025

FOND DU LAC AND MANITOWOC COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 45.07	31.04

SHEE0018-004 06/01/2025

ADAMS, DOOR, FLORENCE, FOREST, GREEN LAKE, KEWAUNEE, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, SHAWANO, WAUPACA, AND WAUSHARA COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 46.47	31.33

SHEE0018-014 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 58.03	29.98

SHEE0018-015 09/01/2025

WALWORTH COUNTY

	Rates	Fringes
SHEET METAL WORKER (Including HVAC work)	$ 48.92	38.21

SHEE0018-017 06/01/2025

GREEN AND IOWA COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 48.51	35.86

SHEE0018-022 06/01/2025

BARRON, BUFFALO, BURNETT, CLARK, DUNN, JACKSON, PEPIN, POLK, PRICE, RUSK, SAWYER, TAYLOR, TREMPEALEAU, AND WASHBURN COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 42.00	31.56

SHEE0018-023 06/02/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
Sheet Metal Worker (Including HVAC work)	$ 51.92	34.78

SHEE0018-024 06/01/2025

CRAWFORD, GRANT, JUNEAU, MONROE, RICHLAND, AND VERNON COUNTIES

	Rates	Fringes
SHEET METAL WORKER (Including HVAC work)	$ 45.63	29.02

SHEE0018-036 05/26/2025

LANGLADE, LINCOLN, ONEIDA, PORTAGE, AND WOOD COUNTIES

	Rates	Fringes

Sheet Metal Worker (Including
HVAC work).....$ 42.90 32.47

TEAM0346-003 05/01/2025

ASHLAND, BAYFIELD, BURNETT, SAWYER & WASHINGTON COUNTIES

	Rates	Fringes
TRUCK DRIVER		
2 Axle Trucks	$ 35.79	24.13

TEAM0662-002 06/01/2025

ADAMS, BARRON, BUFFALO, CLARK , DOOR, DUNN, JACKSON, JUNEAU, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MENOMINEE, OCONTO, ONEIDA, PEPIN, POLK, PORTAGE, PRICE, RUSK, SHAWANO, TAYLOR, TEMPEALEAU, WAUPACA & WOOD COUNTIES

	Rates	Fringes
TRUCK DRIVER		
2 Axle Trucks	$ 39.57	28.57
3 or more Axles	$ 39.72	28.57

SUWI2002-001 01/23/2002

	Rates	Fringes
Fence Installers	$ 15.00	2.37
GLAZIER	$ 20.21	1.86
Painters:		
Brush & Roller (Excluding Drywall Finishing)	$ 14.64	2.55
Spray	$ 13.72	2.25
Power Equipment Operator		
Backhoe	$ 17.454	7.61
Excavator	$ 17.37	7.45
Front End Loader	$ 23.36	4.61
ROOFER	$ 15.52	3.21
TRUCK DRIVER (3-Axle)	$ 15.28	4.78

WELDERS - Receive rate prescribed for craft performing operation to which welding is incidental.

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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.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.30 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 2025. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate 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. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the 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. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail 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 an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail 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 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.

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END OF GENERAL DECISION"

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"General Decision Number: WI20250015 12/12/2025

Superseded General Decision Number: WI20240015

State: Wisconsin

Construction Type: Heavy

Counties: Wisconsin Statewide.

HEAVY CONSTRUCTION PROJECTS (Excluding Tunnel, Sewer, and Water Lines).

Modification Number	Publication Date
0	01/03/2025
1	02/21/2025
2	05/23/2025
3	06/06/2025
4	06/27/2025
5	07/04/2025
6	07/11/2025
7	07/25/2025
8	08/15/2025
9	08/29/2025
10	09/05/2025
11	09/12/2025
12	09/19/2025
13	12/05/2025
14	12/12/2025

BOIL0107-001 01/01/2025

	Rates	Fringes
BOILERMAKER		
Boilermaker	$ 46.52	34.63

BRWI0001-002 06/01/2025

CRAWFORD, JACKSON, JUNEAU, LA CROSSE, MONROE, TREMPEALEAU, AND VERNON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.09	28.10

BRWI0002-002 06/01/2025

ASHLAND, BAYFIELD, DOUGLAS, AND IRON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 48.60	29.31

BRWI0002-005 06/01/2025

ADAMS, BARRON, BROWN, CALUMET, CHIPPEWA, CLARK, COLUMBIA, DODGE, DOOR, DUNN, FLORENCE, FOND DU LAC, FOREST, GREEN LAKE, JEFFERSON, KEWAUNEE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, OCONTO, ONEIDA, OUTAGAMIE, POLK, PORTAGE, RUSK, SAUK, SHAWANO, SHEBOYGAN, ST. CROIX, TAYLOR, VILAS, WALWORTH, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER	$ 46.01	29.31

BRWI0003-002 06/01/2024

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, AND OCONTO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0004-002 06/01/2025

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
BRICKLAYER	$ 44.71	28.90

BRWI0006-002 06/01/2025

ADAMS, CLARK, FOREST, LANGLADE, LINCOLN, MARATHON, MENOMINEE, ONEIDA, PORTAGE, PRICE, TAYLOR, VILAS AND WOOD COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.36	28.83

BRWI0007-002 06/01/2025

GREEN, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.34	29.49

BRWI0008-002 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
BRICKLAYER	$ 45.72	27.42

BRWI0009-001 06/01/2024

GREEN LAKE, MARQUETTE, OUTAGAMIE, SHAWANO, WAUPACA, WASHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0011-002 06/01/2024

CALUMET, FOND DU LAC, MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 38.45	27.41

BRWI0013-002 06/01/2025

DANE, GRANT, IOWA, AND RICHLAND COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.17	28.66

BRWI0019-002 06/01/2025

BARRON, BUFFALO, BURNETT, CHIPPEWA, DUNN, EAU CLAIRE, PEPIN, PIERCE, POLK, RUSK, ST. CROIX, SAWYER AND WASHBURN COUNTIES

	Rates	Fringes
BRICKLAYER	$ 39.50	28.69

BRWI0021-002 06/01/2025

DODGE AND JEFFERSON COUNTIES

	Rates	Fringes
BRICKLAYER	$ 40.14	29.67

BRWI0034-002 06/01/2025

COLUMBIA AND SAUK COUNTIES

	Rates	Fringes
BRICKLAYER	$ 41.17	28.66

CARP0068-011 05/05/2025

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	$ 47.57	31.17
PILEDRIVERMAN	$ 47.71	30.98

CARP0231-002 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
CARPENTER	$ 45.46	31.52

CARP0310-002 06/01/2025

ADAMS, ASHLAND, BAYFIELD (Eastern 2/3), FOREST, IRON, JUNEAU, LANGLADE, LINCOLN, MARATHON, ONEIDA, PORTAGE, PRICE, SHAWANO (Western Portion of the County), TAYLOR, VILAS, AND WOOD COUNTIES

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP0314-001 06/02/2025

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, JEFFERSON, LAFAYETTE, RICHLAND, ROCK, SAUK, AND WALWORTH COUNTIES

	Rates	Fringes
Carpenter	$ 42.45	28.78
Piledrivermen	$ 44.45	28.78

CARP0361-004 05/05/2025

BAYFIELD (West of Hwy 63) AND DOUGLAS COUNTIES

	Rates	Fringes
CARPENTER	$ 46.82	31.92

CARP0731-002 06/03/2024

CALUMET (Eastern Portion of the County), FOND DU LAC (Eastern Portion of the County), MANITOWOC, AND SHEBOYGAN COUNTIES

	Rates	Fringes
Carpenter	$ 42.44	28.44
Piledriver	$ 42.44	28.44

CARP0955-002 06/02/2025

CALUMET (Western Portion of the County), FOND DU LAC (Western Portion of the County), GREEN LAKE, MARQUETTE, OUTAGAMIE, WAUPACA, WAUSHARA, AND WINNEBAGO

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP1056-002 06/01/2024

ADAMS, ASHLAND, BARRON, BAYFIELD , BROWN, BUFFALO, BURNETT ,CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MANITOWOC, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE, OCONTO,

ONEIDA, OUTAGAMIE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), PORTAGE, PRICE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST. CROIX (E. of Hwy. 65), TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO, AND WOOD COUNTIES

	Rates	Fringes
MILLWRIGHT	$ 42.00	28.85

CARP1074-002 06/02/2025

BARRON, BURNETT, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, PEPIN, PIERCE (E. of Hwy. 29 & 65), POLK (E. of Hwy. 35, 48 & 65), RUSK, SAWYER, ST. CROIX (E. of Hwy. 65), AND WASHBURN

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP1143-002 06/02/2025

BUFFALO, CRAWFORD, JACKSON, LA CROSSE, MONROE, TREMPEALEAU AND VERNON COUNTIES

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP1146-002 06/02/2025

BROWN, DOOR, FLORENCE, KEWAUNEE, MARINETTE, MENOMINEE, OCONTO, AND SHAWANO (Western Portion of the County) COUNTIES

	Rates	Fringes
Carpenter	$ 44.43	29.95
Piledriver	$ 44.43	29.95

CARP2337-009 06/02/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
PILEDRIVERMAN	$ 44.39	34.79

CARP2337-010 06/02/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA

	Rates	Fringes
MILLWRIGHT	$ 44.03	32.94

ELEC0014-002 05/25/2025

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:	$ 44.29	25.21

ELEC0014-007 05/25/2025

ADAMS, ASHLAND, BARRON, BAYFIELD, BROWN, BUFFALO, BURNETT, CALUMET, CHIPPEWA, CLARK, COLUMBIA, CRAWFORD, DANE, DODGE, DOOR, DOUGLAS, DUNN, EAU CLAIRE, FLORENCE, FOND DU LAC, FOREST, GRANT, GREEN, GREEN LAKE, IOWA, IRON, JACKSON, JEFFERSON, JUNEAU, KENOSHA, KEWAUNEE, LA CROSSE, LAFAYETTE, LANGLADE, LINCOLN, MARATHON, MARINETTE, MARQUETTE, MENOMINEE, MONROE,

OCONTO, ONEIDA, OUTAGAMIE, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RACINE, RICHLAND, ROCK, RUSK, SAUK, SAWYER, SHAWANO, SHEBOYGAN, ST CROIX, TAYLOR, TREMPEALEAU, VERNON, VILAS, WALWORTH, WASHBURN, WAUPACA, WAUSHARA, WINNEBAGO AND WOOD COUNTIES

	Rates	Fringes
Teledata System Installer		
Installer/Technician	$ 31.17	20.08

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 06/01/2025

KENOSHA COUNTY

	Rates	Fringes
Electricians:	$ 50.01	28.4

ELEC0158-002 05/25/2025

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	$ 42.00	23.93

ELEC0159-003 05/26/2024

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	$ 48.55	25.91

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 06/01/2025

DOUGLAS COUNTY

	Rates	Fringes
Electricians:	$ 47.46	33.34

ELEC0388-002 06/01/2024

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:	$ 40.19	26%+12.45

ELEC0430-002 06/01/2024

RACINE COUNTY (Except Burlington Township)

	Rates	Fringes
Electricians:	$ 48.50	26.25

ELEC0494-005 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Electricians:	$ 50.86	28.26

ELEC0494-006 06/01/2025

CALUMET (Township of New Holstein), DODGE (East of Hwy 26 including Chester Township), FOND DU LAC, MANITOWOC (Schleswig), and SHEBOYGAN COUNTIES

	Rates	Fringes
Electricians:	$ 45.20	25.27

ELEC0494-013 06/01/2025

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:	$ 37.13	21.58
Technician:	$ 37.13	21.58

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 06/01/2025

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:	$ 41.76	23.65

ELEC0890-003 06/01/2024

DODGE (Emmet Township only), GREEN, JEFFERSON, LAFAYETTE,
RACINE (Burlington Township), ROCK AND WALWORTH COUNTIES

	Rates	Fringes
Electricians:	$ 43.65	25.95%+12.26

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

ENGI0139-001 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WASHINGTON, AND WAUKESHA
COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 55.21	28.55
Group 2	$ 54.71	28.55
Group 3	$ 54.21	28.55
Group 4	$ 52.72	28.55
Group 5	$ 48.74	28.55
Group 6	$ 43.59	28.55

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, Pedestal Tower Cranes and Derricks with or w/o attachments with a lifting capacity of over 100 tons; or Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with boom, leads, and/or jib lengths measuring 176 feet or longer; Self-Erecting Tower Cranes over 4000 lbs lifting capacity; All Cranes with Boom Dollies; Boring Machines (directional); Master Mechanic. $0.50 additional per hour per 100 tons or 100 ft of boom over 200 ft or lifting capacity of crane over 200 tons to a maximum of 300 tons or 300 ft. Thereafter an increase of $0.01 per ft or ton, whichever is greater.

GROUP 2: Cranes, Tower Cranes, Pedestal Tower Cranes and Derricks with or without attachments with a lifting capacity of 100 tons or less; or Cranes, Tower Cranes Portable Tower Cranes, Pedestal Tower Cranes and Derricks with boom, leadsand/or jib lengths measuring 175 feet or less; Backhoes (excavators) 130,000 lbs and over; Caisson Rigs; Pile Drivers; Boring Machines (vertical or horizontal), Versi-Lift, Tri-Lift, Gantry 20,000 lbs & over.

GROUP 3: Backhoe (excavator) under 130,000 lbs;Self-erecting Tower Crane 4000 lbs & under lifting capacity;Traveling Crane (bridge type); Skid Rigs; Dredge Operator; Mechanic; Concrete Paver (over 27E); Concrete Spreader and Distributor; Forklift/ Telehandler (machinery- moving / steel erection); Hydro Blaster, 10,000 psi and over

GROUP 4: Material Hoists; Stack Hoists; Hydraulic Backhoe (tractor or truck mounted); Hydraulic Crane, 5 tons or under (tractor or truck mounted); Hoist (tuggers 5 tons & over); Hydro-Excavators/Daylighters; Concrete Pumps Rotec type Conveyors; Tractor/Bulldozer/End Loader (over 40 hp); Motor Patrol; Scraper Operator; Sideboom; Straddle Carrier; Welder; Bituminous Plant and Paver Operator; Roller over 5 tons; Rail Leveling Machine (Railroad); Tie Placer; Tie Extractor; Tie Tamper; Stone Leveler; Rotary Drill Operator and Blaster; Percussion Drill Operator; Air Track Drill and/or Hammers; Gantrys (under 20,000 lbs); Tencher (wheel

type or chain type having 8 inch or larger bucket); Milling Machine; Off-Road Material Haulers.

GROUP 5: Backfiller; Concrete Auto Breaker (large); Concrete Finishing Machines (road type); Rubber Tired Roller; Concrete Batch Hopper; Concrete Conveyor Systems; Grout Pumps; Concrete Mixers (14S or over); Screw Type Pumps and Gypsum Pumps; Tractor, Bulldozer, End Loader (under 40 hp); Trencher (chain type, bucket under 8 inch); Industrial Locomotives; Rollers under 5 tons; Stump Grinder/Chipper (Large); Timber Equipment; Firemen (pile drivers and derricks); Personnel Hoist, Telehandler over 8000 lbs; Robotic Tool Carrier with or without attachments

GROUP 6: Tampers - Compactors (riding type); Assistant Engineer; A-Frames and Winch Trucks; Concrete Auto Breaker; Hydrohammers (small); Brooms and Sweepers; Hoist (tuggers under 5 tons); Boats (Tug, Safety, Work Barges, Launch); Shouldering Machine Operator; Prestress Machines; Screed Operator; Stone Crushers and Screening Plants; Screed Operators (milling machine), Farm or Industrial Tractor Mounted Equipment; Post Hole Digger; Fireman (asphalt plants); Air Compressors over 400 CFM; Generators, over 150 KW; Augers (vertical and horizontal); Air, Electric, Hydraulic Jacks (slipform); Skid Steer Loaders (with or without attachments); Boiler Operators (temporary heat); Refrigeration Plant/Freeze Machines; Power Pack Vibratory/Ultra Sound Drivers and Extractors; Welding Machines; Heaters (mechanical); Pumps; Winches (small electric); Oiler and Greaser; Rotary Drill Tender; Conveyor; Forklifts/Telehandler 8000 lbs & under; Elevators: Automatic Hoists; Pumps (well points); Combination Small Equipment Operators

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ENGI0139-003 06/02/2025

REMAINING COUNTIES

	Rates	Fringes
Power Equipment Operator		
Group 1	$ 50.53	27.89
Group 2	$ 49.28	27.89
Group 3	$ 45.73	27.89
Group 4	$ 45.20	27.89
Group 5	$ 43.13	27.89
Group 6	$ 41.60	27.89

HAZARDOUS WASTE PREMIUMS:
EPA Level ""A"" Protection: $3.00 per hour
EPA Level ""B"" Protection: $2.00 per hour
EPA Level ""C"" Protection: $1.00 per hour

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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IRON0008-002 06/01/2025

BROWN, CALUMET, DOOR, FOND DU LAC, KEWAUNEE, MANITOWOC, MARINETTE, OCONTO, OUTAGAMI, SHAWANO, SHEBOYGAN, AND WINNEBAGO COUNTIES:

	Rates	Fringes
IRONWORKER	$ 44.66	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0008-003 06/01/2025

KENOSHA, MILWAUKEE, OZAUKEE, RACINE, WALWORTH (N.E. 2/3), WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
IRONWORKER	$ 47.52	33.67

Paid Holidays: New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day & Christmas Day.

IRON0383-001 06/01/2025

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	$ 44.00	32.66

IRON0512-008 05/01/2025

BARRON, BUFFALO, CHIPPEWA, CLARK, DUNN, EAU CLAIRE, JACKSON, PEPIN, PIERCE, POLK, RUSK, ST CROIX, TAYLOR, AND TREMPEALEAU COUNTIES

	Rates	Fringes
IRONWORKER	$ 46.35	36.86

IRON0512-021 05/01/2025

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, LINCOLN, ONEIDA, PRICE, SAWYER, VILAS AND WASHBURN COUNTIES

	Rates	Fringes
IRONWORKER	$ 42.89	36.86

LABO0113-002 06/02/2025

MILWAUKEE AND WAUKESHA COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 38.81	25.53
Group 2	$ 38.96	25.53
Group 3	$ 39.16	25.53
Group 4	$ 39.31	25.53
Group 5	$ 39.46	25.53
Group 6	$ 35.30	25.53

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 06/02/2025

OZAUKEE AND WASHINGTON COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 38.06	25.53
Group 2	$ 38.16	25.53
Group 3	$ 38.21	25.53
Group 4	$ 38.41	25.53
Group 5	$ 38.26	25.53
Group 6	$ 35.15	25.53

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 06/02/2025

KENOSHA AND RACINE COUNTIES

	Rates	Fringes
LABORER		
Group 1	$ 37.87	25.53
Group 2	$ 38.02	25.53
Group 3	$ 38.22	25.53
Group 4	$ 38.19	25.53
Group 5	$ 38.52	25.53
Group 6	$ 35.02	25.53

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 06/02/2025

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	$ 43.77	19.97
Group 2	$ 43.87	19.97
Group 3	$ 43.92	19.97
Group 4	$ 44.12	19.97
Group 5	$ 43.97	19.97
Group 6	$ 40.40	19.97

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 06/02/2025

DANE COUNTY

	Rates	Fringes
LABORER		
Group 1	$ 44.05	19.97
Group 2	$ 44.15	19.97
Group 3	$ 44.20	19.97
Group 4	$ 44.40	19.97
Group 5	$ 44.25	19.97
Group 6	$ 40.40	19.97

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 05/05/2025

ASHLAND, BAYFIELD, BURNETT, AND DOUGLAS COUNTIES

	Rates	Fringes
Painters:		
New:		
Brush, Roller	$ 38.17	27.26
Spray, Sandblast, Steel	$ 38.77	27.26
Repaint:		
Brush, Roller	$ 36.67	27.26
Spray, Sandblast, Steel	$ 37.27	27.26

PAIN0108-002 06/01/2025

RACINE COUNTY

	Rates	Fringes
Painters:		
Brush, Roller	$ 43.64	23.35
Spray & Sandblast	$ 44.64	23.35

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 06/01/2025

JEFFERSON, MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
Painters:		
Bridge	$ 43.19	24.87
Brush	$ 42.44	24.87
Spray & Sandblast	$ 43.19	24.87

PAIN0802-002 06/01/2025

COLUMBIA, DANE, DODGE, GRANT, GREEN, IOWA, LAFAYETTE, RICHLAND, ROCK, AND SAUK COUNTIES

	Rates	Fringes
PAINTER		
Brush	$ 37.65	21.17

PREMIUM PAY:
Structural Steel, Spray, Bridges = $1.00 additional per hour.

PAIN0802-003 06/01/2025

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	$ 37.65	21.17

PAIN0934-001 06/01/2025

KENOSHA AND WALWORTH COUNTIES

	Rates	Fringes
Painters:		
Brush	$ 40.62	26.37
Spray	$ 41.62	26.37
Structural Steel	$ 40.77	26.37

PAIN1011-002 06/01/2025

FLORENCE COUNTY

	Rates	Fringes
Painters:	$ 31.17	15.92

PLAS0599-002 06/01/2025

	Rates	Fringes
CEMENT MASON/CONCRETE FINISHER		
Area A	$ 47.22	31.90
Area C	$ 40.06	28.65
Area D	$ 42.28	26.43
Area E	$ 41.16	27.54

Area F.....$ 37.33 31.38

AREA DESCRIPTIONS:

AREA A: ASHLAND, BURNETT, BAYFIELD, DOUGLAS, IRON, PRICE, SAWYER, AND WASHBURN COUNTIES

AREA C: BUFFALO, CRAWFORD, EAU CLAIRE, JACKSON, JUNEAU, LA CROSSE, MONROE, PEPIN, PIERCE, RICHLAND, TREMPEALEAU, AND VERNON COUNTIES

AREA D: MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

AREA E: DANE, GRANT, GREEN, IOWA, LAFAYETTE, AND ROCK COUNTIES

AREA F: KENOSHA AND RACINE COUNTIES

PLUM0011-003 05/05/2025

ASHLAND, BAYFIELD, BURNETT, DOUGLAS, IRON, SAWYER, AND WASHBURN COUNTIES

	Rates	Fringes
PLUMBER	$ 52.24	27.56

PLUM0075-002 06/01/2025

MILWAUKEE, OZAUKEE, WASHINGTON, AND WAUKESHA COUNTIES

	Rates	Fringes
PLUMBER	$ 60.05	27.90

PLUM0075-004 06/01/2025

DODGE (Watertown), GREEN, JEFFERSON, LAFAYETTE, AND ROCK COUNTIES

	Rates	Fringes
PLUMBER	$ 60.05	27.90

PLUM0075-009 06/01/2025

COLUMBIA, DANE, IOWA, MARQUETTE, RICHLAND AND SAUK COUNTIES

	Rates	Fringes
PLUMBER	$ 60.57	27.34

PLUM0111-007 06/03/2024

MARINETTE COUNTY (Niagara only)

	Rates	Fringes
PLUMBER/PIPEFITTER	$ 43.90	27.53

PLUM0118-002 06/01/2025

KENOSHA, RACINE, AND WALWORTH COUNTIES

	Rates	Fringes
Plumber and Steamfitter	$ 57.35	29.37

PLUM0400-003 06/01/2025

ADAMS,BROWN, CALUMET, DODGE (except Watertown), DOOR, FOND DU LAC, GREEN LAKE,KEWAUNEE, MANITOWOC, MARINETTE (except Niagara), MENOMINEE, OCONTO, OUTAGAMIE, SHAWANO, SHEBOYGAN, WAUPACA, WAUSHARA, AND WINNEBAGO COUNTIES

	Rates	Fringes
PLUMBER/PIPEFITTER	$ 53.23	23.40

PLUM0434-002 06/01/2025

BARON, BUFFALO, CHIPPEWA, CLARK, CRAWFORD, DUNN, EAU CLAIRE, FLORENCE, FOREST, GRANT, JACKSON, JUNEAU, LA CROSSE, LANGLADE, LINCOLN, MARATHON, MONROE, ONEIDA, PEPIN, PIERCE, POLK, PORTAGE, PRICE, RUSK, ST. CROIX, TAYLOR, TREMPEALEAU, VERNON, VILAS, AND WOOD COUNTIES

	Rates	Fringes
PIPEFITTER	$ 50.94	25.98

PLUM0601-003 06/01/2025

Zone 1

DODGE (Watertown), GREEN, JEFFERSON, LAFAYETTE, MILWAUKEE, OZAUKEE, ROCK, WASHINGTON AND WAUKESHA COUNTIES

	Rates	Fringes
PIPEFITTER	$ 58.92	31.34

PLUM0601-009 06/01/2025

COLUMBIA, DANE, IOWA, MARQUETTE, RICHLAND AND SAUK COUNTIES

	Rates	Fringes
PIPEFITTER	$ 60.13	30.16

TEAM0039-002 06/01/2025

	Rates	Fringes
TRUCK DRIVER		
1 & 2 Axle Trucks	$ 39.57	28.70
3 or more axles; Euclids or Dumptor, Articulated Truck, Mechanic	$ 39.72	28.70

SUWI2011-001 11/16/2011

	Rates	Fringes
WELL DRILLER	$ 16.52	

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.

Note: Executive Order 13658 generally applies to contracts subject to the Davis-Bacon Act that were awarded on or between January 1, 2015 and January 29, 2022, and that have not been renewed or extended on or after January 30, 2022. Executive Order 13658 does not apply to contracts subject only to the Davis-Bacon Related Acts regardless of when they were awarded. If a contract is subject to Executive Order 13658, the contractor must pay all covered workers at least $13.30 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 2025. The applicable Executive Order minimum wage rate will be adjusted annually. Additional information on contractor requirements and worker protections under Executive Order 13658 is available at www.dol.gov/whd/govcontracts.

Unlisted classifications needed for work not included within the scope of the classifications listed may be added after award only as provided in the labor standards contract clauses (29CFR 5.5 (a) (1) (iii)).

The body of each wage determination lists the classifications and wage rates that have been found to be prevailing for the type(s) of construction and geographic area covered by the wage determination. The classifications are listed in alphabetical order under rate identifiers indicating whether the particular rate is a union rate (current union negotiated rate), a survey rate, a weighted union average rate, a state adopted rate, or a supplemental classification rate.

Union Rate Identifiers

A four-letter identifier beginning with characters other than ""SU"", ""UAVG"", ?SA?, or ?SC? denotes that a union rate was prevailing for that classification in the survey. Example: PLUM0198-005 07/01/2024. PLUM is an identifier of the union whose collectively bargained rate 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. The date, 07/01/2024 in the example, is the effective date of the most current negotiated rate.

Union prevailing wage rates are updated to reflect all changes over time that are reported to WHD in the rates in the collective bargaining agreement (CBA) governing the classification.

Union Average Rate Identifiers

The UAVG identifier indicates that no single rate prevailed for those classifications, but that 100% of the data reported for the classifications reflected union rates. EXAMPLE: UAVG-OH-0010 01/01/2024. UAVG indicates that the rate is a weighted union average rate. OH indicates the State of Ohio. The next number, 0010 in the example, is an internal number used in producing the wage determination. The date, 01/01/2024 in the example, indicates the date the wage determination was updated to reflect the most current union average rate.

A UAVG rate will be updated once a year, usually in January, to reflect a weighted average of the current rates in the collective bargaining agreements on which the rate is based.

Survey Rate Identifiers

The ""SU"" identifier indicates that either a single non-union rate prevailed (as defined in 29 CFR 1.2) for this classification in the survey or that the rate was derived by computing a weighted average rate based on all the rates reported in the survey for that classification. As a weighted average rate includes all rates reported in the survey, it may include both union and non-union rates. Example: SUFL2022-007 6/27/2024. SU indicates the rate is a single non-union prevailing rate or a weighted average of survey data for that classification. FL indicates the State of Florida. 2022 is the year of the 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. The date, 6/27/2024 in the example, indicates the survey completion date for the classifications and rates under that identifier.

?SU? wage rates typically remain in effect until a new survey is conducted. However, the Wage and Hour Division (WHD) has the discretion to update such rates under 29 CFR 1.6(c)(1).

State Adopted Rate Identifiers

The ""SA"" identifier indicates that the classifications and prevailing wage rates set by a state (or local) government were adopted under 29 C.F.R 1.3(g)-(h). Example: SAME2023-007 01/03/2024. SA reflects that the rates are state adopted. ME refers to the State of Maine. 2023 is the year during which the state completed the survey on which the listed classifications and rates are based. The next number, 007 in the example, is an internal number used in producing the wage determination. The date, 01/03/2024 in the example, reflects the date on which the classifications and rates under the ?SA? identifier took effect under state law in the state from which the rates were adopted.

WAGE DETERMINATION APPEALS PROCESS

1) Has there been an initial decision in the matter? This can be:

a) a survey underlying a wage determination
b) an existing published wage determination
c) an initial WHD letter setting forth a position on a wage determination matter
d) an initial conformance (additional classification and rate) determination

On survey related matters, initial contact, including requests for summaries of surveys, should be directed to the WHD Branch of Wage Surveys. Requests can be submitted via email to davisbaconinfo@dol.gov or by mail to:

Branch of Wage Surveys
Wage and Hour Division
U.S. Department of Labor
200 Constitution Avenue, N.W.
Washington, DC 20210

Regarding any other wage determination matter such as conformance decisions, requests for initial decisions should be directed to the WHD Branch of Construction Wage Determinations. Requests can be submitted via email to BCWD-Office@dol.gov or by mail 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 an initial decision has been issued, then any interested party (those affected by the action) that disagrees with the decision can request review and reconsideration from the Wage and Hour Administrator (See 29 CFR Part 1.8 and 29 CFR Part 7). Requests for review and reconsideration can be submitted via email to dba.reconsideration@dol.gov or by mail 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 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.

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END OF GENERAL DECISION"

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SECTION 00 80 00
FUNDING REQUIREMENTS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. It is anticipated that a variety of Federal, State and Local funds will be utilized for the project. The Contractor shall follow all requirements outlined in the following funding provision sections and elsewhere in the Contract Documents for each type of funding.
   1. DNR Clean Water Fund and/or Safe Drinking Water Section 00 80 01

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS

A. Contractor shall submit American Iron and Steel (AIS) Product Certificates with all pay requests that include AIS products and/or materials. Payment for AIS products and materials will only be approved with a completed AIS Certification.

B. Contractor shall submit certified payrolls reports and supporting documentation weekly through eComply Software. Payment for labor will only be approved when pay application related payrolls are in full compliance.

C. Closeout Procedures, Section 01 77 00, 1.05 Submittals. Note that some submittals are ongoing throughout the project.

PART 2 PRODUCTS AND MATERIALS

2.01 FUNDING REQUIREMENTS

A. Products and materials associated with the funding requirements of the project is considered incidental and no additional payments will be made for satisfying these requirements.

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT

4.01 FUNDING REQUIREMENTS

A. Work associated with the funding requirements of the project is considered incidental and no additional payments will be made for satisfying these requirements.

END OF SECTION

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DNR Safe Drinking Water/Clean Water Fund Provisions
(With American Iron and Steel)
Section 00 80 01

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Contractor Acknowledgement Form
Consolidated Appropriations Act, 2014
Use of American Iron and Steel Provisions ("AIS")

The Contractor acknowledges to and for the benefit of the **City of Menomonie** ("Purchaser") and the State of Wisconsin (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

_____ _____
Contractor Signature Date

_____
Name and Title of Signee (please print)

_____
Contractor Firm Name

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AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
	Obligation:	AIS Product Certification is required to be submitted with Shop Drawings, if possible, and prior to delivery of product on site. Payment will not be made on items unless Engineer has receipt of AIS Product Certification.
	Warning:	Contractor is liable for all non-compliant installed items. Liability includes all necessary work to replace non-compliant item(s).
CONTRACTOR:	**Instructions:**	If "AIS Applicable", check box and enter specification section number(s); If "AIS Non-Applicable", check box and no further action is necessary; If "AIS De-Minimis", indicate primary specification section(s) numbers where applicable or provide comment on items. *NOTE: Only certain small items and fasteners are permissible as de-minimis, and Contractor is responsible/required to keep spreadsheet of all de-minimis items.* If AIS-regulated item is not listed in this spreadsheet, add it to the list. This AIS Product List is not a comprehensive list. *Refer to AIS documents on the EAP website: https://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers*

AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
EXAMPLE										
☑	☐	☐	PCCP (Pre-Stressed Concrete Cylinder Pipe) - Reinforced Precast Concrete	40 23 36						AIS Cert coming prior to installation. Pay Application line #32
☐	☐	☐	Access Hatches - Municipal Castings							
☐	☐	☐	Access Ramps - Construction Materials							
☐	☐	☐	Angles - Construction Materials							
☐	☐	☐	Angles (>3") - Structural Steel							
☐	☐	☐	Ballast Screen - Municipal Castings							
☐	☐	☐	Bar - Construction Materials							
☐	☐	☐	Benches - Municipal Castings							
☐	☐	☐	Bollards - Municipal Castings							
☐	☐	☐	Cable Hanging Systems - Construction Materials							
☐	☐	☐	Casing - Construction Materials							
☐	☐	☐	Cast Bases - Municipal Castings							
☐	☐	☐	Cast Iron Hinged Hatches (square or rectangular) - Municipal Castings							
☐	☐	☐	Cast Iron Products (Other) - Municipal Castings							
☐	☐	☐	Cast Iron Riser Rings - Municipal Castings							
☐	☐	☐	Catch Basin Inlet - Municipal Castings							
☐	☐	☐	Channel (>3") - Structural Steel							
☐	☐	☐	Cleanout/Monument Boxes - Municipal Castings							
☐	☐	☐	Concrete Reinforcing Bar - Construction Materials							
☐	☐	☐	Construction Covers and Frames - Municipal Castings							
☐	☐	☐	Corrugated Steel Pipe							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Couplings - Fittings							
☐	☐	☐	Cross Ties - Structural Steel							
☐	☐	☐	Curb and Corner Guards - Municipal Castings							
☐	☐	☐	Curb Openings - Municipal Castings							
☐	☐	☐	Decking - Construction Materials							
☐	☐	☐	Detectable Warning Plates - Municipal Castings							
☐	☐	☐	Dome Structures - Construction Materials							
☐	☐	☐	Door Hardware - Construction Materials							
☐	☐	☐	Doors - Construction Materials							
☐	☐	☐	Doors - Overhead							
☐	☐	☐	Downspout Shoes (Boot, Inlet) - Municipal Castings							
☐	☐	☐	Drainage Gates, Frames, Curb Inlets - Municipal Castings							
☐	☐	☐	Ductwork - Construction Materials							
☐	☐	☐	Expansion Joints - Fittings							
☐	☐	☐	Fasteners (nuts and bolts) - Construction Materials							
☐	☐	☐	Fencing and Fence Tubing - Construction Materials							
☐	☐	☐	Fire Escapes - Construction Materials							
☐	☐	☐	Flanges - Construction Materials							
☐	☐	☐	Framing - Construction Materials							
☐	☐	☐	Grating - Construction Materials							
☐	☐	☐	Guardrails - Construction Materials							
☐	☐	☐	H-Piles - Structural Steel							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Hydrants							
☐	☐	☐	I-Beam shapes - Structural Steel							
☐	☐	☐	Inlets - Municipal Castings							
☐	☐	☐	Joists - Construction Materials							
☐	☐	☐	Junction Boxes - Municipal Castings							
☐	☐	☐	Ladders - Construction Materials							
☐	☐	☐	Lampposts - Municipal Castings							
☐	☐	☐	Lined Fittings							
☐	☐	☐	Lined Pipes							
☐	☐	☐	Manhole Covers							
☐	☐	☐	Manhole Covers, Rings and Frames, Risers - Municipal Castings							
☐	☐	☐	Manhole Risers and Chimneys - Reinforced Precast Concrete							
☐	☐	☐	Manhole Steps - Construction Materials							
☐	☐	☐	Meter Boxes - Municipal Castings							
☐	☐	☐	Other rolled flanged shapes - Structural Steel							
☐	☐	☐	PCCP (Pre-Stressed Concrete Cylinder Pipe) - Reinforced Precast Concrete							
☐	☐	☐	Pipe Clamps and Restraints, Couplings, Joints, Flanges, Saddles, Service Sleeves, Tees							
☐	☐	☐	Pipe Connectors - Fittings							
☐	☐	☐	Railings - Construction Materials							
☐	☐	☐	Reinforced Precast Concrete							
☐	☐	☐	Roofing - Construction Materials							
☐	☐	☐	Service Box - Municipal Castings							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Sheet Piling - Structural Steel							
☐	☐	☐	Stairs - Construction Materials							
☐	☐	☐	Stationary Screens - Construction Materials							
☐	☐	☐	Steel Hinged Hatches (square or rectangular) - Municipal Castings							
☐	☐	☐	Steel Riser Rings - Municipal Castings							
☐	☐	☐	Surface Drains - Construction Materials							
☐	☐	☐	Tanks							
☐	☐	☐	Tees - Structural Steel							
☐	☐	☐	Tie Plates - Structural Steel							
☐	☐	☐	Trash Receptacles - Municipal Castings							
☐	☐	☐	Tree Grates - Municipal Castings							
☐	☐	☐	Tree Guards - Municipal Castings							
☐	☐	☐	Trench Gates - Municipal Castings							
☐	☐	☐	Trusses - Construction Materials							
☐	☐	☐	Tubing - Construction Materials							
☐	☐	☐	Unlined Fittings							
☐	☐	☐	Unlined Pipes							
☐	☐	☐	Valve Boxes, Covers and Risers - Municipal Castings							
☐	☐	☐	Valves							
☐	☐	☐	Wall Panels - Construction Materials							
☐	☐	☐	Welding Rods - Construction Materials							
☐	☐	☐	Wide-flanged shapes - Structural Steel							

AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
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AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
☐	☐	☐	Wire - Construction Materials							
☐	☐	☐	Wire cloth - Construction Materials							
☐	☐	☐	Wire Rod - Construction Materials							
☐	☐	☐	Wire Rope and Cables - Construction Materials							
☐	☐	☐	Zees - Structural Steel							
☐	☐	☐								
☐	☐	☐								
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AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
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	Warning:	Contractor is liable for all non-compliant installed items. Liability includes all necessary work to replace non-compliant item(s).
CONTRACTOR:	**Instructions:**	If "AIS Applicable", check box and enter specification section number(s); If "AIS Non-Applicable", check box and no further action is necessary; If "AIS De-Minimis", indicate primary specification section(s) numbers where applicable or provide comment on items. *NOTE: Only certain small items and fasteners are permissible as de-minimis, and Contractor is responsible/required to keep spreadsheet of all de-minimis items.* If AIS-regulated item is not listed in this spreadsheet, add it to the list. This AIS Product List is not a comprehensive list. *Refer to AIS documents on the EAP website: https://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers*

AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
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AMERICAN IRON AND STEEL (AIS) COMPLIANCE CHECKLIST

PROJECT:	**NOTE:**	**Applicable to ALL DNR Clean Water Fund and Safe Drinking Water Funded projects.** Contractor is required to complete this spreadsheet. AIS Compliance Checklist will amend the Shop Drawing Review process to track AIS compliance.
	Obligation:	AIS Product Certification is required to be submitted with Shop Drawings, if possible, and prior to delivery of product on site. Payment will not be made on items unless Engineer has receipt of AIS Product Certification.
	Warning:	Contractor is liable for all non-compliant installed items. Liability includes all necessary work to replace non-compliant item(s).
CONTRACTOR:	**Instructions:**	If "AIS Applicable", check box and enter specification section number(s); If "AIS Non-Applicable", check box and no further action is necessary; If "AIS De-Minimis", indicate primary specification section(s) numbers where applicable or provide comment on items. *NOTE: Only certain small items and fasteners are permissible as de-minimis, and Contractor is responsible/required to keep spreadsheet of all de-minimis items.* If AIS-regulated item is not listed in this spreadsheet, add it to the list. This AIS Product List is not a comprehensive list. *Refer to AIS documents on the EAP website: https://www.epa.gov/cwsrf/american-iron-and-steel-requirement-guidance-and-questions-and-answers*

AIS Applicable	AIS Non-Applicable	AIS De-Minimis	AIS PRODUCT LIST (Reference only; list is not comprehensive)	SPECIFICATION SECTION 1	2	3	4	5	6	NOTES AND COMMENTS:
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 20 2014

OFFICE OF WATER

MEMORANDUM

SUBJECT: Implementation of American Iron and Steel provisions of P.L. 113-76, Consolidated Appropriations Act, 2014

FROM: For Andrew D. Sawyers, Director
Office of Wastewater Management (4201M)

Peter C. Grevatt, Director
Office of Ground Water and Drinking Water (4601M)

TO: Water Management Division Directors
Regions I - X

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel (AIS)" requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use iron and steel products that are produced in the United States for projects for the construction, alteration, maintenance, or repair of a public water system or treatment works if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Federal Fiscal Year 2014.

Section 436 also sets forth certain circumstances under which EPA may waive the AIS requirement. Furthermore, the Act specifically exempts projects where engineering plans and specifications were approved by a State agency prior to January 17, 2014.

The approach described below explains how EPA will implement the AIS requirement. The first section is in the form of questions and answers that address the types of projects that must comply with the AIS requirement, the types of products covered by the AIS requirement, and compliance. The second section is a step-by-step process for requesting waivers and the circumstances under which waivers may be granted.

Implementation

The Act states:

Sec. 436. (a)(1) None of the funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12) shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States.

(2) In this section, the term ''iron and steel products'' means the following products made primarily of iron or steel: lined or unlined pipes and fittings, manhole covers and other municipal castings, hydrants, tanks, flanges, pipe clamps and restraints, valves, structural steel, reinforced precast concrete, and construction materials.

(b) Subsection (a) shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency (in this section referred to as the ''Administrator'') finds that—

(1) applying subsection (a) would be inconsistent with the public interest;

(2) iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or

(3) inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

(c) If the Administrator receives a request for a waiver under this section, the Administrator shall make available to the public on an informal basis a copy of the request and information available to the Administrator concerning the request, and shall allow for informal public input on the request for at least 15 days prior to making a finding based on the request. The Administrator shall make the request and accompanying information available by electronic means, including on the official public Internet Web site of the Environmental Protection Agency.

(d) This section shall be applied in a manner consistent with United States obligations under international agreements.

(e) The Administrator may retain up to 0.25 percent of the funds appropriated in this Act for the Clean and Drinking Water State Revolving Funds for carrying out

the provisions described in subsection (a)(1) for management and oversight of the requirements of this section.

(f) This section does not apply with respect to a project if a State agency approves the engineering plans and specifications for the project, in that agency's capacity to approve such plans and specifications prior to a project requesting bids, prior to the date of the enactment of this Act.

The following questions and answers provide guidance for implementing and complying with the AIS requirements:

Project Coverage

1) What classes of projects are covered by the AIS requirement?

All treatment works projects funded by a CWSRF assistance agreement, and all public water system projects funded by a DWSRF assistance agreement, from the date of enactment through the end of Federal Fiscal Year 2014, are covered. The AIS requirements apply to the entirety of the project, no matter when construction begins or ends. Additionally, the AIS requirements apply to all parts of the project, no matter the source of funding.

2) Does the AIS requirement apply to nonpoint source projects or national estuary projects?

No. Congress did not include an AIS requirement for nonpoint source and national estuary projects unless the project can also be classified as a 'treatment works' as defined by section 212 of the Clean Water Act.

3) Are any projects for the construction, alteration, maintenance, or repair of a public water system or treatment works excluded from the AIS requirement?

Any project, whether a treatment works project or a public water system project, for which engineering plans and specifications were approved by the responsible state agency prior to January 17, 2014, is excluded from the AIS requirements.

4) What if the project does not have approved engineering plans and specifications but has signed an assistance agreement with a CWSRF or DWSRF program prior to January 17, 2014?

The AIS requirements do not apply to any project for which an assistance agreement was signed prior to January 17, 2014.

5) What if the project does not have approved engineering plans and specifications, but bids were advertised prior to January 17, 2014 and an assistance agreement was signed after January 17, 2014?

If the project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the approval date for purposes of the exemption in section 436(f).

6) What if the assistance agreement that was signed prior to January 17, 2014, only funded a part of the overall project, where the remainder of the project will be funded later with another SRF loan?

If the original assistance agreement funded any construction of the project, the date of the original assistance agreement counts for purposes of the exemption. If the original assistance agreement was only for planning and design, the date of that assistance agreement will count for purposes of the exemption only if there is a written commitment or expectation on the part of the assistance recipient to fund the remainder of the project with SRF funds.

7) What if the assistance agreement that was signed prior to January 17, 2014, funded the first phase of a multi-phase project, where the remaining phases will be funded by SRF assistance in the future?

In such a case, the phases of the project will be considered a single project if all construction necessary to complete the building or work, regardless of the number of contracts or assistance agreements involved, are closely related in purpose, time and place. However, there are many situations in which major construction activities are clearly undertaken in phases that are distinct in purpose, time, or place. In the case of distinct phases, projects with engineering plans and specifications approval or assistance agreements signed prior to January 17, 2014 would be excluded from AIS requirements while those approved/signed on January 17, 2014, or later would be covered by the AIS requirements.

8) What if a project has split funding from a non-SRF source?

Many States intend to fund projects with "split" funding, from the SRF program and from State or other programs. Based on the Act language in section 436, which requires that American iron and steel products be used in any project for the construction, alteration, maintenance, or repair of a public water system or treatment works receiving SRF funding between and including January 17, 2014 and September 30, 2014, any project that is funded in whole or in part with such funds must comply with the AIS requirement. A "project" consists of all construction necessary to complete the building or work regardless of the number of contracts or assistance agreements involved so long as all contracts and assistance agreements awarded are closely related in purpose, time and place. This precludes the intentional splitting of SRF projects into separate and smaller contracts or assistance agreements to avoid AIS coverage on some portion of a larger

project, particularly where the activities are integrally and proximately related to the whole. However, there are many situations in which major construction activities are clearly undertaken in separate phases that are distinct in purpose, time, or place, in which case, separate contracts or assistance agreement for SRF and State or other funding would carry separate requirements.

9) What about refinancing?

If a project began construction, financed from a non-SRF source, prior to January 17, 2014, but is refinanced through an SRF assistance agreement executed on or after January 17, 2014 and prior to October 1, 2014, AIS requirements will apply to all construction that occurs on or after January 17, 2014, through completion of construction, unless, as is likely, engineering plans and specifications were approved by a responsible state agency prior to January 17, 2014. There is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to January 17, 2014.

10) Do the AIS requirements apply to any other EPA programs, besides the SRF program, such as the Tribal Set-aside grants or grants to the Territories and DC?

No, the AIS requirement only applies to funds made available by a State water pollution control revolving fund as authorized by title VI of the Federal Water Pollution Control Act (33 U.S.C. 1381 et seq.) or made available by a drinking water treatment revolving loan fund as authorized by section 1452 of the Safe Drinking Water Act (42 U.S.C. 300j–12)

Covered Iron and Steel Products

11) What is an iron or steel product?

For purposes of the CWSRF and DWSRF projects that must comply with the AIS requirement, an iron or steel product is one of the following made primarily of iron or steel that is permanently incorporated into the public water system or treatment works:

Lined or unlined pipes or fittings;
Manhole Covers;
Municipal Castings (defined in more detail below);
Hydrants;
Tanks;
Flanges;
Pipe clamps and restraints;
Valves;
Structural steel (defined in more detail below);
Reinforced precast concrete; and
Construction materials (defined in more detail below).

12) What does the term 'primarily iron or steel' mean?

'Primarily iron or steel' places constraints on the list of products above. For one of the listed products to be considered subject to the AIS requirements, it must be made of greater than 50% iron or steel, measured by cost. The cost should be based on the material costs.

13) Can you provide an example of how to perform a cost determination?

For example, the iron portion of a fire hydrant would likely be the bonnet, body and shoe, and the cost then would include the pouring and casting to create those components. The other material costs would include non-iron and steel internal workings of the fire hydrant (i.e., stem, coupling, valve, seals, etc). However, the assembly of the internal workings into the hydrant body would not be included in this cost calculation. If one of the listed products is not made primarily of iron or steel, United States (US) provenance is not required. An exception to this definition is reinforced precast concrete, which is addressed in a later question.

14) If a product is composed of more than 50% iron or steel, but is not listed in the above list of items, must the item be produced in the US? Alternatively, must the iron or steel in such a product be produced in the US?

The answer to both question is no. Only items on the above list must be produced in the US. Additionally, the iron or steel in a non-listed item can be sourced from outside the US.

15) What is the definition of steel?

Steel means an alloy that includes at least 50 percent iron, between .02 and 2 percent carbon, and may include other elements. Metallic elements such as chromium, nickel, molybdenum, manganese, and silicon may be added during the melting of steel for the purpose of enhancing properties such as corrosion resistance, hardness, or strength. The definition of steel covers carbon steel, alloy steel, stainless steel, tool steel and other specialty steels.

16) What does 'produced in the United States' mean?

Production in the United States of the iron or steel products used in the project requires that all manufacturing processes, including application of coatings, must take place in the United States, with the exception of metallurgical processes involving refinement of steel additives. All manufacturing processes includes processes such as melting, refining, forming, rolling, drawing, finishing, fabricating and coating. Further, if a domestic iron and steel product is taken out of the US for any part of the manufacturing process, it becomes foreign source material. However, raw materials such as iron ore, limestone and iron and steel scrap are not covered by the AIS requirement, and the

material(s), if any, being applied as a coating are similarly not covered. Non-iron or steel components of an iron and steel product may come from non-US sources. For example, for products such as valves and hydrants, the individual non-iron and steel components do not have to be of domestic origin.

17) Are the raw materials used in the production of iron or steel required to come from US sources?

No. Raw materials, such as iron ore, limestone, scrap iron, and scrap steel, can come from non-US sources.

18) If an above listed item is primarily made of iron or steel, but is only at the construction site temporarily, must such an item be produced in the US?

No. Only the above listed products made primarily of iron or steel, permanently incorporated into the project must be produced in the US. For example trench boxes, scaffolding or equipment, which are removed from the project site upon completion of the project, are not required to be made of U.S. Iron or Steel.

19) What is the definition of 'municipal castings'?

Municipal castings are cast iron or steel infrastructure products that are melted and cast. They typically provide access, protection, or housing for components incorporated into utility owned drinking water, storm water, wastewater, and surface infrastructure. They are typically made of grey or ductile iron, or steel. Examples of municipal castings are:

Access Hatches;
Ballast Screen;
Benches (Iron or Steel);
Bollards;
Cast Bases;
Cast Iron Hinged Hatches, Square and Rectangular;
Cast Iron Riser Rings;
Catch Basin Inlet;
Cleanout/Monument Boxes;
Construction Covers and Frames;
Curb and Corner Guards;
Curb Openings;
Detectable Warning Plates;
Downspout Shoes (Boot, Inlet);
Drainage Grates, Frames and Curb Inlets;
Inlets;
Junction Boxes;
Lampposts;
Manhole Covers, Rings and Frames, Risers;

Meter Boxes;
Service Boxes;
Steel Hinged Hatches, Square and Rectangular;
Steel Riser Rings;
Trash receptacles;
Tree Grates;
Tree Guards;
Trench Grates; and
Valve Boxes, Covers and Risers.

20) What is 'structural steel'?

Structural steel is rolled flanged shapes, having at least one dimension of their cross-section three inches or greater, which are used in the construction of bridges, buildings, ships, railroad rolling stock, and for numerous other constructional purposes. Such shapes are designated as wide-flange shapes, standard I-beams, channels, angles, tees and zees. Other shapes include H-piles, sheet piling, tie plates, cross ties, and those for other special purposes.

21) What is a 'construction material' for purposes of the AIS requirement?

Construction materials are those articles, materials, or supplies made primarily of iron and steel, that are permanently incorporated into the project, not including mechanical and/or electrical components, equipment and systems. Some of these products may overlap with what is also considered "structural steel". This includes, but is not limited to, the following products: wire rod, bar, angles, concrete reinforcing bar, wire, wire cloth, wire rope and cables, tubing, framing, joists, trusses, fasteners (i.e., nuts and bolts), welding rods, decking, grating, railings, stairs, access ramps, fire escapes, ladders, wall panels, dome structures, roofing, ductwork, surface drains, cable hanging systems, manhole steps, fencing and fence tubing, guardrails, doors, and stationary screens.

22) What is not considered a 'construction material' for purposes of the AIS requirement?

Mechanical and electrical components, equipment and systems are not considered construction materials. Mechanical equipment is typically that which has motorized parts and/or is powered by a motor. Electrical equipment is typically any machine powered by electricity and includes components that are part of the electrical distribution system.

The following examples (including their appurtenances necessary for their intended use and operation) are NOT considered construction materials: pumps, motors, gear reducers, drives (including variable frequency drives (VFDs)), electric/pneumatic/manual accessories used to operate valves (such as electric valve actuators), mixers, gates, motorized screens (such as traveling screens), blowers/aeration equipment, compressors, meters, sensors, controls and switches, supervisory control and

data acquisition (SCADA), membrane bioreactor systems, membrane filtration systems, filters, clarifiers and clarifier mechanisms, rakes, grinders, disinfection systems, presses (including belt presses), conveyors, cranes, HVAC (excluding ductwork), water heaters, heat exchangers, generators, cabinetry and housings (such as electrical boxes/enclosures), lighting fixtures, electrical conduit, emergency life systems, metal office furniture, shelving, laboratory equipment, analytical instrumentation, and dewatering equipment.

23) If the iron or steel is produced in the US, may other steps in the manufacturing process take place outside of the US, such as assembly?

No. Production in the US of the iron or steel used in a listed product requires that all manufacturing processes must take place in the United States, except metallurgical processes involving refinement of steel additives.

24) What processes must occur in the US to be compliant with the AIS requirement for reinforced precast concrete?

While reinforced precast concrete may not be at least 50% iron or steel, in this particular case, the reinforcing bar and wire must be produced in the US and meet the same standards as for any other iron or steel product. Additionally, the casting of the concrete product must take place in the US. The cement and other raw materials used in concrete production are not required to be of domestic origin.

If the reinforced concrete is cast at the construction site, the reinforcing bar and wire are considered to be a construction material and must be produced in the US.

Compliance

25) How should an assistance recipient document compliance with the AIS requirement?

In order to ensure compliance with the AIS requirement, specific AIS contract language must be included in each contract, starting with the assistance agreement, all the way down to the purchase agreements. Sample language for assistance agreements and contracts can be found in Appendix 3 and 4.

EPA recommends the use of a step certification process, similar to one used by the Federal Highway Administration. The step certification process is a method to ensure that producers adhere to the AIS requirement and assistance recipients can verify that products comply with the AIS requirement. The process also establishes accountability and better enables States to take enforcement actions against violators.

Step certification creates a paper trail which documents the location of the manufacturing process involved with the production of steel and iron materials. A step certification is a process under which each handler (supplier, fabricator, manufacturer,

processor, etc) of the iron and steel products certifies that their step in the process was domestically performed. Each time a step in the manufacturing process takes place, the manufacturer delivers its work along with a certification of its origin. A certification can be quite simple. Typically, it includes the name of the manufacturer, the location of the manufacturing facility where the product or process took place (not its headquarters), a description of the product or item being delivered, and a signature by a manufacturer's responsible party. Attached, as Appendix 5, are sample certifications. These certifications should be collected and maintained by assistance recipients.

Alternatively, the final manufacturer that delivers the iron or steel product to the worksite, vendor, or contractor, may provide a certification asserting that all manufacturing processes occurred in the US. While this type of certification may be acceptable, it may not provide the same degree of assurance. Additional documentation may be needed if the certification is lacking important information. Step certification is the best practice.

26) How should a State ensure assistance recipients are complying with the AIS requirement?

In order to ensure compliance with the AIS requirement, States SRF programs must include specific AIS contract language in the assistance agreement. Sample language for assistance agreements can be found in Appendix 3.

States should also, as a best practice, conduct site visits of projects during construction and review documentation demonstrating proof of compliance which the assistance recipient has gathered.

27) What happens if a State or EPA finds a non-compliant iron and/or steel product permanently incorporated in the project?

If a potentially non-compliant product is identified, the State should notify the assistance recipient of the apparent unauthorized use of the non-domestic component, including a proposed corrective action, and should be given the opportunity to reply. If unauthorized use is confirmed, the State can take one or more of the following actions: request a waiver where appropriate; require the removal of the non-domestic item; or withhold payment for all or part of the project. Only EPA can issue waivers to authorize the use of a non-domestic item. EPA may use remedies available to it under the Clean Water Act, the Safe Drinking Water Act, and 40 CFR part 31 grant regulations, in the event of a violation of a grant term and condition.

It is recommended that the State work collaboratively with EPA to determine the appropriate corrective action, especially in cases where the State is the one who identifies the item in noncompliance or there is a disagreement with the assistance recipient.

If fraud, waste, abuse, or any violation of the law is suspected, the Office of Inspector General (OIG) should be contacted immediately. The OIG can be reached at 1-

888-546-8740 or OIG_Hotline@epa.gov. More information can be found at this website: http://www.epa.gov/oig/hotline.htm.

28) How do international trade agreements affect the implementation of the AIS requirements?

The AIS provision applies in a manner consistent with United States obligations under international agreements. Typically, these obligations only apply to direct procurement by the entities that are signatories to such agreements. In general, SRF assistance recipients are not signatories to such agreements, so these agreements have no impact on this AIS provision. In the few instances where such an agreement applies to a municipality, that municipality is under the obligation to determine its applicability and requirements and document the actions taken to comply for the State.

Waiver Process

The statute permits EPA to issue waivers for a case or category of cases where EPA finds (1) that applying these requirements would be inconsistent with the public interest; (2) iron and steel products are not produced in the US in sufficient and reasonably available quantities and of a satisfactory quality; or (3) inclusion of iron and steel products produced in the US will increase the cost of the overall project by more than 25 percent.

In order to implement the AIS requirements, EPA has developed an approach to allow for effective and efficient implementation of the waiver process to allow projects to proceed in a timely manner. The framework described below will allow States, on behalf of the assistance recipients, to apply for waivers of the AIS requirement directly to EPA Headquarters. Only waiver requests received from states will be considered. Pursuant to the Act, EPA has the responsibility to make findings as to the issuance of waivers to the AIS requirements.

Definitions

The following terms are critical to the interpretation and implementation of the AIS requirements and apply to the process described in this memorandum:

Reasonably Available Quantity: The quantity of iron or steel products is available or will be available at the time needed and place needed, and in the proper form or specification as specified in the project plans and design.

Satisfactory Quality: The quality of iron or steel products, as specified in the project plans and designs.

Assistance Recipient: A borrower or grantee that receives funding from a State CWSRF or DWSRF program.

Step-By-Step Waiver Process

Application by Assistance Recipient

Each local entity that receives SRF water infrastructure financial assistance is required by section 436 of the Act to use American made iron and steel products in the construction of its project. However, the recipient may request a waiver. Until a waiver is granted by EPA, the AIS requirement stands, except as noted above with respect to municipalities covered by international agreements.

The waiver process begins with the SRF assistance recipient. In order to fulfill the AIS requirement, the assistance recipient must in good faith design the project (where applicable) and solicit bids for construction with American made iron and steel products. It is essential that the assistance recipient include the AIS terms in any request for proposals or solicitations for bids, and in all contracts (see Appendix 3 for sample construction contract language). The assistance recipient may receive a waiver at any point before, during, or after the bid process, if one or more of three conditions is met:

1. Applying the American Iron and Steel requirements of the Act would be inconsistent with the public interest;
2. Iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality; or
3. Inclusion of iron and steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Proper and sufficient documentation must be provided by the assistance recipient. A checklist detailing the types of information required for a waiver to be processed is attached as Appendix 1.

Additionally, it is strongly encouraged that assistance recipients hold pre-bid conferences with potential bidders. A pre-bid conference can help to identify iron and steel products needed to complete the project as described in the plans and specifications that may not be available from domestic sources. It may also identify the need to seek a waiver prior to bid, and can help inform the recipient on compliance options.

In order to apply for a project waiver, the assistance recipient should email the request in the form of a Word document (.doc) to the State SRF program. It is strongly recommended that the State designate a single person for all AIS communications. The State SRF designee will review the application for the waiver and determine whether the necessary information has been included. Once the waiver application is complete, the State designee will forward the application to either of two email addresses. For CWSRF waiver requests, please send the application to: cwsrfwaiver@epa.gov. For DWSRF waiver requests, please send the application to: dwsrfwaiver@epa.gov.

Evaluation by EPA

After receiving an application for waiver of the AIS requirements, EPA Headquarters will publish the request on its website for 15 days and receive informal comment. EPA Headquarters will then use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

In the event that EPA finds that adequate documentation and justification has been submitted, the Administrator may grant a waiver to the assistance recipient. EPA will notify the State designee that a waiver request has been approved or denied as soon as such a decision has been made. Granting such a waiver is a three-step process:

1. Posting – After receiving an application for a waiver, EPA is required to publish the application and all material submitted with the application on EPA's website for 15 days. During that period, the public will have the opportunity to review the request and provide informal comment to EPA. The website can be found at: http://water.epa.gov/grants_funding/aisrequirement.cfm

2. Evaluation – After receiving an application for waiver of the AIS requirements, EPA Headquarters will use the checklist in Appendix 2 to determine whether the application properly and adequately documents and justifies the statutory basis cited for the waiver – that it is quantitatively and qualitatively sufficient – and to determine whether or not to grant the waiver.

3. Signature of waiver approval by the Administrator or another agency official with delegated authority – As soon as the waiver is signed and dated, EPA will notify the State SRF program, and post the signed waiver on our website. The assistance recipient should keep a copy of the signed waiver in its project files.

Public Interest Waivers

EPA has the authority to issue public interest waivers. Evaluation of a public interest waiver request may be more complicated than that of other waiver requests so they may take more time than other waiver requests for a decision to be made. An example of a public interest waiver that might be issued could be for a community that has standardized on a particular type or manufacturer of a valve because of its performance to meet their specifications. Switching to an alternative valve may require staff to be trained on the new equipment and additional spare parts would need to be purchased and stocked, existing valves may need to be unnecessarily replaced, and portions of the system may need to be redesigned. Therefore, requiring the community to install an alternative valve would be inconsistent with public interest.

EPA also has the authority to issue a public interest waiver that covers categories of products that might apply to all projects.

EPA reserves the right to issue national waivers that may apply to particular classes of assistance recipients, particular classes of projects, or particular categories of iron or steel products. EPA may develop national or (US geographic) regional categorical waivers through the identification of similar circumstances in the detailed justifications presented to EPA in a waiver request or requests. EPA may issue a national waiver based on policy decisions regarding the public's interest or a determination that a particular item is not produced domestically in reasonably available quantities or of a sufficient quality. In such cases, EPA may determine it is necessary to issue a national waiver.

If you have any questions concerning the contents of this memorandum, you may contact us, or have your staff contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kiri Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Attachments

Appendix 1: Information Checklist for Waiver Request

The purpose of this checklist is to help ensure that all appropriate and necessary information is submitted to EPA. EPA recommends that States review this checklist carefully and provide all appropriate information to EPA. This checklist is for informational purposes only and does not need to be included as part of a waiver application.

Items	✓	Notes
General • Waiver request includes the following information: — Description of the foreign and domestic construction materials — Unit of measure — Quantity — Price — Time of delivery or availability — Location of the construction project — Name and address of the proposed supplier — A detailed justification for the use of foreign construction materials • Waiver request was submitted according to the instructions in the memorandum • Assistance recipient made a good faith effort to solicit bids for domestic iron and steel products, as demonstrated by language in requests for proposals, contracts, and communications with the prime contractor		
Cost Waiver Requests • Waiver request includes the following information: — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products — Relevant excerpts from the bid documents used by the contractors to complete the comparison — Supporting documentation indicating that the contractor made a reasonable survey of the market, such as a description of the process for identifying suppliers and a list of contacted suppliers		
Availability Waiver Requests • Waiver request includes the following supporting documentation necessary to demonstrate the availability, quantity, and/or quality of the materials for which the waiver is requested: — Supplier information or pricing information from a reasonable number of domestic suppliers indicating availability/delivery date for construction materials — Documentation of the assistance recipient's efforts to find available domestic sources, such as a description of the process for identifying suppliers and a list of contacted suppliers. — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of construction materials • Waiver request includes a statement from the prime contractor and/or supplier confirming the non-availability of the domestic construction materials for which the waiver is sought • Has the State received other waiver requests for the materials described in this waiver request, for comparable projects?		

Appendix 2: HQ Review Checklist for Waiver Request

Instructions: To be completed by EPA. Review all waiver requests using the questions in the checklist, and mark the appropriate box as Yes, No or N/A. Marks that fall inside the shaded boxes may be grounds for denying the waiver. If none of your review markings fall into a shaded box, the waiver is eligible for approval if it indicates that one or more of the following conditions applies to the domestic product for which the waiver is sought:

1. The iron and/or steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality.
2. The inclusion of iron and/or steel products produced in the United States will increase the cost of the overall project by more than 25 percent.

Review Items	Yes	No	N/A	Comments
Cost Waiver Requests • Does the waiver request include the following information? — Comparison of overall cost of project with domestic iron and steel products to overall cost of project with foreign iron and steel products				
— Relevant excerpts from the bid documents used by the contractors to complete the comparison				
— A sufficient number of bid documents or pricing information from domestic sources to constitute a reasonable survey of the market				
• Does the Total Domestic Project exceed the Total Foreign Project Cost by more than 25%?				
Availability Waiver Requests • Does the waiver request include supporting documentation sufficient to show the availability, quantity, and/or quality of the iron and/or steel product for which the waiver is requested? — Supplier information or other documentation indicating availability/delivery date for materials — Project schedule — Relevant excerpts from project plans, specifications, and permits indicating the required quantity and quality of materials				
• Does supporting documentation provide sufficient evidence that the contractors made a reasonable effort to locate domestic suppliers of materials, such as a description of the process for identifying suppliers and a list of contacted suppliers?				
• Based on the materials delivery/availability date indicated in the supporting documentation, will the materials be unavailable when they are needed according to the project schedule? (By item, list schedule date and domestic delivery quote date or other relevant information)				
• Is EPA aware of any other evidence indicating the non-availability of the materials for which the waiver is requested? Examples include: — Multiple waiver requests for the materials described in this waiver request, for comparable projects in the same State — Multiple waiver requests for the materials described in this waiver request, for comparable projects in other States — Correspondence with construction trade associations indicating the non-availability of the materials				
• Are the available domestic materials indicated in the bid documents of inadequate quality compared those required by the project plans, specifications, and/or permits?				

Appendix 3: Example Loan Agreement Language

ALL ASSISTANCE AGREEMENT MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN SRF ASSISTANCE AGREEMENTS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE LAW:

Comply with all federal requirements applicable to the Loan (including those imposed by the 2014 Appropriations Act and related SRF Policy Guidelines) which the Participant understands includes, among other, requirements that all of the iron and steel products used in the Project are to be produced in the United States ("American Iron and Steel Requirement") unless (i) the Participant has requested and obtained a waiver from the Agency pertaining to the Project or (ii) the Finance Authority has otherwise advised the Participant in writing that the American Iron and Steel Requirement is not applicable to the Project.

Comply with all record keeping and reporting requirements under the Clean Water Act/Safe Drinking Water Act, including any reports required by a Federal agency or the Finance Authority such as performance indicators of program deliverables, information on costs and project progress. The Participant understands that (i) each contract and subcontract related to the Project is subject to audit by appropriate federal and state entities and (ii) failure to comply with the Clean Water Act/Safe Drinking Water Act and this Agreement may be a default hereunder that results in a repayment of the Loan in advance of the maturity of the Bonds and/or other remedial actions.

Appendix 4: Sample Construction Contract Language

ALL CONTRACTS MUST HAVE A CLAUSE REQUIRING COMPLIANCE WITH THE AIS REQUIREMENT. THIS IS AN EXAMPLE OF WHAT COULD BE INCLUDED IN ALL CONTRACTS IN PROJECTS THAT USE SRF FUNDS. EPA MAKES NO CLAIMS REGARDING THE LEGALITY OF THIS CLAUSE WITH RESPECT TO STATE OR LOCAL LAW:

The Contractor acknowledges to and for the benefit of the City of _____ ("Purchaser") and the _____ (the "State") that it understands the goods and services under this Agreement are being funded with monies made available by the Clean Water State Revolving Fund and/or Drinking Water State Revolving Fund that have statutory requirements commonly known as "American Iron and Steel;" that requires all of the iron and steel products used in the project to be produced in the United States ("American Iron and Steel Requirement") including iron and steel products provided by the Contactor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the State that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement, (b) all of the iron and steel products used in the project will be and/or have been produced in the United States in a manner that complies with the American Iron and Steel Requirement, unless a waiver of the requirement is approved, and (c) the Contractor will provide any further verified information, certification or assurance of compliance with this paragraph, or information necessary to support a waiver of the American Iron and Steel Requirement, as may be requested by the Purchaser or the State. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or State to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Purchaser or State resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the State or any damages owed to the State by the Purchaser). While the Contractor has no direct contractual privity with the State, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the State is a third-party beneficiary and neither this paragraph (nor any other provision of this Agreement necessary to give this paragraph force or effect) shall be amended or waived without the prior written consent of the State.

Appendix 5: Sample Certifications

The following information is provided as a sample letter of **step** certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Step Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the (melting, bending, coating, galvanizing, cutting, etc.) process for (manufacturing or fabricating) the following products and/or materials shipped or provided for the subject project is in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

The following information is provided as a sample letter of certification for AIS compliance. Documentation must be provided on company letterhead.

Date

Company Name

Company Address

City, State Zip

Subject: American Iron and Steel Certification for Project (XXXXXXXXXX)

I, (company representative), certify that the following products and/or materials shipped/provided to the subject project are in full compliance with the American Iron and Steel requirement as mandated in EPA's State Revolving Fund Programs.

Item, Products and/or Materials:

1. Xxxx
2. Xxxx
3. Xxxx

Such process took place at the following location:

_____

If any of the above compliance statements change while providing material to this project we will immediately notify the prime contractor and the engineer.

Signed by company representative

American Iron & Steel (AIS) Requirement of the Consolidated Appropriations Act of 2014 (Public Law 113-76) Q&A Part 1: Valves and Hydrants

Q1: Does the AIS requirement of the Consolidated Appropriations Act of 2014 require minor, miscellaneous components within a covered valve or hydrant, such as nuts, bolts and washers, to be made in the U.S.?

A1: The definition of "iron and steel products" that must either be domestically produced or subject to a waiver in order to comply with the AIS requirement of the Consolidated Appropriations Act of 2014 includes valves and hydrants. Unlike many other of the "iron and steel products" that are listed in the definition, valves and hydrants are typically precision mechanical products with multiple fitted, operating parts and connections. Valves and hydrants, unlike most of the other listed products, contain other minor components, such as small washers, nuts, and bolts that are of unknown origin but are added to the valve or hydrant during the manufacturing process. For purposes of the 2014 AIS requirement, EPA considers only the significant iron and steel components of a covered valve or hydrant – the body, bonnet, shoe, stem, and wedge/disc/gate/ball – to be within the definition of "iron and steel products" that must either be made domestically, or otherwise must comply with the AIS requirement. The minor components represent a very small percentage of the iron and steel in the hydrants and valves that are defined as "iron and steel products." These minor components, which EPA has learned through our research are currently difficult to find domestically in sufficient quantity, such as minor nuts, bolts, and washers, are not required to be of U.S. origin.

Q2: Do the actuators/control systems attached to valves have to comply with the AIS requirement, or just the valve itself?

A2: The AIS requirement of the Consolidated Appropriations Act of 2014 includes valves in its definition of "iron and steel products" that recipients must make certain are either domestically made or subject to a waiver in order to comply with the AIS requirement. Actuators and control systems are not included in the definition. Only the valve itself is required to be either domestically produced or subject to a waiver in order to be compliant with the AIS requirement. Absent a waiver, EPA considers valves and hydrants to be domestically produced if the significant iron and steel components of a covered valve or hydrant – the body, bonnet, shoe, stem, and wedge/disc/gate/ball – if made of iron or steel, is produced in the U.S. See Q1 above for a discussion about minor components. The valves and actuators, while often purchased and shipped together, are two unique products that are manufactured separately and typically attached together during the final step of the process. Valves are included in the definition of "iron and steel products" in the AIS requirement. Actuators, whether manual, electric, hydraulic or pneumatic, are not listed as an "iron and steel product" under the AIS requirement of the Consolidated Appropriations Act of 2014, nor are they considered construction materials. Therefore, they do not need to be domestically produced in the U.S. in order to comply with the requirement.

Q3: Are electric powered motor operated valves excluded based on the valve being motorized equipment (i.e. electrical equipment)?

A3: No, electric powered motor operated valves are not excluded based on the valve being motorized equipment. The actuator, a motor that controls the valve, is considered a separate product, which is not

listed as an “iron and steel product” under the AIS requirement of the Consolidated Appropriations Act of 2014, nor is it considered a construction material. Therefore, the actuator does not need to be domestically produced in the U.S. in order to comply with the requirement. See Q2 for further clarification.

Q4: Based on EPA’s AIS guidance dated March 20, 2014, gates are not considered construction materials and therefore do not have to be produced in the U.S. Does that include gate valves?

A4: No, valves are specifically listed in the Consolidated Appropriations Act of 2014 as an “iron and steel product” and therefore, absent a waiver, must be produced in the U.S. to be in compliance with the requirement if they are “primarily” iron and steel. Gates as referenced in the EPA March 20, 2014 guidance refer only to common sluice and slide gates, and not to gate valves.

American Iron & Steel (AIS) Requirement of the Consolidated Appropriations Act of 2014
(Public Law 113-76)

Q&A Part 2

PRODUCT QUESTIONS

1. **Q: Do all fasteners qualify for de minimis exemption?**

   A: No. There is no broad exemption for fasteners from the American Iron and Steel (AIS) requirements. Significant fasteners used in SRF projects are not subject to the de minimis waiver for projects and must comply with the AIS requirements. Significant fasteners include fasteners produced to industry standards (e.g., ASTM standards) and/or project specifications, special ordered or those of high value. When bulk purchase of unknown-origin fasteners that are of incidental use and small value are used on a project, they may fall under the national de minimis waiver for projects. The list of potential items could be varied, such as big-box/hardware-store-variety screws, nails, and staples. The key characteristics of the items that may qualify for the de minimis waiver would be items that are incidental to the project purpose (such as drywall screws) and not significant in value or purpose (such as common nails or brads). See the following: http://water.epa.gov/grants_funding/upload/Deminimis-Waiver-04-15-14.pdf.

   EPA also clarifies that minor components of two listed products – valves and hydrants -- may not need to meet the AIS requirements if the minor components compromise a very small quantity of minor, low-cost fasteners that are of unknown origin. See EPA's questions and answers on the subject at the following: http://water.epa.gov/grants_funding/upload/AIS-QandA-Part-1-Valves-and-Hydrants-final.pdf.

2. **Q: Does PCCP pipe have to be domestically produced?**

   A: Yes. Pre-stressed concrete cylinder pipe (PCCP) or other similar concrete cylinder pipes would be comparable to pre-cast concrete which is specifically listed in the Consolidated Appropriations Act of 2014 as a product subject to the AIS requirement.

3. **Q: If the iron or steel is made from recycled metals will the vendor/supplier have to provide a certification document certifying that the recycled metals are domestically produced?**

   A: No. Recycled source materials used in the production of iron and steel products do not have to come from the U.S. Iron or steel scrap, for instance, are considered raw materials that may come from anywhere. While certification is not required for the raw material, EPA does recommend that additional final processing of iron and steel be certified to have occurred in the U.S.

4. **Q: Do tanks used for filtration systems, if delivered to the construction site separately and then filled with filtration media onsite, have to be domestically produced?**

A: No. Tanks that are specifically designed to be filters, or as parts of a filtration system, do not have to be domestically produced because these parts are no longer simply tanks, even if the filter media has not been installed and will be installed at the project site, as is customary to do for shipping purposes. These parts have only one purpose which is to be housing for filters and cannot be used in another fashion.

5. **Q: Can a recipient use non-domestic flanged pipe?**

   A: No. While the Consolidated Appropriations Act of 2014 does not specifically mention flanged pipe, since it does mention both pipe and flanges, both products would need to be domestically produced. Therefore, flanged pipe would also need to be domestically produced.

6. **Q: Can a recipient use non-domestic couplings, expansion joints, and other similar pipe connectors?**

   A: No. These products would be considered specialty fittings, due to their additional functionality, but still categorized under the larger "fitting" categorization. Fittings are defined as a material that joins pipes together or connects to a pipe (AWWA, The Drinking Water Dictionary, 2000). Therefore, these products must comply with the AIS requirements and be produced domestically.

7. **Q: Can a recipient use non-domestic service saddles and tapping sleeves?**

   A: No. These products are necessary for pipe repair, to tap a water main, or to install a service or house connection. Therefore, they are included under the larger "pipe restraint" category which is a specifically identified product subject to the domestic preference in the Consolidated Appropriations Act of 2014.

8. **Q: The AIS guidance does not appear to cover reused items (i.e., existing pipe fittings, used storage tanks, reusing existing valves). How should reused items be addressed?**

   A: The AIS guidance does not address reuse of items. Reuse of items that would otherwise be covered by AIS is acceptable provided that the item(s) was originally purchased prior to January 17, 2014, the reused item(s) is not substantially altered from original form/function, and any restoration work that may be required does not include the replacement or addition of foreign iron or steel replacement parts. EPA recommends keeping a log of these reused items by including them on the assistance recipient's de minimis list, and stating therein that these items are reused products. The donation of new items (such as a manufacturer waiving cost for certain delivered items because of concerns regarding the origin of a new product) is not, however, considered reuse.

9. **Q: What does "time needed" mean in the AIS guidance, in reference to the definition of "Reasonably Available Quantity"?**

A: For considering whether a product would meet reasonably available quantity, "time needed" is based on the construction schedule. If the item is delayed and there is substantial impact on the overall construction schedule, this would not be according to the "time needed."

10. **Q: If a product is not specifically included on the list of AIS covered products, must it comply with AIS?**

    A: Possibly. The AIS requirements include a list of specifically covered products, one of which is construction materials, a broad category of potential products. For construction materials, EPA's AIS guidance includes a set of example items that it considers construction materials composed primarily of iron and steel and covered by the Act. This example list in the guidance is not an all-inclusive list of potential construction materials. However, the guidance also includes a list of items that EPA specifically does not consider construction materials, generally those of electrical or complex-mechanical nature. If a product is similar to the ones in the non-construction material list (and it is also not specifically listed by the Act), it is not a construction material. For all other items specifically included in the Act, coverage is generally self-evident.

11. **Q: If a listed iron and steel product is used as a part for an assembled product that is non-domestic, do the AIS requirements apply?**

    A: AIS requirements only apply to the final product as delivered to the work site and incorporated into the project. Other assemblies, such as a pumping assembly or a reverse osmosis package plant, are distinct products not listed and do not need to be made in the U.S. or composed of all U.S. parts. Therefore, for the case of a non-covered product used in a larger non-domestic assembly, the components, even if specifically listed in the Consolidated Appropriations Act, do not have to be domestically produced.

12. **Q: Is cast iron excluded from the AIS requirements?**

    A: No. Cast iron products that fall under the definition of iron and steel products must comply with the AIS requirements.

13. **Q: The guidance states that "construction materials" do not include mechanical equipment, but then identifies ductwork as a construction material. Please clarify.**

    A: Ductwork is not mechanical equipment, therefore it is considered a "construction material" and must comply with the AIS requirements.

14. **Q: Do "meters" mentioned in EPA's guidance as non-construction materials include both flow meters and water meters?**

    A: Yes. "Meters" includes any type of meter, including: flow meters, wholesale meters, and water meters/service connections.

15. **Q: Must coiled steel be domestic?**

    A: Yes. Coiled steel is an intermediate product used in the production of steel pipe and must come from a U.S. source or subject to a waiver in order to comply with the AIS requirements.

16. **Q: Are pig iron, direct reduced iron (DRI), and ingot considered raw materials?**

    A: No. These are considered intermediate products used in the production of iron or steel and must come from a U.S. source or subject to a waiver in order to comply with the AIS requirements.

17. **Q: Can assistance recipients rely on a marking that reads, "Made in the USA," as evidence that all processes took place in the U.S.?**

    A: No. This designation is not consistent with our requirements that all manufacturing processes of iron and steel products must take place in the U.S.

18. **Q: When determining what constitutes a product made "primarily" of iron or steel, who makes this determination?**

    A: The manufacturer will show if its product qualifies as primarily made of iron or steel. The recipient should expect the manufacturer to provide documentation/ certification that its product is AIS compliant.

19. **Q: Do aerators need to be produced domestically in order to comply with AIS?**

    A: No. Aerators, similar to pumps, are mechanical equipment that do not need to meet the AIS requirements. "Blowers/aeration equipment, compressors" are listed in EPA's guidance as non-construction materials.

20. **Q: Are Sluice and Slide Gates considered valves?**

    A: No. Valves are products that are generally encased / enclosed with a body, bonnet, and stem. Examples include enclosed butterfly, ball, globe, piston, check, wedge, and gate valves. Furthermore, "gates" (meaning sluice, slide or weir gates) are listed in EPA's guidance as non-construction materials.

AIS PROCESS QUESTIONS

21. **Q: Will notices of waiver applications be published in the federal register?**

    A: No. Applications for waivers will be published on EPA's website (http://water.epa.gov/grants_funding/aisrequirement.cfm**).** EPA will provide 15 days for open public comment, as noted on the website.

22. Q: Will states be collecting the step certification paper trail, as presented in the AIS guidance?

A. No. Assistance recipients must maintain documentation of compliance with AIS. EPA recommends use of the step certification process. This process is a best practice and traces all manufacturing of iron and steel products to the U.S. If the process is used, the state does not have to collect the documentation. The documents must be kept by the assistance recipient and reviewed by the state during project reviews.

23. Q: Why is it considered a best practice for states to conduct site visits, when it is the assistance recipient's responsibility to meet the AIS requirements?

A: It is both the assistance recipient's and the state's responsibility to ensure compliance with the AIS requirements. The state is the recipient of a federal grant and must comply with all grant conditions, including a condition requiring that the AIS requirements be adhered to. Therefore, it is recommended that states conduct site visits of projects during construction and review documentation demonstrating the assistance recipient's proof of compliance.

24. Q: Please further define the state's role in the waiver process.

A: The state's role in the waiver process is to review any waiver requests submitted to the state in order to ensure that all necessary information has been provided by the assistance recipient prior to forwarding the request to EPA. If a state finds the request lacking, the state should work with the assistance recipient to help obtain complete information.

25. Q: How much time does EPA have to evaluate the waiver during the evaluation step?

A: At a minimum, EPA is required to provide 15 days for open public comment. There is no specific deadline or time limit for EPA to review waiver requests. Each waiver request will come with its own specific details and circumstances and may require a different amount of time for review and analysis. For example, public interest waivers in general may take longer to review than availability waivers which are typically more straightforward. However, EPA understands that construction may be delayed while waiting for a waiver and will make every effort to review and issue decisions on waiver requests in a timely manner.

PROJECT QUESTIONS

26. Q: What if a project is funded by another funding entity (i.e., United States Department of Agriculture – Rural Development) where AIS is not required and begins construction after January 17, 2014 but then applies to the SRF to refinance the project? Are they ineligible?

A: The project is not ineligible. AIS requirements will apply to any construction that occurs after the assistance agreement is signed, through the end of construction. If construction is complete, there is no retroactive application of the AIS requirements.

27. **Q: If the assistance recipient can demonstrate through market research that the AIS requirement will exceed the 25 percent cost threshold, is the entire project exempt from the AIS requirement?**

    A: If the waiver application shows that the inclusion of American iron and steel products causes the entire cost of the project to increase by more the 25 percent, a waiver may be granted for the entirety of the project.

28. **Q: Can the recipient use non-SRF funds to pay for the non-compliant item.**

    A: No. It is not an acceptable to use non-SRF funds to pay for a non-compliant item. The Consolidated Appropriations Act of 2014 requires that all iron and steel products, no matter the source of funding, must be made in the U.S. if SRF funds are used in the project.

29. **Q: What constitutes "satisfactory quality" as defined in the AIS guidance, in reference to the availability waiver process.**

    A: "Satisfactory quality" means the product meets the project design specifications. A waiver may be granted if a recipient determines that the project plans and design would be compromised because there are no American made products available that meet the project design specifications.

30. **Q: The guidance states that the AIS requirement applies to any project "funded in whole or in part" by an SRF. Where is this in the Act?**

    A: The Act states that, "None of the funds made available by a … [State SRF program] … shall be used for a project for the construction, alteration, maintenance, or repair of a public water system or treatment works unless all of the iron and steel products used in the project are produced in the United States." This sentence clearly states that no SRF program may use its funds for a project unless all of the iron and steel products used in the project are made in the U.S. This is true even if only $1 of SRF funding is used in the project.

31. **Q: There is always an expectation on the part of an assistance recipient that the construction phase of a planning and/or design only loan will be funded through the SRF. If the original planning and/or design only loan was executed prior to a January 17, 2014, does this mean the entire project will be exempt from the AIS requirement?**

    A: If the original loan includes construction, and was executed prior to January 17, 2014, then the AIS provision does not apply to the project. If the original loan was only for planning and/or design, then a written commitment or documented "expectation" is needed to show exemption from the

requirements. Appearance on a priority list in an Intended Use Plan along with written reasonable assurance from the state that the recipient will receive SRF funding for project construction could provide sufficient evidence of "expectation of funding".

32. **Q: What if there has been a change order or redesign requiring new plans and specifications to be approved and they were approved after January 17, 2014: does the project now have to comply with AIS?**

    A: In most cases, no. Change orders are typically small enough changes that the original plan and specification date will still hold true. For example, if a pipe alignment has to be changed for a block or two due to unforeseen conditions, but new plans and specifications had to be submitted for this section of the project, then that could be considered a minor change. However, if there has been a major redesign, perhaps the whole project had to be redesigned starting from scratch, then the new plans and specification approval date would apply.

33. **Q: What if the bids on a project with plans and specifications approved before January 17, 2014 but the loan is signed after January 17, 2014 come in low, and there is significant funding remaining in the loan agreement, so the community designs a second project with the remaining funds: does that project have to comply with the AIS requirements?**

    A: If the second project is closely related in purpose, place and time to the first project, then the second project would be exempt from the AIS requirements. It is the assistance recipient's responsibility (with state oversight) to show that a project is closely related, or not, in purpose, place and time.

34. **Q: What if the assistance agreement was signed after January 17, 2014, state approval of plans for the first phase of the project was in place prior to January 17, 2014, but state approval of the plans for the second phase of the project was received after January 17, 2014?**

    A: In such a case, the AIS provision would not apply to the first phase of the project. If the second phase of the project is considered the same project as the first phase, due to its close relation in purpose, place and time, the entire project may be exempt. It is the assistance recipient's responsibility (with state oversight) to show that phases of a project is closely related, or not, in purpose, place and time.

35. **Q: Do products purchased through procurement-only contracts have to be comply with AIS?**

    A: Yes. For projects funded by SRF, the products procured under any form of contract must comply with AIS. A procurement-only contract generally involves the bulk purchase of common items (such as pipe, concrete, and/or pumps) of independent timing from a set of planned projects. If products which are purchased through a procurement-only contract are being installed under another contract, the procurement-only contract would probably not be considered a separate project in purpose, place and time; and therefore, would have to comply with the AIS requirements.

March 2015

American Iron & Steel Requirement for the Clean Water and Drinking Water State Revolving Funds

Q&A Part 3

*For CWSRF and DWSRF: On **January 17, 2014**, Public Law 113-76, the "Consolidated Appropriations Act, 2014," was enacted and included an American Iron and Steel requirement for the Clean Water and Drinking Water State Revolving Fund programs through the end of fiscal year 2014. Since then, the AIS requirement has continued for both programs, but through different statutes, with a few changes as described in the questions and answers provided below.*

*For CWSRF: On **June 10, 2014**, the Water Resources Reform and Development Act amended the Clean Water Act to include permanent requirements for the use of AIS products in CWSRF assistance agreements. Section 608 of the CWA now contains requirements for AIS that repeat those of the Consolidated Appropriations Act, 2014. All CWSRF assistance agreements must comply with Section 608 of the CWA for implementation of the permanent AIS requirement.*

*For DWSRF: On **December 16, 2014**, the President signed Public Law 113- 235, the "Consolidated and Further Continuing Appropriations Act, 2015," which provides fiscal year 2015 full-year appropriations through September 30, 2015. This law continues the requirement for the use of AIS products in DWSRF assistance agreements through September 30, 2015.*

CWSRF PROGRAM

1. **Q: The Water Resources Reform and Development Act amended the Clean Water Act to include permanent requirements for the use of AIS for CWSRF funded assistance agreements. Does the CWA include an exemption for plans and specifications approved prior to the enactment of the legislation similar to the exemption included in the Consolidated Appropriations Act (CAA) 2014?**

   A: Yes. The WRRDA amendment to the CWA, which included AIS requirements, included a similar exemption as the CAA 2014. For any CWSRF assistance agreement signed on or after October 1, 2014, if the plans and specifications were approved prior to June 10, 2014 (the enactment of WRRDA), then the project is exempt from AIS requirements. For assistance agreements signed prior to October 1, 2014, the previous dates in the CAA 2014 apply (see March 20, 2014, AIS guidance document).

   If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this exemption in Section 608 (f).

   The following table summarizes AIS exemptions based on the plans and specifications approval date for CWSRF funded projects.

CWSRF AIS Project Exemption Based on Plans and Specifications Approval Date		
Assistance Agreement Signed:	Exempt from AIS if Plans and Specifications Were Approved Before:	Basis for Exemption:
1/17/2014 through 9/30/2014	4/15/2014	• Consolidated Appropriations Act 2014 • National waiver signed 4/15/2014*
On or after 10/1/2014	6/10/2014	• Clean Water Act Section 608

** To be covered by the national waiver, the plans and specifications had to be submitted to the state prior to 1/17/2014*

2. **Q: Does the AIS requirement apply to refinanced CWSRF projects?**

   A: Yes, in some cases. If a project began construction, financed from a non-CWSRF source prior to June 10, 2014, but is refinanced through a CWSRF assistance agreement executed on or after October 1, 2014, AIS requirements will apply to all construction that occurs on or after June 10, 2014, through completion of construction, unless engineering plans and specifications were approved by the responsible state agency prior to June 10, 2014. For CWSRF projects funded on or after October 1, 2014, there is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to June 10, 2014.

DWSRF PROGRAM

3. **Q: The Consolidated and Further Continuing Appropriations Act 2015 continues the AIS requirements for DWSRF funded assistance agreements. Does the Act include an exemption for plans and specifications approved prior to the enactment of the legislation, similar to the exemption included in the Consolidated Appropriations Act (CAA) 2014?**

   A: Yes. The Consolidated and Further Continuing Appropriations Act 2015 includes a similar exemption as the CAA 2014. For any assistance agreement signed on or after December 16, 2014 (the enactment of the Act), if the plans and specifications were approved prior to December 16, 2014, then the project is exempt from the AIS requirements. For assistance agreements signed prior to December 16, 2014, the previous dates in the CAA 2014 apply (see March 20, 2014 AIS guidance document).

   If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of the exemption in Section 424(f).

4. **Q: Do DWSRF assistance agreements signed during the time period between September 30, 2014, and December 16, 2014, still have to comply with the AIS requirements?**

A: Yes. The Continuing Appropriations Resolution 2015 was signed on September 19, 2014, which extended funding for the DWSRF with the same conditions that were made applicable by the language in the Fiscal Year 2014 appropriations, including the requirement for the use of American Iron and Steel products in projects receiving financial assistance from the DWSRF. Therefore, all assistance agreements starting October 1, 2014, through the enactment of the Consolidated and Further Continuing Appropriations Act 2015 (signed December 16, 2014), must include the AIS requirements. However, if the plans and specifications for any of these projects were approved prior to April 15, 2014 (the date the national waiver was signed), then the project is exempt from the AIS requirements.

The following table summarizes AIS exemptions based on the plans and specifications approval date for DWSRF funded projects.

DWSRF AIS Project Exemption Based on Plans and Specifications Approval Date		
Assistance Agreement Signed:	Exempt from AIS if Plans and Specifications Were Approved Before:	Basis for Exemption:
1/17/2014 through 9/30/2014	4/15/2014	• Consolidated Appropriations Act 2014 • National waiver signed 4/15/2014*
10/1/2014 through 12/15/2014	4/15/2014	• Continuing Appropriations Resolution 2015 (continued CAA 2014 requirements)** • National waiver signed 4/15/2014*
12/16/2014 through 9/30/2015	12/16/2014	• Consolidated and Further Continuing Appropriations Act 2015

** To be covered by the national waiver, the plans and specifications had to be submitted to the state prior to 1/17/2014*

*** Following the first continuing resolution, there were two additional CRs to fill the gap between 12/11/2014 and 12/16/2014*

5. **Q: Does the AIS requirement apply to refinanced DWSRF projects?**

A: Yes, in some cases. If a project began construction, financed from a non-DWSRF source prior to December 16, 2014, but is refinanced through a DWSRF assistance agreement executed on or after December 16, 2014, AIS requirements will apply to all construction that occurs on or after December 16, 2014, through completion of construction, unless engineering plans and

specifications were approved by the responsible state agency prior to December 16, 2014. For DWSRF projects funded on or after December 16, 2014, there is no retroactive application of the AIS requirements where a refinancing occurs for a project that has completed construction prior to December 16, 2014.

BOTH CWSRF AND DWSRF PROGRAMS

6. **Q: If a coating is applied to the external surface of a domestic iron or steel component, and the application takes place outside of the United States, would the product be compliant under the AIS requirements?**

   A: Yes. The product would still be considered a compliant product under AIS requirements. Any coating processes that are applied to the external surface of iron and steel components that would otherwise be AIS compliant would not disqualify the product from meeting the AIS requirements regardless of where the coating processes occur, provided that final assembly of the product occurs in the United States.

   The exemption above only applies to coatings on the *external surface* of iron and steel components. It does not apply to coatings or linings on internal surfaces of iron and steel products, such as the lining of lined pipes. All manufacturing processes for lined pipes, including the application of pipe lining, must occur in the United States for the product to be compliant with AIS requirements.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: De Minimis Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver pursuant to the "American Iron and Steel (AIS)" requirements of P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), section 436 under the authority of Section 436(b)(1) (public interest waiver) for de minimis incidental components of eligible water infrastructure projects. This action permits the use of products when they occur in de minimis incidental components of such projects funded by the Act that may otherwise be prohibited under section 436(a). Funds used for such de minimis incidental components cumulatively may comprise no more than a total of 5 percent of the total cost of the materials used in and incorporated into a project; the cost of an individual item may not exceed 1 percent of the total cost of the materials used in and incorporated into a project.

P.L. 113-76, Consolidated Appropriations Act, 2014 (Act), includes an "American Iron and Steel" (AIS) requirement in section 436 that requires Clean Water State Revolving Loan Fund (CWSRF) and Drinking Water State Revolving Loan Fund (DWSRF) assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded through an assistance agreement executed beginning January 17, 2014 (enactment of the Act), through the end of Fiscal Year 2014, unless the agency determines it necessary to waive this requirement based on findings set forth in Section 436(b). The Act states, "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that— (1) applying subsection (a) would be inconsistent with the public interest" 436(b)(1).

In implementing section 436 of the Act, the EPA must ensure that the section's requirements are applied consistent with congressional intent in adopting this section and in the broader context of the purposes, objectives, and other provisions applicable to projects funded under the SRF. Water infrastructure projects typically contain a relatively small number of high-cost components incorporated into the project. In bid solicitations for a project, these high-cost components are generally described in detail via project specific technical specifications. For these major components, utility owners and their contractors are generally familiar with the conditions of availability, the potential alternatives for each detailed specification, the approximate cost, and the country of manufacture of the available components.

Every water infrastructure project also involves the use of thousands of miscellaneous, generally low-cost components that are essential for, but incidental to, the construction and are incorporated into the physical structure of the project. For many of these incidental components, the country of manufacture and the availability of alternatives is not always readily or reasonably identifiable prior to procurement in the normal course of business; for other incidental components, the country of manufacture may be known but the miscellaneous character in conjunction with the low cost, individually and (in total) as typically procured in bulk, mark them as properly incidental. Examples of incidental components could include small washers, screws, fasteners (i.e., nuts and bolts), miscellaneous wire, corner bead, ancillary tube, etc. Examples of items that are clearly not incidental include significant process fittings (i.e., tees, elbows, flanges, and brackets), distribution system fittings and valves, force main valves, pipes for sewer collection and/or water distribution, treatment and storage tanks, large structural support structures, etc.

The EPA undertook multiple inquiries to identify the approximate scope of de minimis incidental components within water infrastructure projects during the implementation of the American Reinvestment and Recovery Act (ARRA) and its requirements (Buy American provisions, specifically). The inquiries and research conducted in 2009 applies suitably for the case today. In 2009, the EPA consulted informally with many major associations representing equipment manufacturers and suppliers, construction contractors, consulting engineers, and water and wastewater utilities, and performed targeted interviews with several well-established water infrastructure contractors and firms who work in a variety of project sizes, and regional and demographic settings to ask the following questions:

- What percentage of total project costs were consumables or incidental costs?

- What percentage of materials costs were consumables or incidental costs?

- Did these percentages vary by type of project (drinking water vs. wastewater treatment plant vs. pipe)?

The responses were consistent across the variety of settings and project types, and indicated that the percentage of total costs for drinking water or wastewater infrastructure projects represented by these incidental components is generally not in excess of 5 percent of the total cost of the materials used in and incorporated into a project. In drafting this waiver, the EPA has considered the de minimis proportion of project costs generally represented by each individual type of these incidental components within the many types of such components comprising those percentages, the fact that these types of incidental components are obtained by contractors in many different ways from many different sources, and the disproportionate cost and delay that would be imposed on projects if the EPA did not issue this waiver.

Assistance recipients who wish to use this waiver should in consultation with their contractors determine the items to be covered by this waiver and must retain relevant documentation (i.e., invoices) as to those items in their project files.

If you have any questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kirsten Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Issued on: APR 15 2014

Approved by: _____

Nancy K. Stoner
Acting Assistant Administrator

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: Plans and Specifications Waiver of Section 436 of P.L. 113-76, Consolidated Appropriations Act (CAA), 2014

FROM: Nancy K. Stoner
Acting Assistant Administrator

The EPA is hereby granting a nationwide waiver of the American Iron and Steel requirement pursuant to Section 436(b)(1) (public interest waiver), of the Consolidated Appropriations Act (CAA), 2014, for eligible projects that had engineering plans and specifications submitted to an appropriate state agency prior to and including January 17, 2014, the date of enactment of the CAA, and approved between and including January 17, 2014, and the date of this waiver, where the state agency that approved such plans and specifications did so under the normal course of business for that agency. This action permits the use of non-domestic iron and steel products in such projects funded by a Clean or Drinking Water State Revolving Fund that may otherwise be prohibited under section 436.

If a project does not require approved engineering plans and specifications, the bid advertisement date will count in lieu of the plans and specifications approval date for purposes of this national waiver.

The basis for the nationwide waiver is that due to the uncertainty about whether an American Iron and Steel requirement would be included in this year's appropriation, potential assistance recipients did not have the opportunity to plan for a possible American Iron and Steel requirement. Until detailed guidance was issued, potential assistance recipients were unable to solicit bids from construction firms with appropriate definitions of key terms contained in the CAA language. Additionally, projects that submitted engineering plans and specifications prior to and including January 17, 2014, without knowledge of the American Iron and Steel requirement, and with the anticipation that such plans would be quickly approved, but such approval did not occur until on or after January 17, 2014, would be required to redesign elements of the project, investigate potential domestic products, revise engineering drawings and bid specifications, and resubmit such plans and specifications for approval, thereby delaying the initiation of construction substantially. Those projects which do not require approved plans and specifications, but were bid prior to the guidance being issued, also could be required to rebid the project or submit change orders to comply with the new requirements, which would also delay initiation of construction.

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The imposition of CAA's American Iron and Steel requirement on projects eligible for SRF assistance whose assistance applicants had submitted complete engineering plans and specifications prior to and including January 17, 2014, the date on which those requirements were imposed, and had such plans and specifications approved prior to and including the date on which this waiver is signed, would require the time-consuming and expensive redesign of those projects. Specifically, those projects that can show a reasonable basis for the submission of plans and specification prior to the passage of the CAA would be harmed by the imposition of these requirements post submission. This imposition would conflict with both EPA's, as well as the states', interest in providing funding to eligible recipients in an expeditious and efficient manner, as required by the Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA). Project delays would increase the time necessary to comply with CWA and SDWA requirements and adversely impact the protection of public health and the environment.

CAA Section 436(b) (1) authorized the Administrator to waive the requirements of Section 436(a) in any case or category of cases in which she finds that applying subsection (a) would be inconsistent with the public interest. Therefore, for the foregoing reasons, imposing American Iron and Steel requirements on projects that submitted engineering plans and specifications to an appropriate state agency for approval, or the bid advertisement date for a project that does not require approved engineering plans and specifications, prior to and including January 17, 2014, and approved between and including January 17, 2014, through the date on which this waiver was signed, is not in the public interest.

If you have any questions concerning the contents of this memorandum, please contact Jordan Dorfman, Attorney-Advisor, State Revolving Fund Branch, Municipal Support Division, at dorfman.jordan@epa.gov or (202) 564-0614 or Kirsten Anderer, Environmental Engineer, Infrastructure Branch, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

Issued on: APR 15 2014

Approved by:

Nancy K. Stoner
Acting Assistant Administrator

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

FEB 18 2015

OFFICE OF WATER

DECISION MEMORANDUM

SUBJECT: National Product Waiver for Pig Iron and Direct Reduced Iron for State Revolving Fund Projects

FROM: Kenneth J. Kopocis
Deputy Assistant Administrator

The U.S. Environmental Protection Agency is hereby granting a national product waiver pursuant to the "American Iron and Steel" provisions of the Clean Water Act and Public Law 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," for certain intermediate goods used in the manufacture of iron and steel products.[1] This waiver permits the use of pig iron and direct reduced iron manufactured outside of the United States in domestic manufacturing processes for iron and steel products used in projects funded by a Clean Water or Drinking Water State Revolving Fund that may otherwise be prohibited absent this waiver. The waiver is retroactive and thus also applies to the use of non-domestic pig iron and direct reduced iron before the signature date.

Background: Pig iron and direct reduced iron are intermediate products of iron and steel manufacturing used as material feed sources in iron and steel foundries and steel mills. Pig iron is a product of iron ore smelting in a blast furnace. It is made from molten iron, which has been cast in the shape of "pigs" as it comes from the blast furnace. Direct reduced iron ore is produced from iron ore, pellets or fines, which are reduced in a solid state using natural gas. Hot briquetted iron, or HBI, is a compacted form of direct reduced iron with enhanced physical characteristics for shipment and storage.

Coverage: This waiver permits the use of iron and steel products that were manufactured using non-domestic pig iron and direct reduced iron in projects that receive funds from either the CWSRF or DWSRF. Any project that received or will receive funds from the CWSRF or DWSRF beginning with the enactment of P.L. 113-76, the "Consolidated Appropriations Act, 2014," may use this waiver for iron and steel that use these intermediate goods.

Rationale: The AIS provisions require CWSRF and DWSRF assistance recipients to use specific domestic iron and steel products that are produced in the United States if the project is funded

[1]Absent a waiver, all treatment works and drinking water facilities that are constructed, in whole or in part, with funds from the CWSRF or the DWSRF, must use American made iron and steel. EPA is allowed under certain circumstances to provide waivers of this requirement.

through an SRF assistance agreement unless the Agency determines that it is necessary to waive this requirement. EPA has authority to issue waivers in accordance with Section 608(c)(2) of the Clean Water Act and the AIS provisions extended by P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2). The provision states in part: "[the requirements] shall not apply in any case or category of cases in which the Administrator of the Environmental Protection Agency…finds that – iron and steel products are not produced in the United States in sufficient and reasonably available quantities and of a satisfactory quality."

Product manufacturers and suppliers informed EPA of concerns about the sufficient availability of domestically produced pig iron and direct reduced iron. The iron and steel products produced at steel mills and foundries that use non-domestic intermediate goods are not compliant with the AIS requirements. AIS compliant products used at water and wastewater projects could be in extremely short supply should a waiver of the intermediate goods not be available.

EPA conducted extensive market research on the supply of pig iron and direct reduced iron and found that domestic supplies of these goods sold on the open market are generally not available. There are three major types of facilities that manufacture iron and steel finished products: basic oxygen furnace steel mills (BOF), electric arc furnace steel mills (EAF) and foundries. BOF steel mills undertake both iron making and steel making, as molten iron from the blast furnace is the required feedstock for BOF steel production. EAF steel mills and foundries, on the other hand, use iron and steel scrap as their principal feedstock, which must be supplemented with the use of pig iron and/or direct reduced iron in their manufacturing processes to achieve required steel qualities.

EPA market research has shown that BOF steel mills are able to produce adequate amounts of pig iron to meet their own demands, but these mills use the bulk of this production for their own processes and do not sell pig iron on the open market in sufficient quantities. At this time, there is only one producer of direct reduced iron operating in the U.S. and the company uses the output internally for EAF steel production. Therefore, EAF steel mills and foundries must import pig iron and direct reduced iron to meet their iron needs.

At least 60 percent of the nation's steel production comes from the EAF steel mills that use non-domestic pig iron and direct reduced iron in their manufacturing processes. Consequently, the majority of steel used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Similarly, most, if not all, of the iron foundries in the United States use non-domestic pig iron and direct reduced iron to produce cast and ductile iron products used by water and wastewater projects. Therefore, the majority of iron used in water and wastewater projects would not be compliant with the AIS requirements absent this waiver. Hence, EPA is hereby providing a nationwide waiver pursuant to AIS requirements to cover the non-domestic intermediate iron goods used in the manufacture of iron and/or steel components and products for water and wastewater projects.

Public Comments: EPA requested comments on the draft national waiver and a majority of the comments received were supportive of a national waiver. The commenters in support of the waiver agreed with the Agency's conclusion that pig iron and direct reduced iron are not

produced in the United States in sufficient and reasonably available quantities to meet the needs of many domestic foundries and steel mills. These commenters believe that the waiver will ensure that pig iron and direct reduced iron are treated similarly to raw material inputs in iron and steel manufacturing and by doing so the EPA will preserve the viability of the AIS requirement. These commenters also state that the waiver would treat pig iron and direct reduced iron in a manner consistent with the implementation of other similar federal laws such as the Federal Highway Administration's Buy America requirement. The FHWA issued a similar nationwide waiver of the Buy America requirements in 1995 for pig iron and processed, pelletized and reduced iron ore.

A few commenters challenged the Agency's issuance of a nationwide waiver of the AIS requirements for pig iron and direct reduced iron. These commenters disagreed with the Agency's interpretation of the AIS requirements and stated that raw materials used in iron and steel production must also be produced in the United States. In addition, the commenters questioned whether the Agency could exempt iron and steel products that are composed of non-domestic materials.

The statutory language lists the categories of products that are considered "iron and steel products." The statutory requirements include provisions that allow the EPA to issue waivers under defined conditions, including the case where iron and steel products are not produced in the United States in sufficient and reasonably available quantities. The Agency's market research, supported by comments from manufacturers, has shown that pig iron and direct reduced iron are not produced in the United States in sufficient and reasonably available quantities. Therefore the Agency is authorized to issue a waiver for iron and steel products composed of non-domestic pig iron and direct reduced iron.

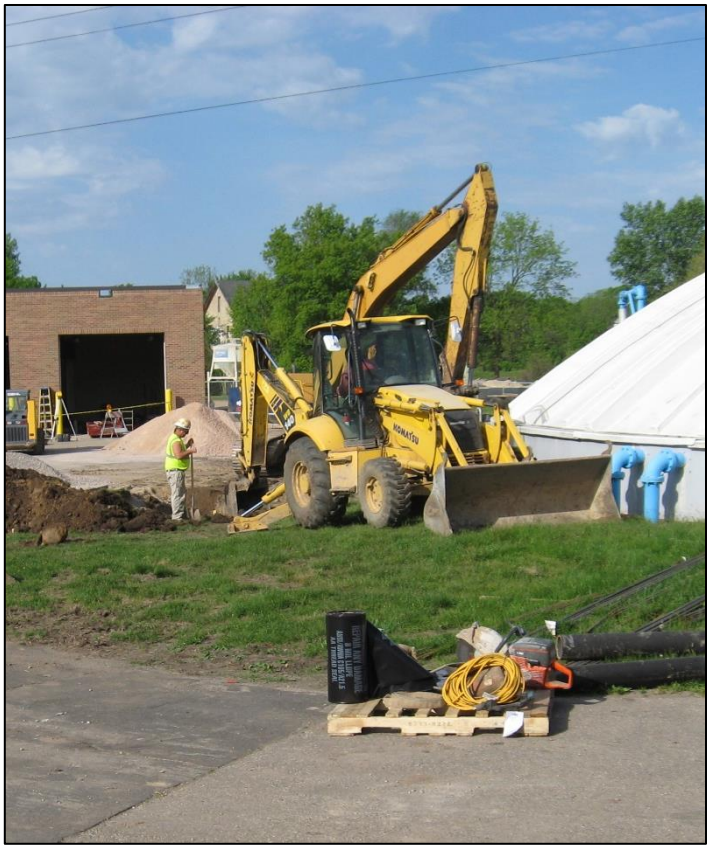
Legal Authority: Legal authority for the AIS requirements for CWSRF projects is included under Sec. 608(c)(2) of the Clean Water Act and previously under P.L. 113-76, the "Consolidated Appropriations Act, 2014," under the authority of Section 436(b)(2). Legal authority for the AIS requirements for DWSRF projects is included under P.L. 113-235, the "Consolidated and Further Continuing Appropriations Act, 2015," under the authority of Section 424(b)(2) and also previously under P.L. 113-76. This waiver will continue in force for DWSRF projects under any continuing resolutions or statutes that use similar language as in Section 424 of the "Consolidated and Further Continuing Appropriations Act, 2015."

If you have questions concerning the contents of this memorandum, please contact Timothy Connor, Chemical Engineer, Municipal Support Division, at connor.timothy@epa.gov or (202) 566-1059 or Kiri Anderer, Environmental Engineer, Drinking Water Protection Division, at anderer.kirsten@epa.gov or (202) 564-3134.

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Contract Packet for Disadvantaged Business Enterprise Compliance

This packet contains important information and required forms for compliance with the U.S. Environmental Protection Agency's Disadvantaged Business Enterprise (DBE) requirements, which are contained in 40 CFR Part 33, and ss. NR 162.09(4) and NR 166.12(4), Wis. Adm. Code. Information is also available on the Environmental Loans website at dnr.wi.gov/aid/documents/EIF/guide/DBE.html.



Acronyms
CWFP: Clean Water Fund Program
DBE: Disadvantaged Business Enterprise
EPA: Environmental Protection Agency
MBE: Minority Business Enterprise
SDWLP: Safe Drinking Water Loan Program
WBE: Women Business Enterprise

Program implementation details are outlined in chs. NR 162 and NR 166, Wis. Adm. Code. Legal notice: This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in federal regulations or state statutes or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing federal regulations and state statutes and administrative rules to the relevant facts. The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240. This publication is offered in other formats upon request, call 608-267-9481.

WISCONSIN DEPT. OF NATURAL RESOURCES

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WHICH DBE REQUIREMENTS APPLY TO YOUR PROJECT?

Throughout this Packet:
- **items in red text apply to ALL municipalities and projects**
- **items in blue text apply to each project designated as Federal Equivalency***

Specific DBE Requirement	CWFP and SDWLP Non-Federal Equivalency Projects	CWFP and SDWLP Federal Equivalency w/ Project Cost *@ or Below* $250,000	CWFP and SDWLP Federal Equivalency w/ Project Cost *Over* $250,000
Solicit for DBEs	X	X	X
Submit Good Faith Certification Form	X	X	X
Establish and Keep a Bidders List			X
Include Extra Conditions in Contracts		X	X
Meet Contract Administration Requirements		X	X

***The department must designate some projects as Federal Equivalency projects each year, see dnr.wi.gov/aid/federalEquivalency. Any recipient whose project is Federal Equivalency must meet ALL of the requirements summarized in the table above.

THE SIX GOOD FAITH EFFORTS

All CWFP and SDWLP financial assistance recipients must comply with the Six Good Faith Effort requirements.

What is the purpose of the Six Good Faith Efforts?

The Six Good Faith Efforts are required for financial assistance agreement recipients to ensure that all DBEs have the opportunity to compete for procurements funded by EPA financial assistance, and to ensure nondiscrimination in the award of contracts resulting from those procurements.

What are the Six Good Faith Efforts?

In order to demonstrate a good faith effort, the recipient must, at a minimum, fulfill the following six affirmative steps:

1. Include qualified DBEs on solicitation lists.

2. Assure that potential DBEs are solicited whenever they are potential sources.

3. Divide scope of work (total requirements), when economically feasible, into smaller tasks or quantities to permit maximum participation of DBEs.

4. Establish delivery schedules (for projects where the requirements of the work allow) that will encourage participation by DBEs.

5. Use the services and assistance of the following, as appropriate:
   - Small Business Administration
   - Minority Business Development Agency
   - U.S. Department of Commerce
   - See list of Unified Certification Programs (UCPs) in Wisconsin and bordering states that certify DBEs and provide similar services and assistance at dnr.wi.gov/aid/documents/EIF/guide/MBElist.html

6. If the prime contractor awards contracts/procurements, require the prime contractor to take the affirmative steps 1-5 above.

How can recipients comply with the DBE solicitation requirements of ss. NR 162.09(4) and NR 166.12(4), Wis. Adm. Code?

All municipalities and prime contractors must make good faith efforts to solicit DBEs whenever required to bid construction work, equipment, raw materials, or supplies for a project according to state procurement laws. DBEs include, but are not limited to, MBEs and WBEs.

Municipalities and prime contractors when applicable, must do ***at least one*** of 1., 2., or 3.:

1. ***Include language* in bid advertisements** that encourages DBEs to submit bid proposals. If contracts are advertised separately, each advertisement should include the DBE language.

   - ***MUNICIPALITIES:*** To make a good faith effort when hiring prime contractors, the municipality should add a statement to its advertisements for prime contractors such as "We encourage DBEs, including MBEs and WBEs, to submit bid proposals." The advertisements must appear at least in the official newspaper of public record for the municipality. ***The municipality must then submit a copy of the advertisement and an affidavit of publishing to the DNR along with other bid documents.***

- ***PRIME CONTRACTORS:*** To make a good faith effort when subcontracting, a contractor can advertise for subcontractors with an ad that includes a statement like "DBEs, including MBEs and WBEs, are encouraged to submit proposals." If just one advertisement is published for all areas of work that may be subcontracted, it should indicate those types of work that could be subcontracted. The advertisement(s) must appear in an industry trade publication and/or the official newspaper of public record for the municipality. ***The prime contractor should supply a copy of the advertisement to the consulting engineer or the municipality so they can submit it to the DNR along with other bid documents.***

2. ***Contact DBEs*** **on a Unified Certification Program (UCP) List** to solicit bids from these firms (e.g., firms registered in the WisDOT UCP, wisconsindot.gov/Pages/doing-bus/civil-rights/dbe/certified-firms.aspx). Individuals that make the contacts should document all the contacts, preferably using Form 8700-294a, the DBE Contacts Worksheet.

   The UCP lists are the main sources of certified DBEs for the CWFP and SDWLP (see dnr.wi.gov/aid/documents/EIF/guide/MBElist.html), but there are other sources available. Any certification must meet the same requirements as those used for UCP-listed businesses.

3. ***Utilize DBEs*** **registered with the UCP** (e.g., WisDOT UCP, wisconsindot.gov/Pages/doing-bus/civil-rights/dbe/certified-firms.aspx). If DBEs are utilized, municipalities must report the expected utilization on Form 8700-294 or Form 8700-294a depending on the solicitation method. ***Municipalities must then submit those forms to DNR along with other bidding documents prior to loan closing.*** When closing out the loan, municipalities will also have to report on the actual details of DBE utilization, so please maintain proper documentation.

When Solicitation Requirements Are Not Met

If none of the above options are used by the municipality and the construction contractor(s) to meet DBE solicitation requirements for a project, ***8% of the construction*** costs in the project budget will be ineligible for SDWLP funding or eligible only for the market interest rate in the CWFP.

MUNICIPALITIES: If a contractor follows at least one of the options to meet DBE solicitation requirements for a project contract, but the municipality uses none of the options to meet DBE solicitation requirements for a project contract, ***1% of the construction costs*** in the project budget for that contract will be ineligible for SDWLP funding or eligible only for the market interest rate in the CWFP.

PRIME CONTRACTORS: If a municipality uses at least one of the options to meet DBE solicitation requirements for a project contract, but the prime contractor uses none of the options to meet DBE solicitation requirements, ***7% of the costs*** of that specific construction contract that would have been eligible for subsidy will instead be ineligible for SDWLP funding or eligible only for market interest rate in the CWFP.

FEDERAL EQUIVALENCY VS. NON-FEDERAL EQUIVALENCY PROJECT REQUIREMENTS

As noted above, **all municipalities** must comply with the ***Six Good Faith Efforts*** **and** ***other steps*** identified ***in Form 8700-294***. These are the only DBE requirements for projects that are non-Federal Equivalency.

Projects designated as Federal Equivalency must comply with the above requirements AND all of the requirements described in the remaining pages of this Contract Packet.

CONTRACT ADMINISTRATION REQUIREMENTS

What are the Contract Administration requirements?

A number of provisions are designed to prevent unfair practices that adversely affect DBEs. Those provisions are as follows:

1) A loan recipient must require its prime contractor to pay its subcontractor for satisfactory performance no later than 30 days from the prime contractor's receipt of payment from the loan recipient.

2) A loan recipient must be notified in writing by its prime contractor prior to any termination of a DBE subcontractor for convenience by the prime contractor.

3) If a DBE subcontractor fails to complete work under the subcontract for any reason, the loan recipient must require the prime contractor to employ the six good faith efforts if soliciting a replacement subcontractor.

4) A loan recipient must require its prime contractor to employ the six good faith efforts even if the prime contractor has achieved its fair share objectives.

What is the Bidders List requirement?

- According to the US EPA: "The purpose of the bidders list is to provide the recipient [DNR] and entities receiving identified loans who conduct competitive bidding [municipalities] with a more accurate database of the universe of MBE/WBE and non-MBE/WBE prime contractors and subcontractors. The bidders list is intended to be a list of all firms that are participating, or attempting to participate, on EPA assisted contracts."

- "The list must include all firms that bid or quote on prime contracts or bid or quote on subcontracts under EPA assisted projects, including both MBE/WBEs and non-MBE/WBEs."

- The bidders list must be kept until construction and the project closeout process are complete.

What information must be retained on the Bidders List?

1) Entity's name with point of contact;

2) Entity's mailing address, telephone number, and email address;

3) The procurement on which the entity bid or quoted, and when; and

4) Entity's status as an MBE/WBE or non-MBE/WBE.

What is the exemption from the Bidders List requirement?

- A municipality receiving funds in the amount of $250,000 or less in any single financial assistance agreement, or in more than one financial assistance agreement with a combined total of $250,000 or less in any one fiscal year, is exempt from the requirement to create and maintain a bidders list.

- This exemption is limited to the bidders list requirements only.

REQUIRED CONTRACT CONDITIONS

Include the following language in all construction contracts associated with a Federal Equivalency project.

This project is being financed in whole or in part by the Wisconsin Department of Natural Resources through the Clean Water Fund Program (CWFP) or the Safe Drinking Water Loan Program (SDWLP). Municipalities constructing projects designated as Federal Equivalency must comply with the following federal laws and all applicable state and federal laws, rules, and regulations and must ensure that their contractor(s) also comply with these laws, rules, and regulations.

1) Title VI of the Civil Rights Act of 1964 (P.L 88-352), the Rehabilitation Act of 1973 (P.L. 93-1123, 87 Stat. 355, 29 U.S.C. Sec. 794), the Older Americans Amendments of 1975 (P.L. 94-135 Sec. 303, 89 Stat. 713, 728, 42 U.S.C. Sec. 6102), and subsequent regulations ensure access to facilities or programs regardless of race, color, national origin, sex, age, or handicap.

2) Executive Order 11246, as amended by Executive Orders 11375 and 12086 and subsequent regulations, prohibits employment discrimination on the basis of race, color, religion, sex, or national origin. Inclusion of the seven clauses in Section 202 of E.O. 11246 as amended by E.O. 11375 and 12086 are required in all project related contracts and subcontracts for municipalities over 3,300 population.

3) Executive Orders 11625, 12138, and 12432; 40 CFR part 33; Section 129 of P.L. 100-590 Small Businesses Reauthorization & Amendment Act of 1988; Public Law 102-389 (42 USC. 437d); a 1993 appropriations act ("EPA's 8% statute"); and Public Law 101-549, Title X of the Clean Air Acts Amendments of 1990 (42 USC. 7601 note) ("EPA's 10% statute") encourage recipients to award construction, supply, and professional service contracts to minority and women's business enterprises (MBE/WBE) and small businesses and require recipients to utilize affirmative steps in procurement.

4) 40 CFR Part 33 - Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency (EPA) Financial Assistance Agreements sets forth a narrowly tailored EPA program to serve the compelling government interest of remedying past and current racial discrimination through agency-wide DBE procurement objectives.

5) Executive Order 12549, 3 CFR, 189; and 40 CFR Part 32, Subparts B and C, prohibit entering into contracts or subcontracts with individuals or businesses who are debarred or suspended. Borrowers are required to check the status of all contractors (construction and professional services) and must require contractors to check the status of subcontractors for contracts expected to be equal to or over $25,000 at SAM.gov/content/exclusions.

6) Executive Order 13202, as amended by Executive Order 13208, does not allow bid specifications, project agreements, or other controlling agreements to require or prohibit bidders, contractors, or subcontractors to enter into or to adhere to project labor agreements.

7) Section 513 of the Federal Water Pollution Control Act (33 USC 1372) or Section 1450(e) of the Safe Drinking Water Act (42 USC 300j-9(e)), as applicable, requires that all laborers and mechanics employed by contractors and subcontractors on projects funded directly by or assisted in whole or in part by and through the Federal Government pursuant to this Act shall be paid wages at rates not less than those prevailing on projects of a character similar in the locality as determined by the Secretary of Labor in accordance with subchapter IV of chapter 31 of title 40, United States Code. With respect to the labor standards specified in this section, the Secretary of Labor has the authority and functions set forth in Reorganization Plan Numbered 14 of 1950 (64 Stat. 1267; 5 USC. App.) and section 3145 of title 40, United State Code. **Please note this provision (Davis-Bacon) applies to ALL loan recipients.**

FORMS

Use the following forms to document good faith efforts and DBE utilization. You can obtain all DBE-related forms from our website at dnr.wi.gov/aid/documents/EIF/forms/forms.html, or by contacting Casey Sweeney at (608) 852-1576 or Casey.Sweeney@Wisconsin.gov.

1. ***8700-294*** **– DBE Good Faith Certification Form**. This mandatory form asks the municipality to certify that required steps were taken to utilize DBEs, including MBEs and WBEs, in its EIF project. The municipality must answer several questions and provide explanations or justification for any "no" answers as to why specific steps were not taken.
2. ***8700-294a*** **– DBE Contacts Worksheet**. It is not mandatory to submit this form when following Option 2 to solicit DBEs, but we encourage municipalities and contractors to use Form 8700-294a. This form provides an easy format for documenting contacts and provides DNR with all the information needed to conduct a review of DBE good faith efforts.

ADDITIONAL INFORMATION

For additional information regarding DBE procurement requirements, contact the DNR project manager assigned to your project or contact Casey Sweeney at (608) 852-1576 or Casey.Sweeney@Wisconsin.gov. Information is also available on the Environmental Loans website at dnr.wi.gov/aid/documents/EIF/guide/DBE.html.

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State of Wisconsin
Department of Natural Resources
Bureau of Community Financial Assistance
101 S. Webster St., PO Box 7921
Madison WI 53707-7921
Phone No. (608) 266-7555 FAX (608) 267-0496
Website: dnr.wi.gov/Aid/EIF.html

Environmental Improvement Fund (EIF) DBE Contacts Worksheet

Form 8700-294A (R 03/17)

NOTE: This form is authorized by chs. NR 162 and NR 166, Wis. Adm. Code. The information requested on this form is necessary for the review of solicitation of Disadvantaged Business Enterprises (DBEs). This form is intended to be a tool to assist those seeking funding from the EIF (Clean Water Fund Program or Safe Drinking Water Loan Program) to meet the DBE requirements of EIF programs. Submitting this form to the Department is optional. Applicants may submit the form as the required documentation of solicitation efforts or provide the information in some other format. Personally identifiable information provided on this form will only be used in determining whether or not DBE requirements are met. Failure to complete or submit this form has no impact on the applicant. For complete information regarding DBE requirements, see the Contract Packet for DBE Compliance on DNR's website at http://dnr.wi.gov/Aid/documents/EIF/Guide/DBE.html.

Contact DBEs on a Unified Certification Program (UCP) List to solicit bids from DBE firms (e.g., firms registered in the WisDOT UCP, http://wisconsindot.gov/pages/doing-bus/civil-rights/dbe/certified-firms.aspx). The individual that makes the contacts should document all contacts. Contact at least 2 minority business enterprises (MBEs) and 2 women's business enterprises (WBEs); additional contacts may be to any type of DBE. Only contacts made to DBEs on DOT's UCP list can be considered in determining whether a good faith effort was made to solicit DBEs.

Project Information

Name of Municipality	EIF Project Number
Name of Prime Contractor	Information Prepared By (Name and Phone or E-Mail Address)

Contacts

Information Needed For Review	Contact 1	Contact 2	Contact 3
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 4	Contact 5	Contact 6
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 7	Contact 8	Contact 9
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 10	Contact 11	Contact 12
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 13	Contact 14	Contact 15
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information Needed For Review	Contact 16	Contact 17	Contact 18
a. Name of Firm Contacted			
b. Contact's Phone Number or E-Mail			
c. Firm Type	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE	◯ MBE ◯ WBE ◯ Other DBE
d. On DOT UCP list?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
e. Date Contacted			
f. Result of contact			
g. Bid received?	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No
h. If bid received and rejected, why rejected?			
i. Utilizing this firm? (If yes, more on p. 4)*	◯ Yes ◯ No	◯ Yes ◯ No	◯ Yes ◯ No

Information on Utilized Firms

Business Name	Street Address	City, State, Zip	Type of Product or Service	Subcontract Amount

SAMPLE AD FORMAT

ATTENTION WBE/MBE/DBE
SUBCONTRACTORS & SUPPLIERS

REQUEST FOR PROPOSALS
(PROJECT NAME)

_____(*Name of Company*)_____ is seeking proposals for the following disciplines:

_____ - Description (optional)
subcontract

_____ - Description (optional)
subcontract

_____ - Description (optional)
subcontract

Disadvantaged Business Enterprises (DBEs) including but not limited to Minority Business Enterprises (MBEs), and Women Business Enterprises (WBEs) are encouraged to submit proposals.

Proposals must be received by _____(*Date & Time*)_____.

For information regarding specific jobs and any assistance you may need, please contact our office.

Company Name
Address
City, State zip
Phone Number
Email address
EEO Employer

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No Anticipated Use of Subcontractors

Name of Bidder:_____
Business Address:_____

_____
Bid Date: _____

The above named Bidder hereby certifies that the Bidder plans to perform the work using its own personnel and resources and does not anticipate using any subcontractors. This statement is provided in lieu of the Environmental Improvement Fund (EIF) MBE/WBE Contacts Worksheet, Form 8700-294A. The Contacts Worksheet is not applicable because the Bidder is not using subcontractors as a part of this bid.

Authorized Signature:_____
Name (Typed or Printed):_____
Title: _____

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Complying with Davis-Bacon Requirements

Learn about the Environmental Loans programs and find guidance at dnr.wi.gov/aid/eif.html

Davis-Bacon and Related Acts (DBRA) apply to projects funded by the U.S. Environmental Protection Agency (EPA) via the Clean Water and Drinking Water State Revolving Funds (SRFs). The DBRA require all contractors and sub-contractors performing on federally-funded construction contracts in excess of $2,000 to pay their laborers and mechanics no less than the locally prevailing wage rates and fringe benefits for corresponding work on similar projects in the area as determined by the Secretary of Labor for inclusion in Davis-Bacon-covered contracts. See the U.S. Department of Labor (DOL) Wage and Hour Division (WHD) Government Contracts Compliance Assistance for information on Davis-Bacon and Related Acts.

Municipal Responsibilities

- Obtain wage determination and monitor it through contract award.
- Ensure all bid, contract, and subcontract documents and sole source contracts contain the wage determination and Davis-Bacon labor standards clauses (prime contractor and sub-contractors).
- For prime contracts over $100,000, comply with Contract Work Hours and Safety Standards Act (CWHSSA).
- Ensure no contracts are awarded to ineligible contractors.
- Ensure the Davis-Bacon poster and wage determination are posted at work site.
- Collect certified payroll reports and statements of Davis-Bacon compliance weekly.
- Spot-check payroll reports/related records.
- Conduct confidential, onsite interviews using Standard Form 1445, Labor Standards Interview.
- Periodically review use of apprentices and trainees.
- Report all alleged Davis-Bacon violations.
- Maintain full documentation of payrolls, certifications, interview forms, etc., for 3 years after project completion in the event the Office of Inspector General examines the project.

Contracts

Municipalities must ensure bids, contracts, and subcontracts contain the applicable wage determination and the Davis-Bacon labor standards clauses found in 29 CFR § 5.5 (Code of Federal Regulations), titled Contract Provisions and Related Matters. The labor standards describe contractor responsibilities and provide remedies for noncompliance. A wage determination (WD) is a set of wages, fringe benefits, and work rules that the DOL has ruled to be prevailing for a given labor category in a given locality. Note that if federal and state wage rates apply, contracts must contain both wage decisions/contract standards and employers must pay the higher of the two rates.

The EPA requires the following language (or a variation thereof) to be included in all bid solicitations and resulting contracts:

> "The successful bidder will be required to conform to the wage requirements prescribed by the federal Davis-Bacon and Related Acts which requires that all laborers and mechanics employed by contractors and sub-contractors performing on contracts funded in whole or in part with federal funds in excess of $2,000 pay their laborers and mechanics not less than the prevailing wage rates and fringe benefits, as determined by the Secretary of Labor, for corresponding classes of laborers and mechanics employed on similar projects in the area." – U.S. Department of Labor Wage and Hour Division May 29, 2009, Guidance.

The following items must be included in the contract with the prime contractor:

- DOL Davis-Bacon wage determination for the project type and location.
- Requirement for sub-contractors to apply the same wage determination.

Program implementation details are outlined in chs. NR 162 and NR 166, Wis. Adm. Code. Legal notice: This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in federal regulations or state statutes or administrative rules are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing federal regulations and state statutes and administrative rules to the relevant facts. The Wisconsin Department of Natural Resources provides equal opportunity in its employment, programs, services, and functions under an Affirmative Action Plan. If you have any questions, please write to Equal Opportunity Office, Department of Interior, Washington, D.C. 20240. This publication is offered in other formats upon request, call 608-267-9481.

WISCONSIN DEPT. OF NATURAL RESOURCES

PRINTED ON RECYCLED PAPER

- Requirement for the wage determination and Davis-Bacon Poster WH1321 to be posted in all relevant languages at all times by the contractor and sub-contractors at the project/work site in a prominent and accessible place for laborers and mechanics.

Additionally, prime contractors and sub-contractors must provide certifications with submitted bids agreeing to comply with Davis-Bacon requirements. **If Davis-Bacon language is included in the sub's contract and the sub signs the contract, this would cover the certification.** If any portion of the construction contract is receiving funding subject to Davis-Bacon, the entire contract is subject to Davis-Bacon. If the punchlist work is included in the construction contract and will be invoiced and paid thru the contractor, then Davis-Bacon applies.

Wage Determination (WD)

Prior to issuing a request for bids or proposals, the municipality must obtain the WD for the project area by accessing Wage Determinations at SAM.gov/content/wage-determinations, then selecting the Davis-Bacon Act (DBA) option, the state and county where the work will be performed, and the DBA construction type. The municipality must include the generated WD document in all bid specifications and resulting contracts. If you are unsure about the funding source, a project can be bid with alternates—one including federal wage rates and one without. (Note: SAM.gov replaced WDOL.gov)

DBA construction types

The construction types are building, residential, highway, and heavy. Most SRF projects will fall under the "heavy" type. The "building" type is for sheltered enclosures, especially with windows, doors, and roofs, that house machinery and equipment, and will be occupied at times. Municipalities should ask their consulting engineer what type to use if they are unsure. A contract can contain more than one construction type. If over 80% of the project cost falls into one construction type, the municipality can use that type for the WD; this may be a benefit or a detriment depending on the project. Contact your DNR Construction Management Engineer (CME) with questions.

Monitor the WD

During the bid advertisement period, municipalities or their consulting engineers **must** monitor SAM.gov to ensure DOL has not changed the wage determination. If the WD changes more than 10 days before bid opening, the bid specifications must be amended with the new WD. Once the bids have been opened, the wage determination is valid for 90 days. If contract award is more than 90 days after bid opening, the WD must be updated. The Davis-Bacon WD included in the contract at the time of contract award stays in effect for the duration of the project.

Request additional classifications

If the WD is missing a wage rate needed for a specific work/job classification, construction type, and/or project location, contact your DNR CME for guidance on requesting a conformance using the Request for Authorization of Additional Classification and Rate Standard Form 1444. The municipality should incorporate the final conformance rate into the bid specifications and construction contracts, and copies of the conformance letter should be kept on file.

Ineligible Contractors

Municipalities cannot knowingly award an SRF construction project to a contractor who has been debarred or suspended by the Federal government. During the bid evaluation period, municipalities must look up all bidders at SAM.gov/content/exclusions to determine if they are ineligible contractors. Municipalities should make a note of verification in the contract file. Contractors are responsible for verifying the eligibility of sub-contractors. Note that SAM.gov replaced Excluded Parties List System (EPLS).

Payroll Reports

Municipalities must collect certified payroll reports and compliance statements from the prime contractor and sub-contractors for every week of contract work and keep them on file for at least three years after project completion. Prime contractors are responsible for preparing and submitting payroll reports for its own employees and submitting

payroll reports for all sub-contractor employees. Per 29 CFR 5.5(a)(3)(ii), payroll reports do **not** include full social security numbers and home addresses. The optional Payroll Form WH-347 (see instructions) may be used to collect and report all of the necessary information.

A weekly payroll statement must provide the following information:

- Name of contractor or sub-contractor (indicate which)
- Project and location
- Project or contract number
- Name of employee
- Employee identification number (e.g., last four digits of social security number – Do not use full SSN)
- Work/Job classification
- Hourly rate of pay (straight and overtime)
- Daily and weekly number of hours worked
- Deductions made
- Actual wages paid

Along with each payroll report, the contractor (or payment supervisor) must submit to the municipality a signed statement of Davis-Bacon compliance, such as the one on the back of Payroll Form WH-347.

Review Payroll Reports

To verify that contractors and sub-contractors are paying appropriate wage rates and fringe benefits, municipalities must spot-check a representative sample of weekly payroll reports for accuracy at least twice for each contract and subcontract during the project—a minimum of once within 2 weeks of initial payroll and once within 2 weeks of final payroll.

Note: The check boxes on page 1 of the Request for Disbursement Form 8700-215 replaced the DBRA Payroll Certification page. The check boxes serve the purpose of assurance from the municipality to DNR certifying that Davis-Bacon has been satisfied for each week employees are paid.

Interview Employees

Municipalities should periodically conduct confidential, onsite interviews with a sampling of the contractor and sub-contractors' employees to determine whether laborers, mechanics, apprentices, and trainees are being paid in accordance with Davis-Bacon requirements—a minimum of once within 2 weeks of initial payroll and once within 2 weeks of final payroll is suggested. The Labor Standards Interview Standard Form 1445 must be completed with every interview and kept on file for at least three years after project completion.

Verify Apprentice and Trainee Registrations

While municipalities (or their designated representatives) are onsite conducting Davis-Bacon interviews, they should take the opportunity to review the apprentice and trainee registrations and certifications that the contractor should be able to easily provide upon request. Municipalities can use the relevant documents to confirm that the number of apprentices does not exceed the ratio to journeymen allowed by the apprenticeship program plan.

Report Violations

Additional interviews may be completed at the municipality's discretion and are required in the case of questionable payroll reports or employee complaints. Report alleged violations to the EPA Davis-Bacon Coordinator listed in the assistance agreement and to the DOL WHD District Office.

Violations include:

- Misclassification of laborers and mechanics.
- Failure to pay full prevailing wage, including fringe benefits, for all hours worked (including overtime hours).

- Inadequate recordkeeping, such as not counting all hours worked by an individual in two or more classifications during a day.
- Failure to maintain a copy of bona fide apprenticeship program and individual registration documents for apprentices.
- Failure to submit certified weekly payrolls.
- Failure to post the Davis-Bacon poster and applicable wage determination.

Final Loan Closeout

When the SRF loan has reached 95% disbursement of the loan amount, DNR will send a final closeout letter to the municipality, including a Wage Rate Compliance Certification. The municipality must prepare the certification on municipal letterhead and submit it to DNR prior to receiving the final loan disbursement.

EPA Davis-Bacon Applicability

Site of work

Davis-Bacon applies only to laborers and mechanics employed "directly upon the site of the work." The site of work is the physical place or places where the construction is called for in the contract or will remain after work has been completed, and any other site where a significant portion of the building or work is construction, provided that such site is established specifically for the contract. It may also include job headquarters, tool yards, batch plants, borrow pits, etc., provided the properties are located adjacent or virtually adjacent to the "site of work" and dedicated exclusively or nearly so to the performance of the contract or project.

Laborers and mechanics

Laborers and mechanics are employees who work with their hands, have manual or physical duties, or are in specific trades. They include carpenters, plumbers, sheet metal workers, etc., including apprentices and trainees. **The DOL focuses on the actual work being performed by the person, not necessarily their title**. As a general rule, an employee who spends the majority of time in a supervisory position onsite and who spends less than 20% of the work week engaged in skilled labor, is exempt from Davis-Bacon requirements for the percentage of time spent in that skilled time. Clerical staff (timekeepers), professionals (architects, engineers, inspectors), and certain utility installers are also exempt.

Force account employees

Davis-Bacon does not apply to "force account" work in which the municipality performs the construction in-house with its own "force account" employees rather than contracting out the construction work. Furthermore, the DOL does not consider a state or local government to be a contractor, even if it enters into a contract to perform construction work (see 29 CFR 5.2(h)).

Business owners

Davis-Bacon requirements do **not** apply to the owner of a construction company. However, to be exempt, the owner must be a "business owner" as defined under 29 CFR § 541.101 and be actively engaged in the management of their business. Davis-Bacon would **apply** if the owner were not engaged in management but predominantly performs manual or physical duties of construction work.

Truck drivers

Davis-Bacon does **not** apply to truck drivers employed by the contractor who come on the job site to deliver construction materials because they are not employed "directly upon the site of the work." Davis-Bacon **does** apply to truck drivers employed by the contractor to move materials on the site of work or from a property located adjacent or virtually adjacent to it. Davis-Bacon does **not** apply to truck drivers employed by the contractor to move materials at any location that existed prior to bid opening (e.g., contractor's headquarters).

EMPLOYEE RIGHTS

UNDER THE DAVIS-BACON ACT

FOR LABORERS AND MECHANICS EMPLOYED ON FEDERAL OR FEDERALLY ASSISTED CONSTRUCTION PROJECTS

PREVAILING WAGES

You must be paid not less than the wage rate listed in the Davis-Bacon Wage Decision posted with this Notice for the work you perform.

OVERTIME

You must be paid not less than one and one-half times your basic rate of pay for all hours worked over 40 in a work week. There are few exceptions.

ENFORCEMENT

Contract payments can be withheld to ensure workers receive wages and overtime pay due, and liquidated damages may apply if overtime pay requirements are not met. Davis-Bacon contract clauses allow contract termination and debarment of contractors from future federal contracts for up to three years. A contractor who falsifies certified payroll records or induces wage kickbacks may be subject to civil or criminal prosecution, fines and/or imprisonment.

APPRENTICES

Apprentice rates apply only to apprentices properly registered under approved Federal or State apprenticeship programs.

PROPER PAY

If you do not receive proper pay, or require further information on the applicable wages, contact the Contracting Officer listed below:

Community Development Specialists at: (800) 362-4505

or contact the U.S. Department of Labor's Wage and Hour Division.

WAGE AND HOUR DIVISION
UNITED STATES DEPARTMENT OF LABOR

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 REV 10/17

DERECHOS DEL EMPLEADO
BAJO LA LEY DAVIS-BACON

PARA OBREROS Y MECÁNICOS EMPLEADOS EN PROYECTOS DE CONSTRUCCIÓN FEDERAL O CON ASISTENCIA FEDERAL

SALARIOS PREVALECIENTES

No se le puede pagar menos de la tasa de pago indicada en la Decisión de Salarios Davis-Bacon fijada con este Aviso para el trabajo que Ud. desempeña.

SOBRETIEMPO

Se le ha de pagar no menos de tiempo y medio de su tasa básica de pago por todas las horas trabajadas en exceso de 40 en una semana laboral. Existen pocas excepciones.

CUMPLIMIENTO

Se pueden retener pagos por contratos para asegurarse que los obreros reciban los salarios y el pago de sobretiempo debidos, y se podría aplicar daños y perjuicios si no se cumple con las exigencias del pago de sobretiempo. Las cláusulas contractuales de Davis-Bacon permiten la terminación y exclusión de contratistas para efectuar futuros contratos federales hasta tres años. El contratista que falsifique los registros certificados de las nóminas de pago o induzca devoluciones de salarios puede ser sujeto a procesamiento civil o criminal, multas y/o encarcelamiento.

APRENDICES

Las tasas de aprendices sólo se aplican a aprendices correctamente inscritos bajo programas federales o estatales aprobados.

PAGO APROPIADO

Si Ud. no recibe el pago apropiado, o precisa de información adicional sobre los salarios aplicables, póngase en contacto con el Contratista Oficial que aparece abajo:

Community Development Specialists at: (800) 362-4505

o póngase en contacto con la División de Horas y Salarios del Departamento de Trabajo de los EE.UU.

DIVISIÓN DE HORAS Y SALARIOS
DEPARTAMENTO DE TRABAJO DE LOS EE.UU.

1-866-487-9243
TTY: 1-877-889-5627
www.dol.gov/whd

WH1321 SPA REV 10/17

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern Work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. General
1. The project consists of the construction of new municipal well and water treatment facility for the City of Menomonie, Wisconsin.
2. It is the intent of these specifications that the Owner will be provided with a complete treatment facility, functioning as intended and meeting the requirements of all applicable rules and regulations.
3. Phase 1 – Well and Building. It is the intention of the Owner to award the project to a single general contractor. The General Contractor shall coordinate efforts with all other contractors.
4. The General Contractor of Phase 1 shall be responsible for the construction of the well, building, pumps and all other items needed for a fully functioning system capable of pumping water into the City's system.
5. Phase 2 – Treatment Equipment. A separate bid will be held for Phase 2 of the project. Phase 2 will install treatment equipment (aerator and pressure filter) along with fluoride and potassium permanganate chemical addition.
6. A temporary wall will be constructed with Phase 1 work to allow for installation of Phase 2 equipment into the building. Materials for the final wall construction shall be provided by the Phase 1 contractor and properly stored on-site for Phase 2 contractor.
7. All work shall be performed in a first-class manner by qualified workmen and shall meet the requirements of all applicable codes and regulations.

B. Well #9 Construction.
1. This project consists of the construction, pumping and sampling of one rock-walled municipal well with a 18-inch casing installed to a depth of approximately 150 feet and an overall depth of approximately 365 feet and a target capacity of 900 gpm.

C. Building Construction
1. The proposed treatment building is to be constructed of cast-in-place concrete foundation, masonry walls, cast-in-place concrete reservoir below the floor slab, exterior insulated brick and block cavity wall, precast concrete hollow core roof planks, interior masonry walls, FRP doors and frames, aluminum windows, roofing system with metal fascia and flashings. Building includes a toilet room as well as plastic laminate cabinetry with solid surface counters; plumbing, heating and ventilating equipment; dehumidifier; fire extinguishers; fire suppression system; high-performance coatings; and appurtenances; and temporary power for tools and equipment are also included.

D. Process Mechanical
1. The project includes furnishing and installing a vertical turbine well pump/motor, drop pipe, discharge head, airline, altitude gauge, well vent, and all related construction and appurtenances.
2. The project includes furnishing and installing two (2) vertical turbine high lift pump/motor, drop pipe, discharge head, and all related construction and appurtenances.
3. The project includes furnishing and installing process piping, valves and appurtances.

E. Electrical Construction
1. The project includes coordinating the installation of underground electric service.

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2. The project includes all equipment and accessories for motor control, power distribution and circuitry, including panel boards and lighting transformers for all equipment at Water Treatment Building.
3. The project includes supply and installation of indoor and outdoor lighting equipment and circuitry.
4. The project includes supply and installation of process control devices, including flow meter and transmitter, and pressure sensor.
5. The project includes supplying and installing a diesel-powered engine-driven generator, transfer switch, and all related appurtenances, to provide an auxiliary power source for the equipment at the water treatment plant requiring electrical power.

F. Site Work
1. Excavation and Grading. The project includes clearing, grubbing, stripping topsoil, unclassified excavation, site grading; erosion control.
2. Site Dewatering. The project includes site dewatering to allow for the installation backwash tanks and sanitary sewer.
3. Storm Sewer. The project includes providing and installing stormwater piping.
4. Watermain. The project includes installing approximately 700 lf of 14-inch, 10-inch and 8-inch watermain for the installation of treated watermain from the WTP, water service lateral; fire hydrant; and appurtenances.
5. Backwash Tanks. The project includes the installation of two (2) precast buried backwash tanks.
6. Sanitary Sewer: The project includes the installation of approximately 540 lf of gravity sanitary sewer and manholes from the backwash tank to the existing sanitary sewer.
7. Restoration. The project includes providing and installing an aggregate base course and asphaltic concrete pavement in the roadway, driveway and parking area; installing concrete curb and gutter and turf restoration.

G. Utility Services. The project includes coordinating the following utility services to the Water Treatment Facility:
1. Natural gas
2. Electric
3. Internet service

H. Coordination with Phase 2 – Treatment Equipment Bid.
1. After test pumping and receipt of water quality results from the final well, a separate bid package will be issued for the treatment equipment. The scope of the Phase 2 – Treatment Equipment Bid includes the following:
   a. Horizontal Pressure Filter
   b. Forced draft aerator
   c. Permanganate chemical feed system
   d. Fluoride chemical feed system
   e. Start-up services for individual systems provided
2. Contractor shall provide the final wall materials for the knock-out wall to be installed by Phase 2 contractor.

I. Overall Construction Sequence and Milestones
1. Bid Phase 1 – Well and Building – January 2026
2. Construct Well #9 and obtain water quality results – September 15, 2026
3. Earliest start of work on building – October 15, 2026
4. Bid Phase 2 – Treatment Equipment – December 2026
5. Phase 1 Substantial Completion –– August 31, 2027
   a. Well #9 capable of pumping to the system without the filter
6. Phase 2 Substantial Completion – January 31, 2028
   a. Well #9 pumping to the system with the filter
7. Phase 1 and 2 Final Completion – Site restoration and punchlist – May 1, 2028
8.

END OF SECTION

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SECTION 01 14 00
WORK RESTRICTIONS AND PROVISIONS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, current edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK (N/A)

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (N/A)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (N/A)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 EXAMINATIONS

A. Contractor shall obtain complete data at the site and inspect surfaces that are to receive the work before proceeding with assembling, fitting or erecting his work under this contract. The Contractor shall notify the Engineer in writing in the case of discrepancies between existing work and drawings, and of any defects in surfaces that are to receive the Contractor's work. The Engineer will direct the remedy of applicable surfaces.

B. Information pertaining to existing conditions that appear on the drawings is based on available records. While such data has been collected with reasonable care, there is no expressed or implied guarantee that conditions so indicated are entirely representative of those actually existing or that unexpected developments may not occur. All data included was provided to assist the Contractor in the investigation of conditions. The Contractor is responsible for the interpretation of the data provided.

C. The Contractor shall become acquainted with the location of underground service, utilities, structures, etc., which may be encountered or be affected by the Contractor's work, and shall be responsible for any damage caused by neglect to provide proper precautions or protection.

D. Utility Locations. Contractor shall be responsible for locating and verifying all utilities on the project and also all relocations where necessary. Typically the utilities require the request for locate be made a minimum of three working days before the Contractor begins work in the area. The utilities shown on the contract drawings are approximate in location, depth, number, and type.

E. Contractor shall verify grades, lines, levels, locations, and dimensions as shown on drawings and report any errors or inconsistencies to the Engineer before commencing work. Starting of work by the Contractor shall imply acceptance of existing conditions.

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3.02 STORAGE AND HANDLING

A. Contractor or the Contractor's authorized representative must be present to accept delivery of all equipment and material shipments. The Owner's employees will not knowingly accept, unload, or store anything delivered to the site for the Contractor's use. Inadvertent acceptance of delivered items by any representative of the Owner shall not constitute acceptance or responsibility to assume all liability for any equipment or material delivered to the job site.

B. Any material or equipment removed from the present construction shall be the property of the Owner and disposition shall be as directed by the Owner or stockpiled at locations shown on the contract drawings. All salvaged materials shall be removed in a workmanlike manner and carefully transported to Owner's storage area. The Contractor shall coordinate the salvaging of items with the Owner.

C. Contractor shall confine all operations, equipment, apparatus, and storage of materials to the immediate area of work to the greatest possible extent. Contractor shall ascertain, observe, and comply with all rules and regulations in effect on the project site, including, but not limited to parking and traffic regulations, use of walks, security restrictions and hours of allowable ingress and egress.

D. The storage of materials on the grounds shall be in strict accordance with the instructions of the Owner.
   1. All materials affected by moisture shall be stored on platforms and protected from the weather in accordance with manufacturer recommendations.
   2. Should it be necessary at any time to move material storage platforms, the Contractors shall move same at the Contractor's expense, when directed by the Owner.
   3. Areas used for storage of materials shall be repaired and restored by the Contractor.

E. The Owner assumes no responsibility for materials stored on the site. The Contractor shall assume full responsibility for damage due to the storage of materials.

F. During the construction of this project, materials, storage areas, and earth stockpiles shall be located so as not to interfere with the installation of the utilities nor cause damage to existing structures or utilities.

3.03 WORK RESTRICTIONS AND PROVISIONS

A. Notification. The Contractor shall notify the Owner and the Engineer 72 hours in advance of beginning work. Notice must also be given to the Owner and the Engineer for each subsequent day the Contractor will be working.

B. Operation During Construction. The existing facilities shall remain completely operational during construction. The Contractor shall be responsible to see that the facilities are operating as they should. Sequence of operations or place of commencement may be determined by the Engineer as deemed to best serve the needs and convenience of the Owner, or as necessity of occasion requires.

C. Starting of work implies acceptance of the work of others. Removal and replacement of work applied to defective surfaces, in order to correct defects, shall be done at the expense of the Contractor who applied work to defective surfaces.

D. Access to Work. Representatives of the State and Federal Regulatory Agencies and Owner shall have access to the work and on-site records at all times.

E. Project Log. A project log shall be maintained showing daily progress of work. Engineer and Owner shall have access to this logbook and the project schedule at all times.

F. Existing pipes, electrical work, and all other utilities encountered, which may interfere with new work, shall be rerouted, capped, cut off, or replaced by the Contractor.

G. Dust and Noise. Contractor shall make an effort to keep dust and noise to a minimum during construction. The dispersion of dust from construction related activities shall, until acceptance of work, be minimized by

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the application of water or other acceptable materials or covers. Noise from any construction activities shall only be allowed during approved working hours. This includes preparation, organizational and clean-up work. Work hours are limited to weekdays between 7 a.m. and 7 p.m. unless specifically stated elsewhere in these specifications or approved during construction by the Owner and Engineer in writing. Only maintenance of traffic and/or erosion control activities are allowed outside of these times.

H. Contractor shall confine equipment, apparatus, storage of materials and operations to limits by specific direction of the Owner or Engineer and shall not bring material onto the site until they are needed for the progress of the work.

I. Cleaning. Contractor shall be responsible for all cleaning required within the technical sections of the specifications governing work under the Contractor's jurisdiction as well as for keeping all work areas, passageways, and all other areas of the premises free of rubbish, debris and scrap which may be caused by the Contractor's operations or that of the Subcontractors.

1. Remove rubbish, debris, and scrap promptly upon its accumulation and in no event later than the end of each week.
2. Combustible waste shall be removed immediately or stored in fire resistive containers until disposed of in an approved manner.
3. Spillage of oil, grease, or other liquids which could cause a slippery or otherwise hazardous situation or stain a finished surface, shall be cleaned up immediately.
4. Dust, dirt, and other foreign matter shall be removed completely from all internal surfaces of all mechanical and electrical units, cabinets, ducts, pipes, etc.
5. Dirt, soil, fingerprints, stains and the like, shall be completely removed from all exposed finished surfaces.
6. If rubbish and debris is not removed, or surfaces cleaned as specified above, the Owner reserves the right to have said work done by others and the related cost(s) will be deducted from monies due the Contractor.

J. Disposal of Demolished Materials. Remove from the site all debris, rubbish, and other materials resulting from demolition operations. Storage of removed materials will not be permitted on the site. If burning is allowed, the Contractor shall obtain all required permits.

K. Mail Service.

1. Temporary relocation of mailboxes. If the Postal Carrier cannot deliver mail to the properties affected by the construction of utilities or roadway, the Contractor shall provide temporary mailboxes or shall relocate existing mailboxes to an accessible site. Contractor shall relocate mailboxes to their new location and set to proper height, as directed by an authorized representative of the US Postal Service. Mailboxes shall be reset as close to original location as possible, unless otherwise noted, while maintaining proper height and location requirements of the US Postal Service, upon restoration of regular postal service. If mailboxes, bases or posts are damaged during removal, it shall be the Contractor's responsibility to replace the damaged part prior to reinstallation. Contractor shall not be responsible for correction of existing deficient mailboxes, bases, or posts. Owner and Engineer shall be notified of such instances immediately.
2. Final relocation of mailboxes. If the Postal Carrier can deliver mail to affected properties during construction, Contractor shall maintain reasonable access to said mailboxes. Upon completion of the project, Contractor shall relocate mailboxes to a location and height that meets the US Postal Service requirements along affected roadways.

L. Street Signs. The Contractor shall salvage and reinstall all signs affected by construction. All signs to be removed shall be done in a workmanlike manner and carefully transported to Owner's storage area. If signs, sign bases or posts are damaged during removal, it shall be the Contractor's responsibility to replace said sign, base or post prior to reinstallation.

M. Garbage Collection. Garbage and/or recycling collection will continue throughout the project. Contractor shall provide temporary access to garbage vehicles throughout the project area or assist with garbage collection in areas inaccessible to vehicular traffic during the project.

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3.04 OPERATION AND PROTECTION

A. Contractor shall schedule his work as to minimize the inconvenience to the Owner and residents adjacent to the project.

B. Traffic Control. The Contractor shall meet the requirements for traffic control in accordance with the Manual on Uniform Traffic Control Devices. All structures and equipment shall be constructed, installed, and operated with guards, controls, and other devices in place.

C. The Contractor shall provide protection as follows:

1. Protection. The Contractor shall provide and maintain proper barricades, fences, signal lights, or watchmen to properly protect the work, persons, animal and property against injury. The cost of protection shall be incidental to the contract and no extra payment will be allowed therefore.
2. Provide, erect, and maintain all required barricades, guard rails, temporary walkways, etc., of sufficient size and strength necessary for protection of stored material and equipment; adjacent to or within project area; adjoining property and the building(s) as well as to prevent accidents to the public and the workmen at the job site.
3. Provide and maintain proper shoring and bracing for existing underground utilities encountered during excavation work, to protect them from collapse or other type of damage until such time as they are to be removed, incorporated into the new work, or can be properly backfilled upon completion of new work.
4. Provide protection against rain, snow, wind, ice, storms or heat so as to maintain all work, materials, apparatus, and fixtures, incorporated in the work or stored on the site, free from injury or damage. At the end of the day's work, cover all new work likely to be damaged. Remove snow and ice as necessary for safety and proper execution of the work.
5. Protect the building and foundations from damage at all times from rain and groundwater. Provide all equipment and enclosures as necessary to provide this protection.
6. Damaged property shall be repaired or replaced in order to return it to preconstruction conditions.
7. Protect materials, work, and equipment, not normally covered by above protection, until construction proceeds to a point where the general building protection of the area where located, dispenses with the necessity therefore. Protect work outside of the building lines such as trenches and open excavations, as specified above.
8. Take any and all necessary precautions to protect Owner's property as well as adjacent property, including trees, shrubs, buildings, sanitary sewers, water piping, gas piping, electric conduit or cable, etc., from any and all damage which may result due to work on this project.
9. Repair work outside of property line in accordance with the requirements of the authority having jurisdiction.
10. Repair any work damaged by failure to provide proper and adequate protection to its original state to the satisfaction of the Owner or remove and replace with new work at the Contractor's expense.
11. Tree Protection. Trees shall be protected from damage and scarring. Do not injure trunks, branches, or roots of trees that are to remain. No trees shall be removed without the approval of the Owner. Tree branches in the way of construction operations shall be carefully pruned prior to construction. Do cutting and trimming only as approved and as directed by the Owner. Do not operate equipment or vehicles within the drip line of a tree to be preserved. Any roots exposed during construction shall be cut clean. Ripping of the roots with excavation equipment shall not be allowed.
12. All survey monuments, property stakes, etc., which are encountered during the construction are to be preserved and undisturbed. The Engineer shall be notified of all such items immediately upon discovery. Failure to preserve such monuments will not be allowed and replacement shall be at the Contractor's expense.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Work restrictions and provisions shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 WORK RESTRICTIONS AND PROVISIONS

A. Work Restrictions and Provisions, Inclusive. The cost associated with work restrictions and provisions shall be considered inclusive to payment for work related to the associated construction item, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

END OF SECTION

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SECTION 01 21 00
ALLOWANCES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. To provide adequate budget and bonding to cover items not precisely determined prior to bidding, include in the Contract Price the costs or quantities described in this Section.

B. Adjustment of Cost:
1. If cost or quantity is more or less than the specified allowance, Contract Price will be adjusted by Change Order, unless stated otherwise herein.
2. Submit documentation for engineer review for the actual costs or quantities after completion of Work. Documentation shall include actual invoices or billing statements and evidence of payment.

C. Designate in schedule of values costs and quantities required under each allowance.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 SPECIFIC ALLOWANCES

A. Electric Service
1. The Contractor shall coordinate new electric services. For bidding purposes, the Contractor shall include $102,000 in his bid for electric service. This cost shall cover installation/upgrade of new electric service to the site.

B. Gas Service
1. The Contractor shall coordinate new gas services. For bidding purposes, the Contractor shall include $5,000 in his bid for gas service. This cost shall cover installation/upgrade of new gas service to the site.

C. Fiber Service
1. The Contractor shall coordinate new fiber services. For bidding purposes, the Contractor shall include $3,000 in his bid for fiber service. This cost shall cover installation/upgrade of new telephone service to the site.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 29 73
SCHEDULE OF VALUES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 1 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Provide a detailed breakdown of the Contract Price showing amounts and quantities allocated to each of the various parts of the Work, as specified herein and as required by General Conditions.

B. Upon request of Engineer, support amounts and quantities with data substantiating their correctness.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 FORM AND CONTENT OF SCHEDULE OF VALUES

A. Schedule shall be typed on 8-1/2-inch by 11-inch white paper. Contractor's standard forms and automated printout will be considered for approval by Engineer upon request. Include following:
1. Project title.
2. Project location.
3. Owner.
4. Engineer.
5. Engineer's project number.
6. Name and address of Contractor.
7. Contract designation.
8. Date.

B. Identify installed value of Work in sufficient detail to serve as basis for computing values for progress payments during construction.

C. Provide a separate listing of general items, such as bonds, insurance, mobilization, field supervision, construction facilities, allowances, and record documents.

D. Follow Project Manual table of contents as format for listing component items. At a minimum, listing shall include material cost and total installed cost for each Specification Section for each structure as listed in this Section.
1. Identify each line item with number and title of respective Specification Division and Section.
2. Include directly proportional amount of Contractor's overhead and profit.
3. For items on which progress payments will be requested for stored materials, break down value into:
   a. Cost of materials, delivered and unloaded.
   b. Total installed value.

E. Provide listing of items for each specification section of sitework and for each specification section of structure related construction, each specifications section of piping work, each specification section of

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process equipment, each specifications section of electrical and instrumentation work. Each item of work shall breakdown costs for materials, labor, and installation. General project cost items shall include breakdown of testing, mobilization/demobilization, bonds, insurance, and Contractor's project administration.

F. Sum of values listed shall equal total Contract Price.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 31 13
PROJECT COORDINATION

GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The General Contractor or his appointed representative shall act as the project coordinator. He shall generally be charged with all duties of a project coordinator including, but not limited to, being responsible for conditions of the contract, administrative requirements, subcontractor's scheduling and cooperation, compliance with specifications and drawings, and all other work related requirements.

B. Contractor shall coordinate the work with adjacent work and shall cooperate with all other Contractors so as to facilitate the general progress of the work. Each Contractor shall afford all other Contractors every reasonable opportunity for the installation of their work and for the storage of their material. In no case will any Contractor be permitted to exclude from the premises or work, any other Contractor or employees thereof, or interfere with any Contractor in the executing or installation of the work.

C. Each Contractor shall perform its work in proper sequence in relation to that of other Contractors and as approved by the Engineer. Any cost caused by defective or ill-timed work shall be borne by the Contractors responsible therefore.

D. Contractor shall arrange the work and dispose of materials so as not to interfere with the work or storage of materials of others and each shall join their work to that of others in accordance with the intent of the drawings and specifications.

E. All Contractors shall work in cooperation with each other and fit their work into the structure as job conditions may demand. All final decisions as to right-of-way and run of pipes and ducts, etc., shall be made by the Engineer or the Owner.

F. It shall be the responsibility of the Contractor to keep constant check on the progress of the work so that each particular trade can insure proper preparation for installation of that Contractor's work and not cause delay in the progress of the work. It shall further be the responsibility of the Contractor to periodically make inspections of work in progress and to notify the Engineer when work is complete in compliance with specifications and drawings.

G. A project log shall be maintained showing daily progress of work. The Engineer and Owner shall have access to this log book and the project schedule at all times.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

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PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 31 19
PROJECT MEETINGS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Preconstruction Meeting. A Preconstruction Meeting will be scheduled and conducted by the Engineer and shall be attended by representatives of the Owner, Contractor and all subcontractors as deemed required by the Engineer. The purpose of the meeting will be to identify all project participants, review project requirements and specifications, establish the method of making pay requests and other matters that may be deemed necessary to be discussed. At this meeting, the Contractor shall submit the proposed construction schedule for review, consensus by the parties and approval. The Contractor shall also submit a schedule of values for the work to be used as the accounting format for all progress payments.

1. Submit a minimum of five (5) copies of the American Iron and Steel (AIS) checklist a minimum of one week prior to the pre-construction meeting. The AIS checklist shall provide a list of all products and materials to be furnished to complete the project. ENGINEER may review and request the CONTRACTOR to provide additional statements/certifications for any products and materials provided on the project.

B. Construction Progress Meetings. Brief weekly meetings, as deemed necessary by the Engineer, will be held and shall be attended by all Contractors. The purpose of the meeting will be to coordinate work schedules, review the project progress and other matters that may be deemed necessary to be discussed.

1. A construction progress meeting agenda shall be prepared as deemed necessary to the Engineer.
2. All construction progress meeting attendees shall be fully prepared prior to the meeting and shall be ready to discuss issues raised as they relate to their work. This shall include, but not be limited to, providing revised schedules, milestone activities, specific requirements for subordinate construction and any proposed or completed changes required for their work.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 32 16
CONSTRUCTION PROGRESS SCHEDULE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Submit preliminary Construction Progress Schedule in accordance with General Conditions prior to pre-construction conference.

B. The Contractor shall comply with and the Work shall be completed in accordance with the following construction schedule:
   1. Award Contract (January 2026 - Tentative)
   2. Notice to Proceed (March 2026 – Tentative)
   3. Milestone A Completion. Milestone A shall be completed by September 15, 2026. Milestone A shall include completion of Well #9 and obtaining water quality results.
   4. No work on Treatment Plant Building can commence until Milestone A is complete.
   5. Substantial Completion. Substantial Completion shall be completed by August 31, 2027. Substantial Completion shall include all work on project as shown on the Contract Drawings and detailed in these specifications, including all items addressed in the project punchlists to date.
   6. Final Completion. The project shall be completed by May 1, 2028. Final Completion shall include all work as shown on the Contract Drawings and detailed in these specifications, and all items addressed in final project closeout punchlist.
   7. Within 30 days of final completion, submit final project closeout documentation inclusive of lien waivers, affidavit of compliance with prevailing wage rate determination, and final pay request.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS

A. Furnish four (4) copies of preliminary schedule, and subsequent revisions thereof, to Engineer three (3) days before each progress meeting.

B. Within three (3) days after monthly progress meetings, furnish four (4) copies of revised schedule to Engineer. Furnish revised schedule to Subcontractors as appropriate.

C. Failure to submit schedules on a timely basis shall be considered cause for withholding progress payments.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 FORM OF SCHEDULE

A. Prepare schedule in form of horizontal bar chart.
   1. Provide separate horizontal bar for each trade, activity or operation.
   2. Provide continuous vertical line to identify first working day of each week.

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3. Scale and space to allow for notations and future revisions.

3.02 CONTENT OF SCHEDULE

A. Show complete sequence of construction by activity or operation.

B. Show dates for beginning and completion of each major element of construction and installation dates for major equipment items. Include:
   1. Each individual task of construction.
   2. Procurement of equipment and systems including Shop Drawing submittals, Engineer's review of submittals, shop tests, and delivery dates.
   3. Identification of Work that will affect existing plant operations.
   4. Services of manufactures' representatives.
   5. Startup dates for major equipment.
   6. Field tests.
   7. Dates of Substantial and Final completion.
   8. Subcontractor Work items.
   9. MBE, WBE, and SBE activities.
   10. O&M data activities
   11. Contractor-provided training.

C. Show projected percentage of completion for each activity as of first day of each month.

3.03 REVISIONS TO SCHEDULE

A. Each month Contractor shall receive update information from Subcontractors and Suppliers that shall be included in current schedule. Revised schedule shall indicate changes such as:
   1. Major changes in scope.
   2. Activities modified since previous submittal.
   3. Revised projections of progress and completion.
   4. Other identifiable changes.

B. Provide narrative report to define following:
   1. Problem area and anticipated delays and their impact on schedule.
   2. Corrective action recommended and its effect.

3.04 MONTHLY PROGRESS MEETINGS

A. Once each month Construction Progress Schedule will be reviewed. Progress will be reviewed:
   1. To identify those activities started and completed during previous period.
   2. For remaining duration required to complete each activity started, but not completed.
   3. For durations of selected activities not yet started.
   4. For effect of Change Orders and proposed sequencing.

B. Update schedule accordingly.

3.05 DELAYS AND RECOVERY

A. If, at any time during the Project, Contractor fails to complete activity by its latest scheduled completion date, Contractor shall, within five (5) working days, submit to Engineer written statement as to how and when work force will be reorganized to return to current construction schedule.

B. If, during schedule review meetings, it becomes apparent that milestone completion dates or Contract completion dates will not be met, Contractor shall take some or all of the following actions:
   1. Increase construction staffing in such quantities and crafts as shall eliminate backlog of Work.

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2. Increase number of working hours per shift, shifts per day, Work days per week, amount of construction equipment or combination of foregoing sufficient to substantially eliminate backlog of Work.
3. Reschedule Work actives to achieve concurrency of accomplishment

C. Under no circumstances will addition of equipment or construction forces, increasing working hours or other method, manner or procedure to return to current Construction Progress Schedule be considered justification for Contract modification or treated as acceleration.

PART 4 MEASUREMENT AND PAYMENT

4.01 CONSTRUCTION PROGRESS SCHEDULE

A. General. Construction Progress Schedule shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
1. Construction Progress Schedule, Lump Sum. When so provided, payment for construction progress schedule shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. Construction Progress Schedule, Inclusive. When no quantity is provided, construction progress schedule shall be considered inclusive to payment for work associated with administration.

END OF SECTION

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SECTION 01 32 23
SURVEY AND LAYOUT DATA

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 1 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The Engineer shall supply line and grade staking for the following:

- reference line/alignment
- right-of-way
- easements
- disturbance limits
- structure layout
- sanitary sewer
- water main and appurtenances
- storm sewer
- electrical
- curb and gutter
- benchmarks

B. For linear features (sewer, water, roadway), unless specifically stated otherwise, stakes will be at 50-foot intervals for location and elevation. For point features (manholes, inlets) two offset stakes will be set to provide location and one stake will provide elevation. Any stakes required by the contractor other than those listed will be the responsibility of the Contractor to stake at no additional cost to the Owner. The Contractor shall be responsible for replacement of any stakes negligently disturbed as determined by the Engineer.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS

A. Automated Machine Guidance (AMG) Control / Staking Plan

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

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PART 4 MEASUREMENT AND PAYMENT

4.01 CONSTRUCTION LAYOUT

A. General. Construction Layout shall be paid for at the bid price for the work as described above in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 1.

1. Construction Layout, Inclusive. When no quantity is provided, Construction Layout shall be considered inclusive to payment for the associated work.

END OF SECTION

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SECTION 01 33 00
SUBMITTALS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing submittal information as required by the contract drawings, other specification sections and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittal Log - Section 01 33 23

1.05 SUBMITTALS

A. As soon as possible after Notice to Proceed, submit brochures of catalog cuts and specifications for all new equipment. Submittal of product data shall comply with the requirements for Submittals.

B. Prior to fabrication or installation, submit Submittals for review. Each submittal shall consist of the minimum number of copies as listed on the submittal log. Two will be returned to the Contractor. Should more than two copies of reviewed Submittals be necessary for Contractor's use and distribution, the Contractor shall supply additional sufficient number of Submittals for review as required.

C. Submittals shall include layout details, schedules, setting instructions, and manufacturer's literature. Concrete reinforcing steel Submittals shall include a concrete pouring sequence for structures with vertical construction joints.

1. Submittals shall be identified with the name of the project, numbered consecutively and bear the stamp of review of the Contractor as evidence that all drawings have been checked by the Contractor for accuracy and compatibility with contract requirements. Drawings not so checked and noted will be returned without being examined.
2. Partial lists will not be considered; Submittals for each part of work shall be complete in one submittal.

D. If information on previously submitted Submittals is altered, in addition to the notations made by the Engineer, the Contractor shall bring all changes to the attention of the Engineer. Corrections or changes indicated on reviewed Submittals shall not be considered an order for extra work.

E. Submittals will not be considered reviewed unless they bear the stamp of review and signature of the Engineer. Drawings will be reviewed for general design only. Dimensions and fit of units of various parts shall be the Contractor's responsibility.

F. Prior to work at the site, submit samples allowing reasonable time for review and testing. Submit samples in sufficient quantity (minimum of five), of adequate size showing quality, type, color range, finish and texture. Label each sample stating material, description, applicable specification sections, intended use, project name, and Contractor's name.

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G. Order no materials subject to sample review until receipt of written shop drawing review. Materials installed shall match reviewed samples. No review of samples shall be taken in itself to change or modify contract requirements beyond the expressed stipulations of the review letter.

H. All Submittals for major equipment must be reviewed and delivery dates scheduled prior to performing any work at the site. A revised work schedule shall be submitted weekly showing corrected delivery dates.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Prior to start up of the equipment, the Contractor shall provide the Engineer with operation and maintenance manuals as listed on the submittal log. The manuals shall include the following:

1. Supplier and manufacturer's name, address, telephone number, and local representative's name, address and telephone number. Sources of service and parts and a list of local repair services, supply houses, and potential sources for the types of repairs and equipment parts.
2. Complete and accurate set of record drawings including drawing dimensions, schematics of hydraulics, wiring, and piping.
3. Warranties and bonds shall be included in manual.
4. Catalog literature complete with test data and performance data and ratings.
5. Specify equipment function, normal operating, and limiting conditions.
6. Assembly, installation, alignment, adjusting, and checking instructions.
7. Operating instructions for start-up, shutdown, routine and normal operation.
8. Emergency operating instructions indicating range and flexibility during emergencies.
9. Detailed service information including schedule of recommended maintenance.
10. Troubleshooting, common operating problems, problems that might occur in unit/process. List probable causes and discuss control/prevention.
11. Detailed safety section covering the operation and maintenance of unit. Contractor shall supply a complete list of equipment service numbers, model numbers, electrical requirements, manufacturer's names, etc.
12. The correct model number shall be designated where the literature covers more than one model.
13. For items assembled by the Contractor, the Contractor shall write and provide duplicate operation and maintenance instructions.
14. Data shall be folded to 8-1/2 inch x 11 inch size and placed into hard cover binders. Material shall be grouped according to specifications section and filed behind individual filing tab pages on which the following is to be typed: Item, Manufacturer, Contractor's Order Number, Supplier's Order Number, Manufacturer's Order Number.
15. Manuals shall be delivered to the Engineer for approval prior to job completion.

1.07 PERMITS AND APPROVALS

A. Obtain and submit copies of all permits, code inspections, and approval documents, as specified.

1.08 CONSTRUCTION SCHEDULE

A. Submit a minimum of five copies of a schedule of operation prior to construction. The schedule shall provide for activities of the various trades and shall be sequenced to provide a minimum of interruption to the operation of existing facilities. Allow ample time for the Owner to alter operations as required by the construction of the various components of the work. Revised and updated construction schedule shall be provided throughout the construction as deemed necessary and requested by the Engineer.

B. The construction schedule shall be supplemented by a list of Submittals, dates they will be submitted for approval and a reasonable time allowance for review.

1.09 START-UP REPORTS

A. Where equipment startup by a factory-trained representative is required, a minimum of three copies of the start-up report shall be submitted which describe the representatives activities and installation approval.

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1. Start-up report shall be a typewritten document containing descriptive information specifically identifying the piece by equipment, all tests conducted, and the results of the tests.
2. Start-up role log, with the dated signatures of those conducting and accepting all start-up instructions and tests shall be provided as part of the report.

B. Substantial completion will not be issued until all start-up reports have been submitted.

1.10 RECORD DRAWINGS

A. The Engineer will provide the Contractor with a suitable set of contract drawings on which daily records of changes and deviations from contract shall be recorded. All buried or concealed piping, conduit, or similar items shall be located by dimensions and elevations on the record drawings.
1. The daily record of changes shall be the responsibility of Contractor's field superintendent. No arbitrary mark-ups will be permitted.
2. At completion of the project, the Contractor shall submit the marked-up record drawings to the Owner.

1.11 SUBMITTAL LOG

A. A submittal log is included as Section 01 33 23 of this Project Manual, which lists the minimum required Submittals, product data, samples, and operation and maintenance manuals. Additional submittals not listed on the log may be required by the Engineer during the course of construction. All submittals to the Engineer shall include the submittal number shown on the log. The minimum number of copies to be submitted is shown on the submittal log. Any additional copies required by the Contractor may be submitted in addition to the number shown on the log.

B. Submit a minimum of five (5) copies of the American Iron and Steel (AIS) checklist a minimum of one week prior to the pre-construction meeting. The AIS checklist shall provide a list of all products and materials to be furnished to complete the project. ENGINEER may review and request the CONTRACTOR to provide additional statements/certifications for any products and materials provided on the project.

C. Revised and updated AIS Checklist shall be provided with all pay requests. Certification or statements of AIS compliance shall be provided with payment requests for all AIS products and materials.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Submittals shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 SUBMITTALS

A. Submittals, Inclusive. The cost for all submittals shall be considered inclusive to payment for work related to the respective equipment, associated construction, or utility, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

END OF SECTION

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SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: Well #9 Water Treatment Facility - Phase 1 Well and Building
City of Menomonie

MSA PROJECT NO: 05323007.1

CONTRACTOR:

Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	Referred To	Referred Date Sent	Date Reviewed	Action: Reviewed with no Comments	Action: Reviewed with Comments as Amend and Resubmit	Action: Rejected	Date Ret'd	# copies to: Contractor	# copies to: Owner	# copies to: Field	# copies to: File
01 32 16	Construction Progress Schedule		6													
01 32 23	Survey and Layout Data		6													
01 33 00	Submittals		6													
01 55 26	Traffic Control		6													
01 77 00	Closeout Procedures		6													
03 15 00	Concrete Accessories		6													
03 11 13	Structural Cast-In-Place Concrete Forming															
03 15 00	Concrete Accessories		6													
03 20 00	Concrete Reinforcing		6													
03 30 00	Cast-In-Place Concrete		6													
03 35 16	Heavy-Duty Concrete Floor Finishing		6													
03 62 00	Non-Shrink Grouting		6													
04 20 00	Unit Masonry System		6													
05 50 00	Metal Fabrications		6													
05 51 33	Ladders		6													
05 53 00	Gratings		6													
06 10 00	Rough Carpentry		6													
06 41 00	Architectural Wood Casework		6													
07 13 00	Sheet Waterproofing		6													

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

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07 14 00	Fluid-Applied Waterproofing		6													
07 21 13	Board Insulation		6													
07 27 26	Fluid-Applied Membrane Air/Vapor Retarder		6													
07 53 23	EPDM Membrane Roofing - Fully Adhered		6													
07 62 00	Sheet Metal Flashing and Trim		6													
07 72 33	Roof Hatches		6													
07 84 00	Firestopping		6													
07 92 00	Joint Sealants		6													
08 16 00	Fiberglass Reinforced Polyester Door and Frame System		6													
08 71 00	Door Hardware		6													
08 81 00	Glass Glazing		6													
09 96 00	High Performance Coatings		6													
10 14 00	Signage		6													
10 14 69	Warning Signs		6													
10 28 13	Toilet and Bath Accessories		6													
10 44 16	Fire Extinguishers		6													
11 16 20	Key Vaults		6													
11 16 20	Key Vaults		6													

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: Well #9 Water Treatment Facility - Phase 1 Well and Building
City of Menomonie

MSA PROJECT NO: 05323007.1

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22 11 13	Water Booster System		6													
23 84 16	High Efficiency Dehumidifier		6													
31 05 19.13	Geosynthetics for Earthwork		6													
32 12 13.16	Asphaltic Tack Coat		6													
32 12 16	Asphaltic Concrete Pavement		6													
32 13 10	Concrete Sidewalk, Steps and Driveways		6													
32 16 13	Concrete Curb and Gutter		6													
32 17 23	Pavement Markings		6													
32 31 13	Chain Link Fences and Gates		6													
32 91 19.13	Topsoil Placement Grading		6													
32 92 19	Seeding		6													
33 01 30.72	Lining Sewers (CIPP)		6													
33 05 16.13	Precast Concrete Utility Structures		6													
33 05 26.16	Tracer Wire		6													
33 10 00	Water Utilities		6													
33 31 13	Public Sanitary Utility Sewerage Pipe		6													
33 39 13	Sanitary Sewer Manholes		6													
33 41 13	Public Storm Utility Drainage Piping		6													

SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES SUBMITTAL LOG

PROJECT: Well #9 Water Treatment Facility - Phase 1 Well and Building
City of Menomonie

MSA PROJECT NO: 05323007.1

CONTRACTOR:

Spec Section #	Spec Section Title/Product	Date Rec'd	Min. # Req'd	# Submitted	Submittal/Revision #	Referred To	Referred Date Sent	Date Reviewed	Action: Reviewed with no Comments	Action: Reviewed with Comments as Amend and Resubmit	Action: Rejected	Date Ret'd	# copies to: Contractor	# copies to: Owner	# copies to: Field	# copies to: File
33 49 13	Storm Drainage Manholes, Frames, and Covers		6													
40 23 23	Process Piping, Valves and Specialties		6													
44 42 56.10	Vertical Turbine Pump		6													
44 42 76.30	Mechanical Lift Slide Gate		6													

SECTION 01 35 00
SPECIAL PROCEDURES

CONTENTS: Work under this section is intended to supplement and/or modify the individual specifications. This section does not relieve the Contractor from fulfilling all items in said sections. The numbers of this section are referenced to those of Specifications Divisions 01 through 33.

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

00.01 SPECIFICATION EXPLANATION

A. The Special Procedures items will supplement or supersede the standard specifications. The number preceding special provisions refers to standard specifications that are being referenced. Where reference is made to Wisconsin Department of Transportation Specifications, all conditions of said specification will apply except "Payment and Measurement."

00.02 WAGE RATES

A. The Contractor shall also comply with all current DWD requirements as provided at the following website: https://sam.gov/content/wage-determinations.

00.03 BID QUANTITIES

A. All Bid Quantities are estimated. The Contractor shall field verify all quantities and work prior to submitting a Bid. Final quantities shall be adjusted to reflect the field installed quantities. The unit price in the Bid shall not be adjusted though final quantities may vary. Lump sum prices shall not be adjusted. The Engineer's estimate of quantities as shown in the Bid is approximate and the right is reserved by the Owner to increase or decrease said quantities.

00.04 ADDITIVE BID ALTERNATES

A. The Bid contains additive bid alternates. The alternate bids will be used to shape the project to fit the budget. The Owner reserves to right to award the Contract on the base bid and any combination of the bid alternates.

00.05 SPECIAL ALLOWANCES

A. Contingency Allowance
   1. Include in the Contract, a lump sum price of $100,000 for use upon Owner's instruction and as need arises during construction.
   2. The use of Contingency does not preclude the necessity for a Change Order, any additional work may still require the approval of a Change Order.
   3. At closeout of project, balance of funds remaining in Contingency Allowance shall be deducted from Contract price.

DIVISION 01 - GENERAL REQUIREMENTS

01.01 SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

A. Contractor shall provide a security fence around the project building site.

B. Security fence shall incorporate the entire building site, equipment, and materials.

C. Security fence shall be 8-foot tall chain link fencing.

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D. All gates and entrances shall be properly secured at the end of each working day.

DIVISION 31 - EARTHWORK

31.01 SETION 31 23 16.16 – STRUCTURAL EXCAVATION FOR STRUCTURES

A. Contractor shall be responsible for the proper disposal of any excess material at an off-site location.

31.02 SECTION 31 23 19 - DEWATERING

A. Contractor shall direct all discharged dewatering water into the City's storm sewer system.

B. Contractor is responsible for all permitting related to dewatering.

31.03 SECTION 31 23 33 TRENCHING AND BACKFILLING

A. Backfill of all trenches shall be Type I. Native materials shall be utilized to the extent practical.

B. Any areas with peat material shall be removed in their entirety.

C. All trenches shall be backfilled prior to the completion of each day's work.

D. Saturated soils shall not be immediately used as pipe embedment or trench backfilling. Soils which are saturated shall be stockpiled separately and allowed to dry or mixed with dry material until the soils have reached a suitable moisture content for backfilling. If no suitable material is found onsite for backfill material, imported granular backfill, if required, shall be approved by the Engineer prior to delivery and/or placement. All costs for backfilling with imported granular materials, including compaction and disposal of existing materials shall be included in the unit price bid for Imported Granular Backfill. Imported Granular Backfill shall only be paid for where authorized in writing by the Engineer in the field.

E. Quality Assurance
1. Perform at least one (1) density test in random compacted backfill layer for every 400 linear feet of trench.
2. All testing shall be performed by a certified individual.
3. Testing shall be incidental to construction.
4. Where field testing indicates compaction which does not meet specifications, Contractor shall remedy at no additional expense to Owner.
5. All tests shall be submitted to Engineer prior to payment.

DIVISION 32 - EXTERIOR IMPROVEMENTS

32.01 SECTION 32 91 19.13 – TOPSOIL PLACEMENT AND GRADING & 32 92 19 - SEEDING

A. Turf Restoration bid item shall cover salvaging of topsoil, relaying of topsoil, providing new topsoil if necessary, grading, seed, mulch, fertilizer, water and maintenance until acceptance.

DIVISION 33 - UTILITIES

33.01 SECTION 33 10 00 – WATER UTILITIES

A. Pipe embedment. In all areas where groundwater is encountered, pipe shall be bedded with 3/4-inch clean stone. Remainder of embedment may be dry, dense granular material.

B. Connect to Existing Water Main. It shall be the Contractor's responsibility to verify the location, size, depth and material of the existing water mains where the project plans show the proposed utilities connecting to the existing utilities, and to provide appropriate fittings as required. Where no other fitting is required at the connection to the existing main, a mechanical joint long sleeve shall be used. All costs for water utility

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connections, including but not limited to excavation, fittings, appurtenances, materials, equipment and labor required, shall be incidental to the installation of the main.

C. Operation of Existing System. The water utility will operate all distribution system valves. The contractor shall cut the water main, remove any plugs or caps, etc. and pump the water out of the trench caused by cutting the main or removal of fittings. All excavations required shall be made by the contractor.

D. Pipe Fittings, Bends & Appurtenances. The Contractor shall furnish and install any bedding, tracer wire, pipe fittings, couplings, transitions, bends and appurtenances required to complete this project. All costs for said items shall be included in the unit price of the most closely related bid item.

E. Insulation. At all locations where storm sewer passes over water main or water service laterals and the separation between the pipes is less than twenty-four inches (24"), insulation shall be installed between the storm sewer pipe and the water main. In all instances where cover over water main is required to be less than eight feet inches (7'6") insulation shall be installed over the water main. Insulation shall be four feet wide, 2" thick minimum.

F. Contractor shall verify hydrant nozzle sizes and thread patterns with the Owner prior to ordering.

G. Polyethylene Encasement is NOT required.

33.02 SECTION 33 31 13 PUBLIC SANITARY UTILITY SEWERAGE PIPE

A. Pipe embedment. In all areas where groundwater is encountered, pipe shall be bedded with 3/4-inch clean stone. Remainder of embedment may be dry, dense granular material. Pipe bedding shall be incidental to pipe installation.

B. Connect to Existing Sanitary Sewer. It shall be the contractor's responsibility to verify the location, size, depth and material of the existing sanitary sewer mains where the project plans show the proposed manholes connecting to the existing sewer mains. All costs for the connections, including but not limited to bypass pumping (if necessary), fittings, appurtenances, materials, equipment and labor required, shall be inclusive to the installation of the sewer main.

C. Contractor shall televise completed sanitary sewer and provide a copy of televising to the Owner and Engineer. Televising shall be incidental to sanitary installation.

D. Adjustment rings shall be PRO-RING by Cretex Specialty Products. Adhesive/sealant shall be M-1 Structural Adhesive/Sealant or equal.

E. Sanitary Drop Connection. Pay item shall cover all work and materials necessary to create an outside sanitary drop and connection to existing manhole as shown on the contract drawings.
1. Connections shall be made to existing manhole by core drilling and providing a new gasketed boot connection.

F. Sanitary Cleanout. Pay item shall cover all work and materials necessary to install a cleanout to the sanitary pipe as shown in the contract drawings.

END OF SECTION

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SECTION 01 41 26
PERMITS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The Contractor shall comply in all ways with the requirements of the following permits:
   1. Wisconsin DNR Water Main Extension Permit
   2. Wisconsin DNR Sanitary Sewer Extension Permit
   3. Wisconsin DNR Well and Treatment Plant approval letter
   4. Wisconsin DNR General WPDES Permit for Storm Water Discharge from a Construction Site
   5. Wisconsin DNR Dewatering Permit (if necessary)
   6. City of Menomonie Commercial Building Permit
      a. Including Special Inspections

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 45 00
QUALITY CONTROL

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Provide quality control for all work performed under this contract as described in this section.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Material and Equipment - Division 01

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 QUALITY ASSURANCE

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Perform work by persons qualified to produce workmanship of specified quality.

F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.08 TOLERANCES

A. Monitor tolerance control of installed products to produce acceptable work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

1.09 REFERENCES

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A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.

C. Obtain copies of standards where required by product specification sections.

D. The contractual relationship, duties, and responsibilities of the parties in Contract nor those of the Engineer shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.10 MOCK-UP

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups are representative of the quality required for the work.

D. Where mock-up has been accepted by Engineer and is specified in product specification sections to be removed; remove mock-up and clear area when directed to do so.

1.11 INSPECTING AND TESTING LABORATORY SERVICES

A. Contractor shall be responsible for concrete testing as outlined in Division 03 of these specifications. For other testing, Owner will appoint, contract, and pay for the services of an independent firm to perform inspecting and testing.

B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Engineer or the Owner.

C. Inspecting, testing, and source quality control may occur on or off the project site. Perform off-site inspecting or testing as required by the Engineer or the Owner.

D. Reports will be submitted by the independent firm to the Engineer indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

E. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
   1. Notify Engineer and independent firm 24 hours prior to expected time for operations requiring services.
   2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

F. Testing or inspecting does not relieve Contractor from the responsibility to perform Work to contract requirements.

G. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the Engineer. Payment for retesting will be charged to the Contractor by deducting inspecting or testing charges from the Contract Sum/Price.

1.12 MANUFACTURERS' FIELD SERVICES AND REPORTS

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A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, and test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

C. Submit report within 30 days of observation to Engineer for information.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 45 16.11
CONCRETE QUALITY CONTROL

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover sampling and testing of concrete to determine the materials conformance and work conformance to the requirements specified for cast-in-place concrete.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Cast-in-Place Concrete - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Concrete Institute (ACI), Annual Book of ACI Standards:
      a. ACI 117/177R - Specification for Tolerances for Concrete Construction and Materials and Commentary, Current Edition.
      b. ACI 209.1R - Report on Factors Affecting Shrinkage and Creep of Hardened Concrete, Current Edition.
      c. ACI 301 - Specifications for Structural Concrete, Current Edition.
      d. ACI 302.1R - Guide for Concrete Floor and Slab Construction, Current Edition.
      e. ACI 305R - Hot Weather Concreting, Current Edition.
      f. ACI 306.1 (R2002) - Standard Specification for Cold Weather Concreting, Current Edition.
      g. ACI 311.4R - Guide for Concrete Inspection, Current Edition.
      h. ACI 318/318R - Building Code Requirements for Structural Concrete and Commentary, Current Edition.
      i. ACI 530/530.1/530R/530.1R - Building Code Requirements and Specification for Masonry Structures and Related Commentaries, Current Edition.
      j. ACI ASCC-1(05) - The Contractor's Guide to Quality Concrete Construction, Third Edition.
      k. ACI CP-10/PACK - Craftsman Study Package for ACI Certification of Concrete Flatwork Finisher, Current Edition.
      l. ACI MCP06 - ACI Manual of Concrete Practice, Parts 1 through 6, and Index, 2006 Edition.
      m. ACI SCM-24 - Concrete Repair Basics, Current Edition.
      n. ACI SP-4 - Formwork for Concrete, Current Edition.
      o. ACI SP-15 - Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with Selected ACI Reference, Current Edition.
      p. ACI SP-71 - ASTM Standards in 318, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field, Current Edition.
      b. ASTM C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens, Current Edition.
      c. ASTM C42 - Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete, Current Edition.

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d. ASTM C78 - Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading), Current Edition.
e. ASTM C114 - Standard Test Methods for Chemical Analysis of Hydraulic Cement, Current Edition.
f. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete, Current Edition.
g. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete, Current Edition.
h. ASTM C173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method, Current Edition.
i. ASTM C183 - Standard Practice for Sampling and the Amount of Testing of Hydraulic Cement, Current Edition.
j. ASTM C186 - Standard Test Method for Heat of Hydration of Hydraulic Cement, Current Edition.
k. ASTM C187 - Standard Test Method for Normal Consistency of Hydraulic Cement, Current Edition.
l. ASTM C188 - Standard Test Method for Density of Hydraulic Cement, Current Edition.
m. ASTM C192 - Standard Practice for Making and Curing Concrete Test Specimens in the Laboratory, Current Edition.
n. ASTM C219 - Standard Terminology Relating to Hydraulic Cement, Current Edition.
o. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method, Current Edition.
p. ASTM C470 - Standard Specification for Molds for Forming Concrete Test Cylinders Vertically, Current Edition.
q. ASTM C823 - Standard Practice for Examination and Sampling of Hardened Concrete in Constructions, Current Edition.
r. ASTM E329 - Standard Specification for Agencies Engaged in Construction Inspection and/or Testing, Current Edition.

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 TESTING FOR ACCEPTANCE

A. Samples of concrete shall be delivered to a location on the site where material conformance tests can be performed.
1. Samples of concrete shall be obtained in accordance with ASTM C172.
2. Test specimens shall be stored without being disturbed for the first 24 hours.
3. Contractor's Sampling and Testing. The Contractor, or independent testing laboratory engaged and paid for by the Contractor, as approved by the Engineer, shall conduct tests on the proposed concrete mixture to determine the slump, entrained air content, compressive strength, or other appropriate tests to determine conformance with these specifications. The Contractor shall supply the standard equipment and molds necessary, and the Contractor shall transport the test specimens to the testing laboratory.
4. Owner's Sampling and Testing. The Owner may conduct tests on the proposed concrete mixture to determine the slump, entrained air content, compressive strength, or other appropriate tests to determine conformance with these specifications, as deemed necessary by the Engineer.

B. Slump and Air Content Tests
1. Slump tests shall be made in accordance with ASTM C143. Air content tests shall be made in accordance with ASTM C173 or ASTM C231. Slump tests and air tests shall always be performed from the same batch from which strength tests are performed.

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2. If the measured slump or air content falls outside the limits specified, a check test shall be made immediately on another portion of the same sample. In the event of a second failure, the concrete shall be considered to have failed to meet the requirements of the specifications and shall not be used in the work.

C. Strength Tests (Contractor's Sampling and Testing for Acceptance). Results from tests conducted by the Contractor shall be considered evidence of compliance of Contractor's materials used in the work, when strength is used as the basis for acceptance.

1. Cylinders for strength tests shall be made in accordance with ASTM C31. During the first 24 hours all test specimens shall be covered and kept at air temperatures between 60 Degrees Fahrenheit and 80 Degrees Fahrenheit in facilities provided on the job site by the Contractor. At the end of 24 hours, specimens will be carefully transported by the Contractor to the testing laboratory, where molds shall be removed, and cylinders shall be cured in a moist condition at 73.4 Degrees Fahrenheit ±3.0 Degrees Fahrenheit until time of test.
2. A strength test for any class of concrete shall consist of four standard cylinders made from a composite sample secured from a single load of concrete in accordance with ASTM C172, with one cylinder tested at 7 days, two at 28 days, and the fourth used as a spare. The test results at 28 days shall be the average of the strength of two specimens determined in accordance with ASTM C39, except that if one specimen in a test shows manifest evidence of improper sampling, molding or testing, it shall be disregarded and the spare cylinder shall be tested.

D. Strength Test (For Early Formwork or Shoring Removal). If the Contractor wishes to remove formwork or shoring prior to the minimum time as specified in Structural Cast-In-Place Concrete Forming - Division 03, they shall, at their expense, prepare test cylinders as evidence of concrete strength as follows:

1. Cylinders shall be made in accordance with ASTM C31. During the period of time from completion of the pour to removal of protective cover and stripping of forms, all test specimens shall be kept with the pour and be subjected to ambient conditions resulting from the curing and protection facilities provided on the job site by the Contractor. At the end of this period, specimens will be carefully transported by the Contractor to the testing laboratory, where molds shall be removed and cylinders shall be stored in outdoor ambient conditions to simulate on job site conditions until time of test.
2. A minimum of two cylinders made from a composite sample secured from a single load of concrete in accordance with ASTM C172. The test results shall be the average of the strength of two specimens determined in accordance with ASTM C39, except that if one specimen in a test shows manifest evidence of improper sampling, molding or testing, it shall be disregarded.

3.02 SELECTION OF TESTING LABORATORY

A. An independent testing laboratory to perform Concrete Quality Control shall meet the requirements of ASTM E329. The laboratory shall be selected by the Contractor as approved by the Engineer.

3.03 TEST REPORTS

A. Test reports will be directly distributed by the laboratory as follows: The original to the Contractor; two copies to the Engineer; one copy to the Owner.

3.04 TESTING REQUIREMENTS

A. The Contractor shall be required to perform one test for each 50 cubic yards of concrete poured, or fraction thereof, for each class of concrete used; except at water retaining structures, perform test for each 20 cubic yards of concrete poured. Each test shall consist of four (4) cylinders; one (1) to be tested at seven (7) days, two (2) to be tested at twenty-eight (28) days, and one (1) to be a spare.

B. Compliance testing shall be performed on every single load, or portion thereof, where water addition to the single load, or portion thereof, takes place on site.

C. A minimum of one (1) test shall be performed per day for each class of concrete placed.

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3.05 CONDITIONS OF COMPLIANCE AND NON-COMPLIANCE

A. Compliance of Contractor's Materials Used in the Work.

1. To conform to the requirements of this specification, every 28-day test representing each mix must be equal to or greater than the specified minimum strength without exception. If a specimen shows manifest evidence of improper sampling, molding, or testing, it will be disregarded. Note, however, that the anticipated strength for all mixes is appreciably above the specified minimum strength due to quality required by the water-cement ratio specified.

B. Non-Compliance of Contractor's Materials Used in the Work

1. When strength is used as the basis for acceptance, should individual tests of the Contractor's specimens produce strengths less than 90% of the specified strength (f'c), tests of cores drilled from the area in question may be required in accordance with ASTM C42. Three cores shall be taken for each cylinder test less than 90% of the specified strength (f'c). If the concrete in the structure will be dry under service conditions, the cores shall be air dried (temperature 60 to 80°F, relative humidity less than 60 percent) for seven (7) days before test and shall be tested dry. If the concrete in the structure will be more than superficially wet under service conditions, the cores shall be immersed in water for at least 48 hours and tested wet.
2. Concrete represented by the core tests will be considered structurally adequate and meet the requirements of this specification if the average of the three cores is equal to at least 95 percent of the specified strength (f'c) and if no single core is less than 90 percent of f'c. To check testing accuracy, locations represented by erratic core strengths may be retested. If these strength acceptance criteria are not met by the core tests, the Engineer shall order appropriate action at no additional cost to the Owner.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Concrete quality control shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 CONCRETE QUALITY CONTROL

A. Concrete Quality Control, Inclusive. All required sampling, preparing of specimen and testing, except as modified by these specifications shall be performed by the Contractor, or an independent testing laboratory engaged and paid for by the Contractor and shall be inclusive to payment for work associated with cast-in-place concrete.

1. The cost of any additional testing required because of failure of previous tests to meet specification requirements shall be borne by the Owner for subsequent tests which comply with the specifications.
2. The cost of any additional testing required because of failure of concrete to meet specification requirements shall be borne by the Contractor for tests which fail to comply with the specifications. All tests required under Paragraph 3.05 "Conditions of Compliance and Non-Compliance", above shall be borne by the Contractor.

B. Concrete Quality Control, Lump Sum. When so provided, payment for concrete quality control shall be made at the contract lump sum price bid.

END OF SECTION

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SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover all materials, equipment, tools, labor and supervision necessary to execute the temporary facilities and controls required for the work.

B. Contractor shall be responsible to obtain from authorities of each respective utility the necessary service for water, electricity, telephone, etc., or make arrangements with the Owner for some or all of these services as specified below.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (NONE)

PART 3 EXECUTION (N/A)

3.01 TEMPORARY ELECTRIC

A. The Contractor shall be responsible for coordinating the installation of primary electric service to the site. Contractor shall be responsible for all work associated with obtaining temporary electric service. Meter for temporary electric service shall be in Contractor's name, and Contractor shall be responsible for all electric power bills for the temporary service until Substantial Completion has been granted by Owner.

3.02 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

A. Provide and maintain incandescent lighting for construction operations.

B. Provide and maintain lighting to exterior staging and storage areas after dark for security purposes.

C. Provide and maintain lighting to interior work areas after dark for security purposes.

D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, and lamps for specified lighting levels.

E. Maintain lighting and provide routine repairs.

F. Permanent building lighting may [not] be utilized during construction.

3.03 TEMPORARY HEATING

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A. Heat enclosed areas to achieve curing of materials, to dissipate humidity, and to in general provide with environmental conditions required for construction operations.
   1. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
   2. Enclose building prior to activating temporary heat in accordance with Enclosures article in this section.
   3. Operation of new permanent equipment for temporary heating purposes is not allowed.
   4. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gas shall not be allowed in any temporary enclosure and building envelope.

3.04 TEMPORARY VENTILATION

A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
   1. Provide and pay for ventilation devices and as needed to maintain specified conditions for construction operations. Provide separate metering and reimburse Owner for cost of energy used.
   2. Operation of new permanent equipment for temporary ventilating purposes is not allowed.

3.05 TELEPHONE SERVICE

A. Provide, maintain, and pay for telephone service to field office at time of project mobilization.

3.06 FACSIMILE SERVICE

A. Provide, maintain and pay for facsimile service and dedicated telephone line to field office at time of project mobilization.

3.07 TEMPORARY WATER

A. Provide, maintain and pay for temporary water. Exercise measures to conserve water. Coordinate access to and use of water with utility provider, extend and supplement with temporary devices as needed to maintain specified conditions for construction operations.

B. Extend branch piping with outlets located so water is available by hoses with threaded connections. Provide temporary pipe insulation to prevent freezing.

3.08 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of project mobilization.

3.09 TEMPORARY FIELD OFFICES AND SHEDS

A. Do not use existing facilities for field offices or for storage.

B. Do not use permanent facilities for field offices or for storage.

C. Provide space and facilities for Project as required.

D. Removal: At completion of Work remove buildings, foundations, utility services, and debris. Restore areas.

3.10 VEHICULAR ACCESS

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A. Provide unimpeded access for emergency vehicles. Maintain 20 foot wide driveways with turning space between and around combustible materials.

B. Provide and maintain access to fire hydrants and control valves free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Use designated existing on-site roads for construction traffic.

3.11 TEMPORARY PARKING

A. Arrange for temporary parking areas to accommodate construction personnel. Use of designated areas of existing parking facilities used by construction personnel is permitted. Locate as approved by Owner. Coordinate specific requirements with Owner.

B. When site space is not adequate, provide additional off-site parking.

C. Use of existing on-site streets and driveways used for construction traffic is permitted. Tracked vehicles not allowed on paved areas.

D. Do not allow heavy vehicles or construction equipment in parking areas.

E. Do not allow heavy vehicle parking on existing pavement.

F. Permanent Pavements and Parking Facilities:
   1. Avoid traffic loading beyond paving design capacity. Tracked vehicles not allowed.
   2. Use of permanent parking structures is not permitted.

G. Maintenance:
   1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
   2. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

H. Removal, Repair:
   1. Remove temporary materials and construction when permanent paving is usable.
   2. Remove underground work and compacted materials to depth of 2 foot fill and grade site as specified.
   3. Repair existing facilities damaged by use, to original or better than condition.

I. Mud From Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets.

3.12 PROGRESS CLEANING AND WASTE REMOVAL

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and rubbish from site periodically and dispose off-site.

E. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

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3.13 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by authorities having jurisdiction for public rights-of-way.

C. Provide protection for facilities designated to remain. Replace damaged facilities.

D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

3.14 TEMPORARY ENCLOSURES

A. Exterior Enclosures:
   1. Provide temporary insulated weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

B. Interior Enclosures:
   1. Provide temporary partitions and ceilings as indicated on contract drawings to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.
   2. Construction: Framing and plywood sheet materials with closed joints and sealed edges at intersections with existing surfaces:

3.15 TEMPORARY SECURITY

A. Security Program:
   1. Protect Work, existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
   2. Initiate program in coordination with Owner's existing security system at project mobilization.
   3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.

B. Entry Control:
   1. Owner will control entrance of persons and vehicles related to Owner's operations.
   2. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

3.16 TEMPORARY WATER CONTROL

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

3.17 TEMPORARY DUST CONTROL

A. Execute Work by methods to minimize raising dust from construction operations.

B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

3.18 TEMPORARY EROSION AND SEDIMENT CONTROL

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A. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

B. Minimize surface area of bare soil exposed at one time.

C. Provide temporary measures including berms, dikes, and drains, and other devices to prevent water flow.

D. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.

E. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

3.19 NOISE CONTROL (N/A)

3.20 PEST CONTROL (N/A)

3.21 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials, prior to Substantial Completion inspection.

B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on contract drawings.

C. Clean and repair damage caused by installation or use of temporary work.

D. Restore existing facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 4 MEASUREMENT AND PAYMENT

4.01 TEMPORARY FACILITIES AND CONTROLS

A. Temporary facilities and controls shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Temporary Facilities and Controls, Lump Sum. When so provided, payment for temporary facilities and controls shall be made at the contract lump sum price bid.
2. Temporary Facilities and Controls, Inclusive. When no quantity is provided, temporary facilities and controls shall be in inclusive to payment for work associated with related utility or infrastructure improvement.

END OF SECTION

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SECTION 01 51 00
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Contractor shall be responsible to obtain from authorities of each respective utility the necessary service for water, electricity, telephone, etc., or make arrangements with the Owner for some or all of these services as specified below.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 WATER

A. Contractors shall be responsible for his or her own water service. No additional costs shall be awarded for provision of water service.

3.02 ELECTRIC

A. The Contractor shall be responsible for coordinating the installation of primary electric service to the site. Contractor shall be responsible for all work associated with obtaining temporary electric service. Meter for temporary electric service shall be in Contractor's name, and Contractor shall be responsible for all electric power bills for the temporary service until Substantial Completion has been granted by Owner.

3.03 TELEPHONE

A. Contractors shall be responsible for their own telephone service. No additional costs shall be awarded for provision of telephone service.

3.04 NATURAL GAS SERVICE

A. Contractors shall be responsible for his or her own natural gas service. No additional costs shall be awarded for provision of natural gas service.

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 55 26
TRAFFIC CONTROL

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Manual on Uniform Traffic Control Devices (MUTCD) for Streets and Highways, current edition.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall include installing and maintaining traffic control devices to safely and efficiently direct traffic through or around the construction site.

B. The work also includes removing temporary traffic control devices at the completion of the project.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Work Restrictions and Provisions – Division 01

C. Submittals – Division 01

1.05 SUBMITTALS

A. If a detailed traffic control plan is not included in the Contract Drawings, the Contractor shall submit a traffic control plan. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (N/A)

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL

A. Traffic control devices and materials shall conform to the MUTCD and applicable State Department of Transportation specifications.

PART 3 EXECUTION

3.01 TRAFFIC CONTROL

A. All Contractors shall comply with the approved detour plan and schedule as attached in the Appendix. It shall be the Contractor's responsibility to notify the Wisconsin DOT and coordinate the installation and removal of said detour.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

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A. Traffic control shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 TRAFFIC CONTROL

A. Traffic Control, Lump Sum. When so provided, payment for traffic control shall be made at the contract lump sum price bid.

B. Traffic Control, Inclusive. When no quantity is provided, traffic control shall be considered inclusive to payment for contract work related to the associated construction.

END OF SECTION

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SECTION 01 60 00
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK (NONE)

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Quality Control - Division 01

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 REQUIREMENTS

A. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.

1.08 TRANSPORTATION AND HANDLING

A. Transport and handle Products in accordance with manufacturer's instructions.

B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.

C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.09 STORAGE AND PROTECTION

A. Store and protect Products in accordance with manufacturers' instructions, with seals and labels intact and legible.

B. Store sensitive Products in weathertight, climate controlled enclosures.

C. For exterior storage of fabricated Products, place on sloped supports, above ground.

D. Provide insured off-site storage and protection when site does not permit on-site storage or protection.

E. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.

F. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

G. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.

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H. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.

1.10 OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named in accordance with the following article.

1.11 SUBSTITUTIONS

A. Engineer will consider requests for Substitutions only within 30 days after date established in Notice to Proceed. Approval or disapproval of a substitution after bidding is entirely at the Engineer's discretion.

B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:
1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
2. Will provide the same warranty for the Substitution as for the specified Product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

F. Substitution Submittal Procedure:
1. Submit one copy of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit Submittals, Product Data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
3. The Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 01 75 16
EQUIPMENT START-UP

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Process Mechanical treatment equipment shall be started up as complete process systems. A system includes all of the various components and equipment that function together to make the system work including accessory equipment such as HVAC, process instrumentation and control and electrical equipment.
   1. Work covers all equipment in Divisions 13, 22, 23, 26, 33, 40, 41, and 44.

B. The Contractor will designate a Start-up Coordinator in writing.
   1. The Coordinator will be responsible for scheduling the various parties involved in each system for equipment checkout and training.
   2. The Coordinator will provide the Engineer with a detailed schedule for equipment checkout, training, and system demonstration for each complete process system.
   3. The Coordinator will be responsible for expediting repairs and interface problems that arise during equipment checkout.
   4. The Coordinator will serve as the liaison between the equipment suppliers and technicians and the Engineer and Owner.

C. Equipment start-up will consist of four phases.
   1. Phase One: Adjustment and Check Out. Each equipment item will be inspected by a factory certified technician so that it is ready to be placed into service.
      a. This will be done for all of the various equipment items in the process system.
      b. The technician will provide the Engineer and Owner with a detailed report describing the adjustments, alignments, calibrations, and settings that he made and listing any damaged parts that were repaired or replaced and certifying that the equipment is properly installed. The report will contain a certification that the equipment has been completely checked out and is 100% ready to go into service.
      c. The Contractor shall provide enough oil and grease to get the equipment operational and to maintain it for a period of one year after the systems demonstration has been completed, including seasonal oil changes.
      d. Programming and software installation will be completed during phase one of the start-up.
      e. As part of his adjustment, the Systems Integrator shall physically demonstrate that all alarms and control sequences are operational in the presence of the Engineer and Owner. The Systems Integrator will prepare a written checklist of the alarms and controls with appropriate boxes for the Engineer and Owner to initial their approval of those various items and another column for comments. This demonstration will also serve the purpose of allowing the Owner and Engineer to review the alarms and control sequences and to make any desired changes prior to training.
   2. Phase Two: Operator Training.
      a. O&M manuals must be submitted a minimum of three weeks prior to training.
      b. Equipment adjustment and check out is to be 100% complete for all of the various items in the process system so that the system is completely functional as a whole prior to training of any individual items.
      c. Training must be conducted by a factory-approved instructor who is familiar with the theory of the equipment operation, all the facets of the physical operation and repair of the equipment item.
      d. The instructor will refer to the O&M manual during training.

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e. Use charts and illustrations where possible to enhance the explanation of the equipment operation.

f. Provide a "Certificate of Instructional Services" to be signed by both the Owner and the instructor verifying that training was provided to the satisfaction of all parties.

g. Training will consist of two parts. These will be applicable to all equipment in the process system including accessory items such as HVAC, controls, and electrical.

1) The first part will be classroom instruction to give an overview of the theory of the equipment operation, the mechanical equipment operation and maintenance and the various functions the equipment is to perform.

2) The second part will consist of field training where plant personnel can observe the operation of the equipment and further instruction can take place by directly pointing out items on the machine.

h. Training will include specific information on lubricant type, viscosity, and volumes necessary for the particular model of equipment.

i. It is intended that structures and buildings will be basically complete and have been cleaned when training occurs.

j. The Owner may videotape the training if he desires.

3. Phase Three: Consecutive Seven-Day System Demonstration. During this phase, the equipment will be allowed to run in automatic mode for seven consecutive days.

a. If all items in the system function perfectly for seven days the system will be considered substantially complete and will be accepted by the Owner. If at anytime during the demonstration there are any problems, malfunctions, or the Engineer feels that the system is not operating correctly, the problem will be corrected and the test will then be rerun starting at day one.

b. The Contractor will keep a daily log describing how the system worked during the seven-day test and will note any problems or repairs that were made. This log will continue on as a retest if necessary.

c. The Contractor will be responsible for all maintenance on the system until a successful system's demonstration has been completed.

d. The Contractor will provide any temporary facilities and services necessary to complete the systems testing.

4. Phase Four: Post Start-up Training. The Contractor will include a cost in his bid to provide a one day post start up training session approximately three months after the equipment has been placed into service, or as requested by the Owner. Travel time is additional to the one-day instructional time.

a. The instructor will check out the equipment to see that it is still operating properly.

b. The instructor will review the training for the equipment given previously and answer questions.

c. The instructor will provide a "Certificate of Post Start-up Services" for the Owner to sign.

1.04 RELATED WORK ELSEWHERE (NONE)

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (NONE)

PART 3 EXECUTION

3.01 START-UP

A. Schedule start-up and training with the engineer at least fourteen days in advance.

B. Classroom training will take place at a location designated by the Owner.

C. Process systems will not be considered substantially complete until the systems testing for that process has been successfully completed.

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PART 4 MEASUREMENT AND PAYMENT (NONE)

END OF SECTION

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover: starting of systems; demonstration and instructions; testing, adjusting and balancing; operation and maintenance data; protecting installed and completed construction; final cleaning; manuals for materials and finishes; manual for equipment and systems; spare parts and maintenance products; product warranties, guarantees and bonds; project closeout procedures; and maintenance service.

B. The Contractor shall assume the responsibility for the protection of all finished construction until accepted by the Owner. The Contractor shall repair and restore any and all damage to finished work to the satisfaction of the Engineer.

C. The Contractor shall require each trade to clean the premises of accumulations of surplus materials and rubbish caused by their activities. Burning of rubbish on site will not be permitted.

1.04 RELATED WORK ELSEWHERE

A. (ALL SECTIONS)

1.05 SUBMITTALS

A. The Contactor shall provide to the Engineer a completed list of Disadvantaged Business Enterprise subcontractors used on the Project, including the subcontractor's estimated contract amounts at time of bidding, and the actual dollar amounts paid. DNR Form 8700-294a MBE/WBE Contacts Worksheet is provided in Division 00 for Contractor's use. In addition, EPA Form 6100-4 (DBE Subcontractor Utilization Form) is provided in Division 00 for Contractor's use and must be filed prior to final payment.

B. Davis/Bacon Federal Wage Rates apply. The minimum wages to be paid on the project shall in accordance with the wage scale established by the Federal wage determination. Weekly wage reports must be filed with the Owner or its designated agent, and the Contractor's employees shall be interviewed periodically to verify data. The Owner may withhold payment(s) until wages and fringe benefits are in conformance with prevailing wage requirements.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Provide operation and maintenance manuals covering each item of equipment furnished. Submit manuals to Engineer prior to "Substantial Completion" in accordance with Submittals - Division 01 of these specifications, and as specified herein.

B. Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.

C. Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

D. Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.

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E. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

F. Contents: Prepare Table of contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and supplier. Identify the following:
      a. Significant design criteria.
      b. List of equipment.
      c. Parts list for each component.
      d. Operating instructions.
      e. Maintenance instructions for equipment and systems.
      f. Maintenance instructions for [special] finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
   3. Part 3: Project documents and certificates, including the following:
      a. Shop drawings and product data.
      b. Air and water balance reports.
      c. Certificates.
      d. Originals of warranties and bonds.

1.07 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances.

C. Clean equipment and fixtures to sanitary condition with cleaning materials appropriate to surface and material being cleaned.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

G. Remove waste and surplus materials, rubbish, and construction facilities from site.

1.08 STARTING OF SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems.

B. Notify Engineer and Owner seven days prior to start-up of each item.

C. Verify each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.

D. Verify tests, meter readings, and specified electrical characteristics agree with those required by equipment or system manufacturer.

E. Verify wiring and support components for equipment are complete and tested.

F. Execute start-up under supervision of applicable manufacturer's representative and Contractors' personnel in accordance with manufacturers' instructions.

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G. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

H. Submit a written report in accordance with Submittals-Division 01 that equipment or system has been properly installed and is functioning correctly.

1.09 DEMONSTRATION AND INSTRUCTIONS

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

D. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at schedule time, at equipment location.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

F. Required instruction time for each item of equipment and system is specified in individual sections.

1.10 TESTING, ADJUSTING AND BALANCING

A. The completed Work in accordance with requirements of the contract documents when ready in all respects for use by the Owner shall be subjected to a performance test at operating conditions.

B. Submit reports to Engineer indicating observations and results of tests and indicating compliance or non-compliance with requirements of Contract Documents. Make all adjustments necessary to fulfill requirements and to comply with the instructions and recommendations of manufacturers, and to comply with all codes and regulations.

1.11 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

F. Prohibit traffic from landscaped areas.

1.12 PROJECT RECORD DOCUMENTS

A. Maintain on site one set of the following record documents; record actual revisions to the Work:
   1. Drawings.
   2. Specifications.

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3. Addenda.
4. Change Orders and other modifications to the Contract.
5. Reviewed Shop Drawings, Product Data, and Samples.
6. Manufacturer's instruction for assembly, installation, and adjusting.

B. Ensure entries are complete and accurate, enabling future reference by Owner.

C. Store record documents separate from documents used for construction.

D. Record information concurrent with construction progress, not less than weekly.

E. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
1. Manufacturer's name and product model and number.
2. Product substitutions or alternates utilized.
3. Changes made by Addenda and modifications.

F. Record Drawings [and Shop Drawings]: Legibly mark each item to record actual construction including:
1. Measured depths of foundations in relation to finish first floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
4. Field changes of dimension and detail.
5. Details not on original Contract Drawings.

G. Submit documents to Engineer prior to claim for final Application for Payment.

1.13 MANUAL FOR MATERIALS AND FINISHES

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form within 10 days after final inspection.

E. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Include information for re-ordering custom manufactured products.

F. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

G. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Include recommendations for inspections, maintenance, and repair.

H. Additional Requirements: As specified in individual product specification sections.

I. Include listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

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1.14 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Engineer will review draft and return one copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes 15 days prior to final inspection. Draft copy be reviewed and returned after final inspection, with Engineer comments. Revise content of document sets as required prior to final submission.

D. Submit two sets of revised final volumes in final form with 10 days after final inspection.

E. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.

F. Panelboard Circuit Directories: Provide electrical service characteristics, control, and communications typed.

G. Include color-coded wiring diagrams as installed.

H. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and special operating instructions.

I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

J. Include servicing and lubrication schedule, and list of lubricants required.

K. Include manufacturer's printed operation and maintenance instructions.

L. Include sequence of operation by controls manufacturer.

M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

N. Include control diagrams by controls manufacturer as installed.

O. Include Contractor's coordination drawings, with color-coded piping diagrams as installed.

P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

R. Include test and balancing reports as specified in Quality Control – Division 01.

S. Additional Requirements: As specified in individual product specification sections.

T. Include listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

1.15 SPARE PARTS AND MAINTENANCE PRODUCTS

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A. Furnish spare parts, maintenance, and extra products in quantities specified in individual specification sections.

B. Deliver to Project site and place in location as directed by Owner; obtain receipt prior to final payment.

1.16 PRODUCT WARRANTIES, GUARANTEES AND BONDS

A. Obtain warranties, guarantees and bonds executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

B. Execute and assemble transferable warranty documents and bonds from subcontractors, suppliers, and manufacturers.

C. Verify documents are in proper form, contain full information, and are notarized.

D. Co-execute submittals when required.

E. Include Table of Contents and assemble in three D side ring binder with durable plastic cover.

F. Submit prior to final Application for Payment.

G. Time of Submittals:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

1.17 LOOSE AND DETACHABLE PARTS

A. The Contractor shall retain all loose and small detachable parts of apparatus and equipment furnished under this contract, until completion of the work and shall turn them over to the Owner.

1.18 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.

B. Provide submittals to Engineer for presentation to Owner required by authorities having jurisdiction.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

D. Owner will occupy all portions of building as specified in Summary of Work – Division 01.

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION (N/A)

PART 4 MEASUREMENT AND PAYMENT (N/A)

END OF SECTION

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SECTION 03 11 13
STRUCTURAL CAST-IN-PLACE CONCRETE FORMING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all materials, equipment and labor required to furnish all formwork for cast-in-place concrete as shown on the contract drawings and specified herein.

B. The work shall include formwork, shoring for cast-in-place concrete, and installation into formwork of items by other such as anchor bolts, anchorages, and other items to be embedded in concrete.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Concrete Reinforcing - Division 03

D. Cast-in-Place Concrete - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Concrete Institute (ACI) Annual Book of ACI Standards:
      a. ACI 117/177R - Specifications for Tolerances for Concrete Construction and Materials and Commentary, Current Edition.
      b. ACI 301 - Specifications for Structural Concrete, Current Edition.
      c. ACI 302.1R - Guide for Concrete Floor and Slab Construction, Current Edition.
      d. ACI 311.4R - Guide for Concrete Inspection, Current Edition.
      e. ACI 318 - Building Code Requirements for Structural Concrete, Current Edition.
      f. ACI 347 - Guide to Formwork for Concrete, Current Edition.
      g. ACI 350 – Code Requirements for Environmental Engineering Concrete Structures, Current Edition.
      h. ACI ASCC-1(05) - The Contractor's Guide to Quality Concrete Construction, Third Edition.
      i. ACI SCM-24 - Concrete Repair Basics, Current Edition.
      j. ACI SP-4 - Formwork for Concrete, Current Edition.
      k. ACI SP15 – Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with Selected ACI Reference, Current Edition.
      l. ACI SP-71 - ASTM Standards in ACI 318, Current Edition.
   2. American Plywood Association (APA) Specifications and Standards:
      a. APA PS1 - Plywood Design Specification, Current Edition.

1.05 DEFINITIONS

A. Bug Holes: Surface voids that do not exceed size as listed for Rough Form or Smooth Form Finish. These voids shall be considered surface effects, not defects. Quantity of bug holes is not limited.

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1.06 SUBMITTALS

A. Submit such product literature and catalog cuts of materials to be used for the formation of control / construction joint material in the formwork. Information shall be in conformance with requirements of Submittals – Division 01 of these specifications.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 DESIGN

A. The design and engineering of the formwork and its accessories shall be the responsibility of the Contractor. Formwork shall be designed, erected, supported, braced and maintained so as to safely support all vertical and lateral loads until such loads can be supported by the concrete structure.

B. Determination of loads and design shall be in accordance with ACI 301 and ACI 347.

2.02 FORMS

A. Forms may be wood, plywood, concrete-form-grade hardboard, metal or other acceptable material which will produce smooth, true surfaces.
   1. Provide lumber dressed on at least two edges and one side for tight fit.
   2. Metal forms shall have smooth surfaces free from any pattern, irregularities, dents, bends and sags.

2.03 SHORING

A. All shoring members shall be of such design and material to safely support all dead and working loads throughout the placing and curing period. Shoring shall be placed to prevent sagging and settlement.

2.04 FORM TIES AND ACCESSORIES

A. Form ties shall be factory-fabricated, adjustable-length, removable or snap-off metal, designed to prevent form deflection, and to prevent spalling concrete surfaces upon removal.

B. For exposed concrete surfaces, provide ties so that the portion remaining with the concrete after removal is 1 inch to 1-1/2 inches inside the finished face of the concrete.

C. Unless otherwise indicated, provide form ties which will not leave holes larger than 1 inch in diameter in concrete surfaces.

2.05 FORM COATING COMPOUND

A. Form coating compound shall be a commercial formulation that will not bond with, stain, nor adversely affect concrete surfaces and not impede the wetting of surfaces to be cured with water or curing compounds. Forms for concrete surfaces requiring subsequent treatment shall receive a type of coating that will not impair bond or adhesion.

B. Form coating compound for steel forms shall conform with all requirements stated above and shall be of rust-preventative type.

2.06 CONTROL / CONSTRUCTION JOINT MATERIALS

A. Provide material to be used for the formation of wall control joints and construction joints as indicated on the contract drawings and in this specification. Submit product literature and catalog cuts of materials to be used for forming joints.

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PART 3 EXECUTION

3.01 GENERAL

A. Responsibility. The design and construction of formwork shall be the sole responsibility of the Contractor.

B. Earth forms are not acceptable or permitted.

C. Construct forms to the exact sizes, shapes, lines and dimensions shown, as required to obtain accurate alignment, location, grades, level and plumb in finished construction and to maintain tolerances in accordance with ACI 301. Provide for openings, offsets, keyways, recesses, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required. Chamfer all corners of concrete exposed to view using chamfer strips. Use selected materials to obtain required finishes.

D. Forms shall be sufficiently tight to prevent leakage of concrete. Temporary openings shall be provided in the inside form of all wall forms and in column forms to facilitate cleaning and inspection immediately before placing concrete.

E. Assemble forms so their removal will not damage concrete and adjacent materials.

3.02 FORMWORK

A. Forms shall conform in general to shape, line, grade and dimensions of members as shown on contract drawings, and shall have the strength and stability to ensure finished concrete within the tolerances specified in ACI 347.
   1. Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from those other trades.
   2. Exterior edges of all exposed concrete, unless otherwise specified, shall have a chamfer strip placed in form to provide bevel of sharp edges. Chamfer strips shall be 3/4-inch by 3/4-inch by 45º wood, plastic, or rubber.
   3. Accurately place and secure in position, prior to placing concrete, all anchors, bolts, inserts and other items furnished under other sections of the specifications and for other contractors on the project.

B. Formwork shall be mortar-tight and sufficiently rigid to prevent displacement or sagging between supports.

C. Formwork shall be properly braced or tied together so as to maintain position and shape and ensure safety to workman and passersby.

D. Temporary openings may be provided on all wall and column forms to limit the free fall of the concrete to less than 4 feet and should be so located as to facilitate the placing and consolidation of the concrete. The ports shall be spaced no more than 6 feet apart to limit the horizontal flow of concrete.

E. All forms shall be cleaned and rubbed smooth prior to placing to ensure true forming surfaces for all concrete surfaces.

F. All surfaces that will be exposed to view shall be provided with a smooth-form finish.
   1. Form-facing materials with raised grain, torn surfaces, worn edges, dents, or other defects that would impair the texture of the concrete are not allowed.
   2. Facing materials shall be set in an orderly and symmetrical arrangement and seams shall be kept to a practical minimum.

3.03 FORM TIES AND ACCESSORIES

A. Internal wall ties shall contain positive stops at the required wall thickness. The exterior clamp portions of the pipe shall be adjustable to permit tightening of forms. Ties shall provide a positive disconnection 1 inch to l-1/2 inches inside the finished face of the concrete. Cutting ties back from face of wall or use of wire ties will not be permitted. All tie and plug holes shall be filled with non-shrink grout after forms are removed.

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B. All concrete tie locations shall be watertight. Wall ties shall be fitted with tapered rubber plugs at all water retaining structures and locations specified under Special Procedures - Division 01.

C. Accessories shall be used only for the purpose intended and shall in no way interfere with the placing of concrete. Removal of accessories shall in no way impair or disturb finish concrete surfaces. Accessories shall be compatible with formwork and ties and shall maintain the watertight integrity of the formwork system.

D. Design of all form ties and accessories shall be adequate for all concrete placement, horizontal and vertical, to prevent failures and blowouts.

3.04 FORM COATINGS

A. Coat form contact surfaces with form bond breaker compound before reinforcement is placed. Do not allow excess form coating material to accumulate in the forms or to come into contact with surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.

B. Coat steel forms with form oil or otherwise protect against rusting. Rust-stained steel formwork is not acceptable.

C. Clean reinforcing steel that has become contaminated with form coating to the satisfaction of the Engineer prior to placing concrete.

3.05 EMBEDDED ITEMS

A. Items embedded in concrete shall be properly cleaned to be free from oil or foreign matter that would weaken the bond of the concrete to these items.

B. Install in the formwork requisite inserts, anchors, sleeves and other items specified under other sections of these specifications; close end conduits, piping and sleeves embedded in concrete with caps or plugs.

C. Conduits or pipes embedded in slabs of larger outside diameter than 1-1/2 inches, or when pipes and conduits come closer than 1 inch from either the upper or lower surface of the slab, provide expanded metal or wire mesh laid and extended beyond conduit or piping at least 8 inches on all sides; space conduits or pipes closer than 3 diameters on centers, place to avoid changing locations of reinforcement for indicated locations.

3.06 CONSTRUCTION JOINTS

A. Make construction joints where indicated on the contract drawings; additional construction joints are subject to prior approval of the Engineer; locate additional construction joints to least impair the strength of the structure.

B. Form keyways and joints as indicated on the contract drawings.

C. Continue reinforcing steel and wire fabric across construction joints, unless noted otherwise.

3.07 EXPANSION JOINTS

A. Expansion joints shall be placed where indicated on the contract drawings; reinforcement, corner protection angles or other fixed metal items embedded in or binded to continuously shall not extend through expansion joints; finish concrete slab edges along expansion joints neatly with slightly rounded edging tool; leave joints in the completed work carefully tooled and free of mortar and concrete.

B. Joints between slabs on earth and vertical surfaces, including walls, and other fixed structures shall have expansion joint material placed on abutting vertical surfaces.

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C. Joints to receive joint compound shall have premolded expansion filler strips at proper level placed below finished floor with slightly tapered, dressed, oiled wood strip secured temporarily to top thereof; install wood strip of depth to form groove at least 1 inch deep; after concrete has set, remove strip; fill groove with light colored joint compound for poured application; fill joint grooves flush, to be slightly concave, after drying as specified in Joint Sealers - Division 07.

3.08 CONTROL JOINTS

A. Install vertical control joints as indicated on the contract drawings, and where not indicated not more than 20 feet apart; locate specifically as follows:
   1. At each control joint, extend only alternate horizontal reinforcement bars through the joint; seal control joints with concrete colored joint compound.

B. Install control (contraction) joints in slabs as indicated on the contract drawings, and where not indicated locate specifically as follows:
   1. At each joint, cut reinforcing mesh so only alternate wires extend through joint.
   2. Resulting panels shall be approximately square; elongated and L-shaped panels shall not be acceptable.
   3. Provide 1/4 inch wide saw - cut control joints to a depth equivalent to 1/3 the slab thickness; cut as soon as the slab will support the weight of the saw and operator and not damage the surface and not more than 8 hours after completion of concrete placement.

C. Apply joint compound to all control and construction joints after concrete has sufficiently cured; clean joint slot; fill joint with light colored compound for poured application; fill joint grooves flush, to be slightly concave after drying, as specified in Joint Sealers - Division 07.

3.09 WATERSTOPS

A. Install waterstops of the sizes and shapes indicated on the contract drawings; support and protect that portion of the waterstop which extends beyond the bulkhead during placing of concrete and subsequent removal of forms.
   1. Continuous at construction and expansion joints.
   2. Material, size and shape as indicated on the contract drawings and in Concrete Accessories - Division 03.

B. Make field splices by heat - sealing, maintaining the continuity of the ribs and bulbs, and allow the splice to cool before stressing; field splice must be watertight; repair damaged waterstops.

3.10 FORM/SHORING REMOVAL

A. Arrange forms to allow stripping without removal of principal shores, where required to remain in place.

B. Removal of forms shall be accomplished in such a manner as will prevent injury to concrete and ensure complete safety of structure. Removal times listed below are minimum and may be increased by the Engineer as job conditions warrant.
   1. Where structure as a whole is supported on shores, vertical forms such as beam and girder sides, columns, and similar vertical forms may be removed 24 hours after completion of pour, providing concrete has hardened sufficiently to sustain its own weight and to prevent injury.
   2. Wall forms shall not be removed in less than 24 hours after pouring, unless otherwise required for curing.
   3. Supporting forms and shoring must remain in place until concrete can carry any loads to be imposed upon it and in no case shall be removed in less than seven (7) days.
   4. Forms ties, requiring any operation in removal of forms which would tend to destroy bond between tie and concrete in order to remove form, shall not be disturbed for seven (7) days after completion of pour.
   5. The time periods stipulated above may be reduced if strength results of concrete so indicate adequate conditions.

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C. Notify the Engineer before the forms are removed in order that an examination of the newly-stripped surfaces may be made prior to patching.

3.11 REPAIR TIE HOLES

A. After removal of form tie, the holes shall be filled as follows:
   1. Thoroughly clean and dampen.
   2. Fill solid with patching mortar.

B. Make repairs uniform in color and finish with surrounding concrete.

3.12 FORM FACE MATERIALS

A. Unless otherwise specified, or permitted, form face materials in contact with concrete shall be lumber, plywood, tempered concrete-form-grade hardboard, metal, plastic, or paper that creates specified appearance and texture of concrete surface.

3.13 AS-CAST SURFACE FINISHES

A. See Section 03 30 00 for finish required at each location. See Section 03 30 00 for rubbed finishes and required locations.

B. Surface Finish-1.0 (SF-1.0) per ACI 301; except tie holes shall be repaired.
   1. No formwork facing material.
   2. Patch voids larger than 1-1/2 inch wide or 1/2-inch deep.
   3. Remove projections larger than 1-inch.
   4. Surface tolerance Class D as specified in ACI 117.
      a. At surfaces exposed to view, provide surface tolerance Class C as specified in ACI 117.
   5. Mock-up not required.

C. Surface Finish-2.0 (SF-2.0) per ACI 301.
   1. Use a form facing material that will produce a smooth, hard, uniform texture on the concrete.
   2. Keep seams to a practical minimum.
   3. Patch voids larger than 3/4-inch wide or 1/2-inch deep.
   4. Remove projections larger than 1/4-inch.
   5. Patch tie holes.
   6. Surface tolerance Class B as specified in ACI 117.
   7. Mock-up not required; however, first pour will be reviewed by Engineer for acceptance.

D. Surface Finish-3.0 (SF-3.0) per ACI 301.
   1. Use a form facing material that will provide a smooth, hard, uniform texture on the concrete.
   2. Keep seams to a practical minimum.
   3. Patch voids, or bug holes, larger than 3/4-inch wide or 1/2-inch deep.
   4. Remove projections larger than 1/8-inch.
   5. Patch tie holes.
   6. Surface tolerance Class A as specified in ACI 117.
   7. Mock-up required, mock-up may be part of the first pour if approved by Engineer. Mock-up will be reviewed by Engineer for acceptance.

3.14 EXPOSED SURFACES

A. Exposed surfaces: remove fins; fill pores, stone pickets, honeycombs, etc., with non shrink grout as follows:
   1. Repair immediately after form removal and inspection by the Engineer.
   2. Remove concrete surrounding defect to sound concrete, then wet affected area.
   3. Brush on bonding agent, mixed and applied in accordance with manufacturer's recommendations.
   4. Consolidate patch grout and strike off to leave the patch slightly higher than the surrounding surface.

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5. Finish the repaired area flush with the surrounding area after the patch has been in place for one hour, or as prescribed by the manufacturer.

B. Perform patching before curing compound is applied; cure patched areas in the same manner as adjacent concrete; make repairs uniform in color and finish with surrounding concrete.

C. Exposed surfaces shall be protected from excessive sun, wind and rain, and kept wet until curing compound is applied. When ambient temperature falls below 40ºF heat aggregate and mixing water; clear all forms, reinforcement and subgrade of snow and ice; cover all freshly placed concrete with tarpaulins and provide heat to maintain a temperature of 70ºF for at least three days or 50ºF for five days; rate of cooling after end of protection period shall be accomplished in a manner approved by the Engineer.

3.15 REUSE OF FORMS

A. Clean and repair surfaces of forms to be re-used in the work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable. Apply new form coating compound material to concrete contact surfaces as specified for the new formwork.

B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close all joints. Align and secure joints to avoid offsets.

C. Do not use “patched” forms for concrete surfaces exposed to view.

END OF SECTION

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SECTION 03 15 00
CONCRETE ACCESSORIES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing concrete accessories as shown on the contract drawings and specified herein.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Structural Cast-In-Place Concrete Forming - Division 03

C. Cast-in-Place Concrete - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Concrete Institute (ACI), Annual Book of ACI Standards:
      a. ACI 308R – Guide to Curing Concrete, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete, Current Edition.
      b. ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions, Current Edition.
      c. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete, Current Edition.
      d. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete, Current Edition.
      e. ASTM C882 - Standard Test Method for Bond Strength for Epoxy-Resin Systems Used with Concrete by Slant Shear, Current Edition.
      f. ASTM C884 - Standard Test Method for Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay, Current Edition.
      g. ASTM D6 – Standard Test Method for Loss on Heating of Oil and Asphaltic Compounds, Current Edition.
      h. ASTM D297 – Standard Test Methods for Rubber Products - Chemical Analysis, Current Edition.
      i. ASTM D994 – Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type), Current Edition.
      j. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types), Current Edition.
      k. ASTM D1752 – Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction, Current Edition.
      l. ASTM E154 – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover, Current Edition.
      m. ASTM E1643-98 - Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
      n. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

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3. Canadian General Standards Board (CGSB) Standards:
    a. CGSB 41-GP-35M - Performance Standards for Poly Vinyl Chloride (PVC) Waterstops, Types I and III, Current Edition.
4. Federal Specification TTS 227 and TTS 230, Current Edition.
5. U.S. Army Corps of Engineers (USACOE), Specifications and Standards:
    a. USACOE CRD-C572 - Specification for Poly Vinyl Chloride (PVC) Waterstop, Current Edition.

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to the rate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 WATERSTOP

A. Polyvinyl Chloride PVC Waterstop.
1. Ribbed Centerbulb, for non-moving joints: 4-inch long, minimum 3/16-inch thick with 1/8-inch ribs, 3/8-inch outside diameter centerbulb and shall comply with U.S. Corps of Engineers Specification CRD-C572.
    a. Greenstreak 701 by Sika Corporation
    b. Or equal

B. Gasket Waterstop: Strip-applied non-swelling mastic waterstop for non-moving joints, 3/4-inch by 1-inch wide unless noted otherwise.
1. Lockstop with Lockstop Primer by Sika Corporation

C. Additional Waterstop at Tanks with Waterproofing Admixture: Use at all joints in water-retaining structures with waterproofing admixture (see Section 03 30 00).
1. General: Crystalline, cementitious, non-toxic chemical treatment for the water-proofing and protection of concrete.
2. Product: Use same product provided as admixture in concrete mix – see Section 03 30 00.
3. Concentration: Concentrated slurry coat, concentration as recommended by manufacturer.

2.02 EXPANSION AND CONTRACTION JOINT FILLER

A. Preformed Bituminous. Bituminous expansion and contraction joint filler shall be preformed bituminous strips which complies with ASTM D994.

B. Preformed Sponge Rubber. Sponge rubber expansion and contraction joint filler shall be preformed which complies with ASTM D1752.

C. Preformed Cork. Cork expansion and contraction joint filler shall be preformed which complies with ASTM D1752.

D. Removable Plastic Expansion Joint Cap: Plastic joint cap, board width by 1/2-inch deep.
1. Snap-Cap by W.R. Meadows.
2. Geenstreak Expansion Board Cap by Sika Corporation.

2.03 BOND BREAKER

A. Cast-in-Place Concrete Flatwork. Asphalt impregnated felts, 15 pound.

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B. Cast-in-Place Concrete Formwork. Non-staining liquid product which imparts a waterproof film to prevent adhesion of concrete and will not leave a paint-impeding coating on the face of the concrete.

2.04 VAPOR BARRIER

A. Under Slab Vapor Barrier: 15 mil reinforced high-density multi-layer laminated polyethylene film for under slab application.
   1. Must meet the following minimum properties:
      a. Barrier shall meet or exceed all requirements of ASTM E1745 Classes A, B and C.
      b. Water Vapor Permeance (ASTM F1249): 0.038 perms
   2. Products:
      a. Stego Wrap Vapor Barrier (15-mil) by Stego Industries
      b. Griffolyn Type-65 by Reef Industries
      c. Or equal

B. Seam Tape: High density polyethylene tape with pressure sensitive adhesive, minimum 4 inches wide. Tape or Mastic by vapor barrier manufacturer.

C. Pipe Boots: Construct pipe boots from vapor barrier material and pressure sensitive tape per manufacturer's instructions.

2.05 WATERPROOF SHEET MATERIAL FOR CURING

A. Provide one of the following, complying with ASTM C171: waterproof paper, polyethylene film or polyethylene-coated burlap.

B. Use only materials which are resistant to decay when tested in accordance with ASTM E154, as follows:
   1. Polyethylene sheet not less than 6 mils thick; or
   2. Water resistant barrier paper consisting of heavy papers laminated together with glass fiber reinforcement and overcoated with black polyethylene on each side.

2.06 CONCRETE REPAIR COMPOUND

A. Concrete repair compound shall be as required for the installation as manufactured, Master Builders Solutions, or equal.

2.07 PIPE SLEEVES AND ANCHOR BOLTS

A. Shall be furnished, installed, and anchored solid in their final location.

2.08 CURING AND SEALING COMPOUND - INTERIOR

A. Membrane-forming curing compound shall meet the moisture retention requirements of ASTM C309, Type 1.
   1. MasterKure CC 200WB by Master Builders Solutions.
   2. Sealtight CS-309-25 Curing and Sealing Compound by W.R. Meadows, Inc.
   3. Eucocure VOX by Euclid Chemical Co.
   4. Or equal.

B. Products shall be compatible with surface finish. Where flooring manufacturer allows, use water-based dissipating type.

2.09 CURING COMPOUND - EXTERIOR

A. Curing compound for use on standard exterior concrete shall comply with ASTM C309, Type 2; resin, white pigmented.

2.10 DAMPPROOFING MEMBRANE

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A. Acceptable Manufacturers:
   1. W.R. Meadows, Inc.
   2. Master Builder Solutions by BASF
   3. Substitutions: per Section 01 60 00.

B. Dampproofing:
   1. Sealmastic Asphalt Emulsion Dampproofing by W.R. Meadows, Inc.
   2. MasterSeal 614 by BASF

PART 3 EXECUTION

3.01 INSTALLATION

A. Install accessories where shown on contract drawings and as specified herein.

B. Place bond breaker at junctures of slabs-on-grade with vertical walls.

C. Expansion and Contraction Joint Filler: Install at locations noted on the drawings calling for expansion / contraction joint materials.

D. Seal all exposed surfaces of expansion and contraction joints with joint sealer (3/4 inch deep and hold 1/8 inch below surface of concrete).

E. All splices on PVC waterstops shall be field welded using an indirect heating element. Concrete shall be thoroughly vibrated around the waterstop to avoid honeycombs and to ensure complete embedment of the ribbed flanges.

F. Apply concentrated slurry coat to surface of joints in water-retaining structures with water-proofing admixture. Clean joint as required by manufacturer. Apply slurry coat full width of second pour intersection. Apply per manufacturer's instructions for areas not subject to hydrostatic pressure.

G. Install under-slab vapor barrier at locations shown on Drawings in accordance with manufacturer's instructions and ASTM E1643-98. Unroll vapor barrier with the longest dimension parallel with the direction of the pour. Seal vapor barrier to foundation walls behind perimeter expansion joint, unless shown otherwise on Drawings. Vapor barrier shall be continuous inside building foundation, unless noted otherwise. Overlap joints 6-inches and seal with manufacturer's tape. Seal all penetrations (including pipes) with manufacturer's pipe boot. No penetrations of the vapor barrier are allowed except for reinforcing and permanent utilities. Repair damaged areas by cutting patches of vapor barrier, overlapping damaged area 6-inches and taping all four sides with tape.

H. Concrete Structural Repair Compound: Apply first coat of repair mortar with a stiff bristle brush to apply a scrub coat working the mortar into the honeycomb areas, then use a trowel to completely fill the honeycomb areas and trowel smooth the mortar to flush it out with the face of the concrete.

I. Dampproofing at form ties:
   1. Do not apply dampproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to dampproofing manufacturer.
   2. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
   3. Prime surfaces in accordance with manufacturer's instructions.
   4. Apply mastic to seal penetrations tie bar penetrations in substrate in accordance with manufacturer's instructions. Extend mastic in minimum 3-inch diameter around penetration. Apply two (2) coats, continuous and uniform. Do not apply where finished surface will be exposed.
   5. Protect membrane from damage.

END OF SECTION

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SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing concrete reinforcing as shown on the contract drawings and as specified herein.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 – Unit Masonry: Steel reinforcing bars for masonry wall construction.

1.03 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Cast-in-Place Concrete - Division 03

1.04 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.05 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Concrete Institute (ACI) Specifications and Standards:
    a. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures, Current Edition.
    b. ACI 318 - Building Code Requirements for Structural Concrete and Commentary, Current Edition.
2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
    a. ASTM A82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement, Current Edition.
    b. ASTM A184 - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement, Current Edition.
    c. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, Current Edition.
    d. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plan and Deformed, for Concrete, Current Edition.
3. American Welding Society (AWS), Specifications and Standards:
    a. AWS D12.1 - Welding Reinforcing Steel, Metal Inserts, and Connections in Reinforced Concrete Construction, Current Edition.
4. American Association of State Highway Transportation Officials (AASHTO), Specifications and Standards:
    a. AASHTO M182 - Specification for Burlap Cloth Made from Jute or Kenaf, Current Edition
5. Concrete Reinforcing Steel Institute (CRSI) Specifications and Standards:
    a. CRSI - Manual of Standard Practice, Current Edition.
    b. CRSI - Recommended Practice for Placing Reinforcing Bars, Current Edition.
    c. CRSI - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature, Current Edition.
    d. CRSI - Recommended Practice for Reinforcing Bar Splices, Current Edition.

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1.06 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.
   1. Submit detailed reinforcing drawings prepared in accordance with ACI 315, including bar schedule with bar marks and bends indicated.
   2. Comply with CRSI Manual of Standard Practice showing bar schedules, stirrup spacing, diagrams of bent bars and arrangements of concrete reinforcement. Include special reinforcement required at openings through concrete.
   3. Verify dimensions and make proper allowance for fitting together work of other trades.

B. Submit a certification attesting that reinforcing steel meets the requirements of ASTM A615, including Supplementary Requirements S1, and that welded steel wire fabric meets the requirements of ASTM A185.
   1. Submit certified copies of mill reports, tensile and bend tests for reinforcing steel on projects where the quantity of reinforcing exceeds 15 tons.
   2. For information only, submit manufacturer's data and instruction for proprietary items, including reinforcement and accessories.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 REINFORCEMENT

A. Steel Bar Reinforcement. Main reinforcing and stirrups; ASTM A615, Grade 60.

B. Welded Wire Fabric. Welded wire fabric, flat sheets, ASTM A1064, 6x6-W2.9xW2.9, unless otherwise specified or indicated on the contract drawings.

C. Steel Tie Wire. Steel tie wire, ASTM A82, plain, cold-drawn, 16 gauge or heavier.

D. Supports For Reinforcement. Bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place complying with CRSI Manual of Standard Practice. For slabs on grade where base material will not support chairs, use supports with sand plates or horizontal runners to locate mesh properly in slab. Provide hot-dipped galvanized or plastic-coated accessories in contact with forms for sight exposed concrete; stainless steel accessories for sandblasted or bushhammered concrete.

PART 3 EXECUTION

3.01 FABRICATION

A. Fabricate and place to shapes and dimensions indicated or required to carry out intent of contract drawings and these specifications.

B. Bends for stirrups and ties shall be made around a pin having a diameter not less than four times the diameter of reinforcing bar. Bends for other bars shall be made around a pin having a diameter not less than six times diameter of bar, except that for bars larger than 1 inch, pin shall be not less than eight times diameter of bar.
   1. Perform cutting and bending in the shop; bend and cut steel cold. Heating of reinforcement will not be permitted. Do not bend or straighten bars in a manner that will injure the material.
   2. Field bending of bars shall not be allowed without the Engineer's approval.

C. Tagging shall be with metal, linen, or rope fiber tags filled in with machine or waterproof ink. Paper tags shall not be allowed.

D. Reinforcing bars shall conform accurately to the dimensions shown on the contract drawings.

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3.02 PRODUCT DELIVERY, STORAGE AND HANDLING

A. For reinforcing steel fabricated on-site, shop from the mill in bundles, limited to one size and length, tagged with a waterproof tag showing the name of the mill, heat number, grade and size of the bars and identifying number.

B. For reinforcing steel fabricated off-site, deliver in bundles identified as to structure and shop drawing number. Identify each individual bar with a waterproof tag showing the grade, size and bar mark from the approved bar schedule.

C. Protect reinforcing steel and wire fabric from damage and from dirt, oil grease, other foreign matter, and rust-causing condition. Do not store reinforcement in direct contact with the ground.

3.03 CLEANING

A. Before placing and before pouring concrete, all reinforcement shall be thoroughly cleaned of all oil, dirt, loose mill scale, loose rust, or foreign matter that will destroy or reduce bond.

3.04 PLACING REINFORCEMENT

A. Placement. Metal reinforcement shall be accurately placed in accordance with approved Submittals and adequately secured in position by concrete or metal chairs or spacers. Nails shall not be driven into forms to support reinforcement nor shall wire ties come in contact with forms.

B. Splicing. Lap at splices shall be sufficient to transfer stress between bars by bond and shear.
1. Furnish reinforcing bars in full lengths as indicated on the contract drawings and approved Submittals.
2. Do not splice bars unless indicated on the contract drawings or approved by the Engineer in writing. When authorized, make splices in accordance with ACI 318; perform welding in accordance with AWS D12.1.
3. Splices generally shall be avoided at points of maximum stress. Minimum splice lap for stressed bars shall be forty times bar diameter.

C. Offsets in longitudinal bars at change of cross section shall be placed in region of lateral support. Slope of inclined portion of offset shall not be more than one in six and, in tied columns, ties shall be spaced not over 3 inches on centers for a distance of 1 foot below actual point of offset.

D. Embedded Items. The Contractor shall provide for the installation of all items embedded in the concrete, such as coil rod inserts, anchor bolts, dowels, etc., as shown on the contract drawings or as provided for in other Divisions of these specifications.
1. All dowel bars shall be tied securely in place before pouring concrete.
2. Provide for clearances with appurtenant materials and devices.

E. Drilled and Grouted or Epoxy Dowel Installation. Existing concrete which will be incorporated into new work and requiring integration with new concrete will be doweled as indicated on the contract drawings and as follows:
1. Drill hole in existing concrete of size that is 3/4 inch larger in diameter than diameter of dowel bar. Incline the hole in the concrete such that the non-shrink grouting or epoxy will be retained in the hole.
2. Fill hole with non-shrink grouting or epoxy.
3. Immediately place dowel bar into hole.
4. Allow grout or epoxy to take initial set before disturbing dowel bar.

F. Steel Reinforcing Fabric. Reinforce as detailed on the contract drawings; and where not indicated, reinforce with wire fabric, place 2 inches from the top of the slab.
1. Flat sheets shall be used whenever available. Wire fabric shall lap 6 inches on side joints and 12 inches on end joints. Properly secure with annealed wire. Fabric shall be raised and secured in

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the correct location using permanent supports. Raising the fabric by hook during placement of concrete shall NOT be permitted.

2. Alternately, in tight quarters and around appurtenances and openings, lap mesh reinforcement not less than one mesh space plus 2 inches, and tie.

G. Concrete Cover. The minimum cover of concrete for all reinforcement shall conform to the dimensions indicated on the contract drawings, which indicate the clear distance from the edge and end of the reinforcement to the face of the concrete surface. Provide clearance and spacing indicated on the contract drawings and approved Submittals, where so indicated.

1. Where no clearances are indicated, the thickness of the concrete cover over reinforcement shall be as follows:
   a. Concrete cast against and permanently exposed to earth - 3 inches;
   b. Formed concrete exposed to earth or weather - 2 inches;
   c. Formed concrete not exposed to earth or weather - 1-1/2 inches;
   d. Slabs not exposed to earth or weather - 1 inch.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered under this section shall cover furnishing all materials, equipment and labor required to construct all cast-in-place concrete as shown on the contract drawings and as specified.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Concrete Quality Control - Division 01

D. Structural Cast-in-Place Concrete Forming - Division 03

E. Concrete Accessories - Division 03

F. Concrete Reinforcing - Division 03

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Concrete Institute (ACI), Annual Book of ACI Standards:
    a. ACI 117/177R - Standard Specification for Tolerances for Concrete Construction and Materials and Commentary, Current Edition.
    b. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete, Current Edition.
    c. ACI 209.1R - Report on Factors Affecting Shrinkage and Creep of Hardened Concrete, Current Edition.
    d. ACI 301 - Specification for Structural Concrete, Current Edition.
    e. ACI 302.1R - Guide for Concrete Floor and Slab Construction, Current Edition.
    f. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete, Current Edition.
    g. ACI 305R - Hot Weather Concreting, Current Edition.
    h. ACI 306 - Standard Specification for Cold Weather Concreting, Current Edition.
    i. ACI 308R - Guide to Curing Concrete, Current Edition.
    j. ACI 309R - Guide for Consolidation of Concrete, Current Edition.
    k. ACI 311.4R - Guide for Concrete Inspection, Current Edition.
    l. ACI 318/318R - Building Code Requirements for Structural Concrete and Commentary, Current Edition.
    m. ACI 530/530.1/530R/530.1R - Building Code Requirements for Commentary for Masonry Structures and Specification for Masonry Structures and Related Commentaries, Current Edition.
    n. ACI ASCC MNL-5 - The Contractor’s Guide to Quality Concrete Construction, Current Edition.
    o. ACI CP-10/PACK - Craftsman Study Package for ACI Certification of Concrete Flatwork Technician/Finisher, Current Edition.

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p. ACI MCP - ACI Manual of Concrete Practice, Parts 1 through 7, and Index, Current Edition.
q. ACI SCM-24 - Concrete Repair Basics, Current Edition.
r. ACI SP15 - Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with Selected ACI Reference, Current Edition.
s. ACI SP-71 - ASTM Standards in ACI 318, Current Edition.

2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
   a. ASTM C33 - Standard Specification for Concrete Aggregates, Current Edition.
   b. ASTM C70 - Standard Test Method for Surface Moisture in Fine Aggregate, Current Edition.
   c. ASTM C94 - Standard Specification for Ready-Mixed Concrete, Current Edition.
   d. ASTM C109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (using 2-inch or [50 mm] Cube Specimens), Current Edition.
   e. ASTM C125 - Standard Terminology Relating to Concrete and Concrete Aggregates, Current Edition.
   f. ASTM C127 - Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Coarse Aggregate, Current Edition.
   g. ASTM C128 - Standard Test Method for Density, Relative Density (Specific Gravity) and Absorption of Fine Aggregate, Current Edition.
   h. ASTM C131 - Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine, Current Edition.
   i. ASTM C143 - Standard Test Method for Slump of Hydraulic-Cement Concrete, Current Edition.
   j. ASTM C150 - Standard Specification for Portland Cement, Current Edition.
   k. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete, Current Edition.
   l. ASTM C191 - Standard Test Methods for Time Setting of Hydraulic Cement by Vicat Needle, Current Edition.
   m. ASTM C219 - Standard Terminology Relating to Hydraulic Cement, Current Edition.
   n. ASTM C226 - Standard Specification for Air-Entraining Additions for Use in the Manufacture of Air-Entraining Hydraulic Cement, Current Edition.
   o. ASTM C233 - Standard Test Method for Air-Entraining Admixtures in Concrete, Current Edition.
   p. ASTM C260 - Standard Specification for Air-Entraining Admixtures for Concrete, Current Edition.
   q. ASTM C311 - Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for use as a Mineral Admixture in Portland-Cement Concrete, Current Edition.
   r. ASTM C494 - Standard Specification for Chemical Admixtures for Concrete, Current Edition.
   s. ASTM C535 - Standard Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine, Current Edition.
   t. ASTM C566 - Standard Test Method for Total Evaporable Moisture Content of Aggregate by Drying, Current Edition.
   u. ASTM C595 - Standard Specification for Blended Hydraulic Cement, Current Edition.
   v. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzlan for Use in Concrete, Current Edition.
   w. ASTM C688 - Standard Specification for Functional Additions for Use in Hydraulic Cements, Current Edition.
   x. ASTM C989 - Standard Specification for Slag Cement for Use in Cement and Mortars, current edition.

3. Portland Cement Association (PCA) Standards and Specifications:
   a. PCA - Design and Control of Concrete Mixtures, Current Edition.

1.05 DEFINITIONS

A. Exposed or Exposed to View: Portion of the structure that can be observed by the “public” during normal operation.
   1. Normal Operation: For tanks, this means when the tank is filled with liquid to the projected design average operating liquid level.

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B. Public: Persons allowed on-site and within buildings by the Owner.

C. Liquid-Retaining Structure: A structure intended to hold and contain liquid in various stages of treatment. These structures are designed to be watertight to prevent leakage. Examples include: storage tanks; clarifiers; aeration tanks; digesters; chemical containment.

D. Severe Exposure: Conditions where concrete is subjected to aggressive environments that can significantly impact its durability, such as chemical attacks from substances like acids, alkalis, or other corrosive chemicals.

1.06 SUBMITTALS

A. Submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Concrete Design Mix
1. Prior to the start of placing of concrete, submit the design mix for each class of concrete, indicating that the concrete constituents and proportions will result in a concrete mix meeting the physical requirements for each class of concrete specified.
2. Submit with the design mix, laboratory strength test reports and manufacturer's certificates attesting the conformance of constituents with these specifications.
3. Do not vary the proportions of the constituents or source of material of the approved mix without submitting corresponding test result documentation to the Engineer for review and approval.
4. Design mix shall indicate proportions of cement, aggregate and water, and names and proportions of admixtures and air-entraining agents.
5. Laboratory strength test reports shall contain strength data for the required number of tests as specified in ACI 318 (for non-water retaining concrete) or ACI 350 (for water-retaining concrete) design specifications. If existing data for the required number of tests is not available, then ACI 318/350 allows for alternate data or trial mixture results to be submitted for approval. Provide certification that the design mix complies with all ACI and ASTM requirements.

C. Concrete Installation Submittals
1. Submit proposed plans and methods for cold/hot weather concrete placement procedures.
2. Submit proposed curing and concrete jointing plans that indicate locations of construction joints and control joints for concrete walls and slabs.

1.07 MEETINGS

A. Prior to submitting design mixtures and rebar shop drawings, contractor shall hold a meeting to review detailed requirements for preparing final concrete design mixes and expectations regarding shop drawing quality, to establish procedures for placing, finishing, curing, and protecting concrete to meet required quality under anticipated conditions, to review construction drawing details, and to review proposed construction and control joint locations and layouts. Representatives of each entity directly involved with the cast-in-place concrete shall attend, including the following:
1. Contractor's superintendent
2. Architect of Record or representative
3. Structural Engineer of Record or representative
4. MSA's Resident Project Representative (RPR)
5. Testing laboratory responsible for field quality control
6. Ready-mix concrete supplier
7. Concrete subcontractor
8. Special concrete finish subcontractor

B. Pre-installation concrete meetings shall be held seasonally:
1. Pre-Installation Concrete Meeting – Fall
   a. Review of cold weather concrete placement procedures, curing methods, and protocols.

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2. Pre-Installation Concrete Meeting – Spring
   a. Review of hot weather concrete placement procedures, curing methods, and protocols.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 CEMENTITIOUS MATERIALS

A. Cement
   1. Cement shall be Portland Cement ASTM C150 Type I or IA or ASTM C595 Class IL, except as otherwise noted or approved.
      a. Type III cement shall only be used for Class L concrete, or when approved by the Engineer.
      b. ASTM C150 Type I or IA, Type II, and Type III, and ASTM C595 blended cement types IL, IP, and IS shall be used for exterior flatwork as approved by the Engineer.
   2. A singular brand and manufacturer of cement shall be used for the entire work.

B. Fly Ash and Slag
   1. Cement Substitutions:
      a. Contractor may use fly ash or ground granulated blast furnace slag (GGBFS) as a substitute for a portion of Portland cement in the structural concrete. The maximum allowable substitution rates shall be as follows:
         1) Fly Ash: 20%
         2) GGBFS: 30%
         3) Total Mineral Admixture: 30%
   2. Fly Ash:
      a. Fly ash shall conform to ASTM C618 Class C.
      b. A singular source of fly ash shall be used for the entire work.
   3. Slag:
      a. Slag shall be ground granulated blast furnace slag (GGBFS) conforming to ASTM C989.

2.02 AGGREGATE

A. Aggregate shall consist of clean, hard durable sand, gravel, crushed gravel or crushed rock.

B. Aggregate shall conform to the requirements of ASTM C33. Fine and coarse aggregate shall meet ASTM C33 grading requirements. Coarse aggregates shall be graded in accordance with ASTM gradations as follows:
   1. 3/4 inch maximum coarse aggregate - ASTM No. 67
   2. 1-1/2 inch maximum coarse aggregate - ASTM No. 467

C. Maximum aggregate size shall be as defined in the Concrete Schedule, or where not defined in the Concrete Schedule, as defined by dimensional constraints for cast-in-place concrete as follows.
   1. Not larger than one-fifth of the narrowest dimension between sides of the forms;
   2. Not larger than one-third the thickness of the slab;
   3. Not larger than three-fourths of the minimum clear spacing between individual reinforcing bars or wire, bundles of bars, or prestressing tendons or ducts.

2.03 MIXING WATER

A. Mixing water shall be natural or treated water, clean and free from injurious amount of oil, acid, alkali, chlorides and sulfates, other common salts, organic matter or other deleterious substances.

B. Mixing water shall yield cement paste complying with the requirements ASTM C109 and ASTM C191.

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2.04 ADMIXTURES

A. All admixtures are subject to the written approval of the Engineer and shall be used in strict accordance with the manufacturer's recommendations.
   1. Air-Entraining Admixture
      a. All concrete exposed to weather and freeze-thaw cycles shall be air-entrained, unless otherwise specified.
      b. Air-Entraining admixture shall conform to ASTM C260.
      c. Air-Entrainment shall be as indicated for each class as in the Concrete Schedule.
   2. Water-Reducing, Set-Controlling Admixtures
      a. Water-Reducing, Set-Controlling admixtures shall conform to ASTM C494, Type A for water-reducing, Type C for accelerating, Type D for water-reducing and retarding, and Type E for water-reducing and accelerating. Type F for water reducing, high range, and Type G for water reducing, high range and retarding.

B. Admixtures containing calcium chloride or soluble chloride shall not be used.

PART 3 EXECUTION

3.01 COORDINATION

A. Examine the drawings and specifications for work of other sections or other contractors and coordinate such work with the requirements of this Section; make provisions for installation of such items as sleeves, pipes, conduits, inserts and hangers in a manner that will not impair or weaken concrete construction. Verify that preinstallation meetings have occurred per requirements of Part 1.

3.02 READI-MIX CONCRETE

A. Acceptability and Use. Readi-mix concrete shall be designed on the basis of strength, durability, impermeability, and exposure condition, as required for the intended use of the structure by methods specified in ACI 211.1 and ACI 318. All readi-mix concrete shall comply with the water-cement ratio for each specific class of concrete as specified in the Concrete Schedule. Concrete design mix, complete with sample test results shall be submitted to the Engineer for approval prior to placing any concrete.
   1. Failure to Meet Strength Requirements. Failure to meet strength requirements shall be as defined in Concrete Quality Control- Division 01 of these specifications.
   2. Watertight Concrete. All concrete exposed to earth or water shall be watertight, shall have a water-cement ratio as specified, and shall be air-entrained as specified in the Concrete Schedule.
      a. Provide damp-proofing membrane as indicated on the contract drawings.
   3. Waterproof Concrete. All concrete for water retaining structures shall be waterproof, shall have a water-cement ratio as specified, and shall be air-entrained as specified in the Concrete Schedule.
      a. Install waterstops as indicated on the contract drawings.

B. Mix Proportioning. Mix proportioning shall be the responsibility of the Contractor and shall be submitted for review and approval by the Engineer, in accordance with these specifications.
   1. Select proportions for concrete to obtain the quality requirements for the class of concrete as specified in the Concrete Schedule. Contractor, at their expense, shall have an approved independent laboratory prepare design mixes for each specified concrete class.
   2. Slump. Slump for class of concrete shall be as specified in the Concrete Schedule. The Contractor shall at their expense, make field slump tests in accordance with ASTM C143 and Concrete Quality Control-Division 01 of these specifications.
   3. Adjustment to Concrete Mixes. Design mix adjustments may be requested by the Contractor when characteristics of materials, conditions, weather, test results, or other circumstances warrant. Laboratory test data for revised design mixes and strength results shall be submitted and approved before using in the work. No change in contract price will be allowed for these changes.

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4. Addition of Water to the Batch. Addition of water to the batch delivered to the site shall be in strict accordance with ASTM C94. This shall be the Contractor's responsibility and by their direction, following consultation with the Engineer.
   a. Addition of water to the batch shall be one time only. Total gallons of water added to the batch shall be recorded on the load ticket, which shall be supplied to the Engineer prior to that delivery truck leaving the site. If water is permitted to be added to mixed concrete upon arrival at the job, an additional mixing of 30 revolutions of the drum shall be required.
   b. Contractor shall adjust the water-cement ratio of the batch to the corresponding value based on the addition of water to the batch and shall submit this information to the Engineer with adjusted strength data for the final batch proportion.
   c. At no time shall the addition of water cause the water-cement ratio specified in the concrete class schedule to be exceeded.

3.03 GENERAL

A. Unless otherwise specified, conform to ACI 304, 305, and 306 for concrete installation requirements such as preparation, mixing, conveying, depositing, curing, and cold and hot weather requirements; consolidate concrete in accordance with ACI 309.

B. Concrete not placed within 90 minutes or 300 revolutions, whichever occurs first, after the first mixing of the cement and aggregates will be rejected.

C. Contractor shall indicate on record set of Drawings at site, for review prior to installation, a pouring program for concrete work showing unit of operation, method of pouring, installation of construction/control joints, expansion joints and all necessary work.

D. Proper grade marker or stakes shall be used by Contractor to establish grades for ramps, platforms, sidewalks, slopes to drains, inlets, etc.

E. Trenches, forms, conveying equipment shall be prepared to receive concrete in accordance with ACI 304.

F. Place concrete footings upon undistributed clean surfaces, free from frost, ice, mud and water; when foundation is on dry soil or pervious material, lay waterproof sheathing paper over earth surfaces to receive concrete.

G. Rock surfaces upon which concrete is to be placed, make level, clean, free from all objectionable coatings, water, mud, debris, loose semi-detached or unsound fragments; level surfaces to receive sand cushion placed to minimum thickness of 2 inches.

H. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperature and mechanical injury; maintain with minimum moisture loss and relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete.

I. All freshly cast concrete shall be protected from damaging effects of the elements freezing, rapid drop in temperature and loss of moisture and from future construction operations.

3.04 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT

A. Before placement, clean equipment for mixing and transporting the concrete; remove debris and ice from all surfaces upon which concrete is placed; clean reinforcement of dirt, loose rust, and mill scale, or other coatings.

B. Remove water from all areas before depositing concrete; before depositing new concrete on or against concrete that has set, thoroughly roughen; clean existing surfaces of laitance, foreign matter or loose particles; retighten forms; slush existing surfaces with neat cement grout coat; place new concrete before grout has attained initial set; give horizontal construction joints grout brush coat of cement, fine aggregate, in same proportions as concrete to be placed.

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C. Thoroughly wet the stone base on which slabs are to be placed where no vapor barrier is indicated.

D. Check compaction of fill and proper grade for slabs-on-grade. Check screeds and exercise care to prevent disturbing screeds during placement. Provide for construction joints in slabs-on-grade at 20 feet maximum in each direction unless shown otherwise on the contract drawings. Place expansion joint material at junctures of slabs-on-grade with vertical walls and as otherwise shown.

E. Remove debris, excess form oil, and water from formwork; avoid washing newly deposited concrete.

3.05 MIXING

A. Ready-mixed concrete shall be mixed and delivered in accordance with ASTM C94 and ACI 304. The production facilities shall comply with the requirements of the National Ready Mixed Concrete Association Certification Plan as regards materials storage and handling, batching equipment, central mixer, truck mixers, agitators, non-agitating units, ticketing system, etc.

B. Do not over-mix; do not use concrete which is retained in mixers so long as to require additional water in excess of design mix water to permit satisfactory placing; retempering of mix is not permitted.

C. Concrete shall be delivered to the site of the work and the mixed concrete discharged completely within 1-1/2 hours after water has been added to cement. In hot weather, or under conditions contributing to quick stiffening of concrete, this time may be reduced by the Engineer.

D. Concrete delivered shall arrive at the site having a temperature not less than 50 Degrees F nor greater than 85 Degrees F, unless otherwise permitted by the Engineer.

3.06 CONVEYING

A. Convey concrete from the mixer to the final deposit by methods that will prevent segregation or loss of materials.

B. Use of aluminum conveyances is not permitted.

3.07 CONCRETE PLACEMENT

A. Place concrete, including drops greater than 60 inches using recommended practices in accordance with ACI 304 and ACI 318. Once pouring operation commences, it shall be carried out as a continuous operation until a section is completed.

B. Deposit concrete as nearly as practical in its final position to avoid segregation due to rehandling or flowing; do not use vibrators to move concrete horizontally within the forms.

C. Do not use retempered concrete or concrete contaminated by foreign material.

D. Plan and conduct concrete placement to ensure that the concrete is kept plastic and that the concrete is free of cold joints.

E. Where there is a time delay greater than 45-minutes between adjacent concrete placement, a bulkhead construction joint, complete with waterstops where required, must be installed.

F. Do not commence placing when the sun, heat, wind or limitations of facilities provided prevent proper finishing or curing.

G. Discontinue concreting when the descending natural air temperature falls lower than 40 Degrees Fahrenheit unless preparations are made and in place to heat or insulate concrete in accordance with the cold weather concreting requirements of this specification.

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H. Concrete for walls shall be deposited in approximately horizontal layers not to exceed 18 inches in height to avoid segregation due to rehandling and flowing.

I. Concrete shall not be placed or poured in water. Water level shall be removed or lowered in a manner approved by Engineer. Excess water shall not be permitted. Powdering a mixture of cement to absorb excess water shall not be permitted.

J. Concrete shall be placed before initial set has occurred. Placing should be carried on in such manner that the concrete in the form is still plastic and can be integrated with fresh concrete.

K. Contractor shall notify Engineer of concrete pouring schedule one day in advance of pour to allow for inspection of reinforcing and forms.

L. Bottom dump buckets may be used for transporting mixed concrete to the desired location. Particular care shall be taken to avoid jarring or bumping as this may cause segregation.

M. Where chutes are used to transport concrete, they shall be of metal or wood with metal lining and should have a slope not exceeding 1 vertical to 2 horizontal and not less than 1 vertical to 3 horizontal so that the concrete will travel fast enough to keep the chute clean but slow enough to avoid segregation of materials. The end of each chute shall be provided with a baffle to help prevent segregation, or the concrete should be discharged through a tremie or elephant trunk directly into the form.

N. Elephant trunks and/or tremies shall be used in walls and columns to prevent free fall of the concrete and to allow the concrete to be placed through the cage of reinforcing steel.

O. Pumping equipment shall be of suitable type, without Y-sections, and with adequate pumping capacity. Loss of slump in pumping shall not exceed 1-1/2 inches.

3.08 CONSOLIDATION

A. Each concrete layer placed shall be compacted by mechanical internal vibrating equipment supplemented by hand spading, rodding, or tamping.

B. The period of concrete vibration shall not be less than two seconds nor more than five seconds at any one point.

C. Consolidate concrete thoroughly as it is placed in order to secure a dense mass; work concrete well around the reinforcement and embedded items and into the corners of the forms.

D. Use internal vibrators inserted vertically over the entire area of the placement; form vibrators not permitted; internal vibrators shall maintain a minimum of 5000 impulses when submerged in concrete.

E. Vibrate until voids are eliminated, coarse aggregate is suspended in mortar, and entrapped air bubbles begin to rise to the surface; concrete should move back into the space vacated by the vibrator; vibration duration shall be limited only to the time necessary to produce consolidation without causing segregation.

F. Space vibrator insertions such that the area visibly affected by the vibrator overlaps the adjacent just-vibrated area by a few inches.

G. Penetrate at least 6 inches into previously placed layers in order to bond between layers and avoid cold joints.

H. Take care not to over-vibrate air entrained concrete; place vibrator to eliminate honeycombing but avoid excess vibrating that bleeds all entrapped air from the mix.

I. Do not use vibrators to transport concrete.

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3.09 JOINTS

A. Construct expansion, control, and isolation joints only where indicated on the drawings or at additional locations approved by the Engineer (and as shown on the Standard Details).

B. Where the placing of concrete is discontinued, clean off laitance and other objectionable material to a sufficient depth to expose sound concrete as soon as concrete is firm enough to retain its form; smooth the top surface of concrete adjacent to the forms with a trowel to minimize visible joints on exposed faces.

C. Immediately upon completion of the work of placing concrete, remove accumulations splashed upon the reinforcement and the surfaces of the forms; perform this removal before concrete takes its initial set; clean reinforcing steel carefully to prevent damage to the concrete steel bond.

D. Do not halt work within 18 inches of the top of any face.

E. For bonded horizontal joint construction, roughen the surface and expose the aggregate; clean the surface thoroughly by wet sandblasting, by cutting with high-pressure water jet or by other approved methods; perform cleaning after the concrete has hardened to prevent raveling of the surface below the desired depth.

F. Construction and contraction joints shall be constructed with interfaces roughened to 1/4-inch amplitude, cleaned and laitance removed.

G. Before bonding concrete is placed, clean the surface of loose or soft particles or other objectionable materials and keep wet for a minimum period of 12 hours.

H. Cover the cleaned and saturated surface with a coating of neat cement grout and deposit new concrete before the grout has attained its initial set.

3.10 CURING

A. Concrete shall be wet cured by immersion of moisture-retaining covers in conformance with ACI 308 or shall receive curing compound in accordance with ACI 309.

B. Water curing is the preferred method of protection for curing concrete; cover exposed surfaces with a saturated material (burlap or cotton mats) and keep wet continuously with a soil soaker hose for 7 curing days for all concrete except high early strength concrete; leave covering in place, without wetting, for an additional 3 days.

C. A curing day is defined as 24-hour day when the concrete surfaces are kept moist and the uniform temperature of the concrete mass is between 55 Degrees Fahrenheit and 75 Degrees Fahrenheit.

D. Curing shall start as soon as free surface water disappears after finishing. Where forms are not removed immediately, curing shall be accomplished in a manner acceptable to the Engineer.

E. Curing compounds may not be used on surfaces that are to receive additional concrete, paint or tile, unless approved by the manufacturer for such use.

F. Curing and sealing compound shall not be applied to steel reinforcing anchors, water stops, construction joints, or surfaces to be bonded to other concrete.

G. When using a curing compound, keep surfaces moist after the forms are removed. Preferred sequence: Remove forms in accordance with 03 11 13 Structural Cast-In-Place Concrete Forming of this specification: apply curing compound according to manufacturer's recommendations (if manufacture allows pre-finishing application); repair form tie holes; finish surface. Alternate sequence (if manufacturer does not allow pre-finishing application): Remove forms in accordance with 03 11 13 Structural Cast-In-Place Concrete

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Forming of this specification; repair form tie holes; finish surface; apply curing compound according to manufacturer's recommendations.

H. Slabs: Immediately following slab finishing, begin water curing before the surface becomes dry or apply liquid membrane-forming curing compound.
   1. For exposed slabs with synthetic fiber reinforcement (fiber mesh), the exposed fibers shall be melted or burned off with a heat source prior to applying the curing compound.

I. Vertical Surfaces: When the forms are removed entirely, spray the surface with water and allow it to reach a uniformly damp appearance with no free water on the surface; apply curing compound or begin water curing.

J. For curing concrete under hot weather conditions, see Hot Weather Requirements in this section.

K. For curing concrete under cold weather conditions, see Cold Weather Requirements in this section.

3.11 CONCRETE WALL FINISHES

A. Complete screeding and darbying of top of walls before excess moisture or bleeding water is present on the surface.

B. Do not begin subsequent finishing operations until surface water has disappeared.

C. Refer to Section 03 11 13 for As-Cast Surface Finishes requirements.

D. All areas of concrete that have holes and pockmarks that exceed the definition for bug hole shall be repaired with a structural repair mortar after forms are removed and prior to any specific surface finishes.

E. Refer to Concrete Schedule, included in this specification section, for finish type at each location, defined as follows:
   1. Rough Form Finish: (Type W1)
      a. Provide As-Cast Surface Finish-1.0.
   2. Smooth Form Finish: (Type W2)
      a. Provide As-Cast Surface Finish-2.0.
   3. Smooth Rubbed Finish: (Type W3)
      a. Provide As-Cast Surface Finish-2.0.Wet surface and rub with a Carborundum brick until uniform color and texture are produced.
      b. Perform rubbing no later than 24 hours after forms are removed.
      c. Do not use any cement grout other than the paste drawn from the concrete itself by rubbing.
      d. Thoroughly wash the surface with water.
   4. Smooth Troweled Finish: (Type W4)
      a. Produce a Smooth Rubbed Finish W3.
      b. After wet-rubbing, finish with a steel trowel to increase compaction of fines and to provide maximum density.
   5. Smooth Finish (Grout Cleaned): (Type W5)
      a. Provide As-Cast Surface Finish-3.0.
      b. Use for surfaces exposed to general view, unless noted otherwise. This is not an architectural texture or exposed aggregate finish. This method is to fill bug holes remaining in exposed concrete, not repair defects in concrete work.
      c. Mix 1 part portland cement and 1-1/2 parts fine sand with sufficient water to produce grout having consistency of thick paint; use white portland cement in combination with normal portland cement to achieve uniform surface color after drying.
      d. Wet surface of concrete and uniformly apply grout with brush or spray gun completely filling air bubbles; surface with a wood float scouring wall vigorously.
      e. Allow grout to partially set for one to two hours, depending on weather conditions; in hot dry weather, keep damp, using fine fog spray.

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f. When grout has hardened sufficiently to be scraped from wall with edge of steel trowel without removing grout from small air holes, cut off all grout that can be removed with trowel.

g. Allow surface to dry thoroughly then rub vigorously with dry burlap to completely remove dried grout; there shall be no visible film or grout remaining after this rubbing.

h. The entire cleaning operation for any area must be completed the day it is started; no grout shall be left on overnight, and sufficient time shall be allowed for grout to dry after it has been cut with trowel so it can be wiped off clean with burlap.

i. After entire surface has been grout cleaned, wipe off any slightly dark spots or streaks with fine abrasive hone.

3.12 CONCRETE SLAB FINISHING

A. Complete screeding and darbying slabs before excess moisture or bleeding water is present on the surface.

B. Do not begin subsequent finishing operations until surface water has disappeared and the concrete will sustain foot pressure with only approximately 1/4 inch indentation.

C. Refer to Concrete Schedule, included in this specification section, for finish type at each location, defined as follows:

1. Smooth Float Finish: (Type S1)
   a. Consolidate concrete with a power-driven disc-type float or a combination floating-troweling machine with metal float shoes attached.
   b. Machines which have a water attachment for wetting the concrete during the finishing operation are prohibited.
   c. Check and level surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10-foot straightedge. Cut down high spots and fill low spots; immediately after re-leveling, refloat surface to a uniform, smooth, granular texture.
   d. Where slab drainage is indicated, take care to maintain accurate slopes for drainage.
2. Steel Troweled Finish: (Type S2)
   a. Produce a Smooth Float Finish S1.
   b. After float finishing, steel trowel surface as specified in Concrete Schedule to increase the compaction of fines and to provide maximum density and wear resistance.
   c. Steel Troweled Finish: Screed and bull float or darby. Give preliminary float finish, true, even and free from depressions; float surface with hand or machine floats; compact surface with not less than 2 thorough and complete steel troweling operations.
   d. Tolerance on finished steel troweled floors in no instance shall exceed 1/8 inch in 10'-0" on surface; where floor drains occur, slope floors to drains.
   e. Buffing: After concrete floors have been properly cured, buff thoroughly to remove soluble salt incrustation or other foreign substances.
3. Broom Finish: (Type S4)
   a. Produce Smooth Float Finish S1.
   b. Draw stiff broom over surface, to obtain non-slip finish.
      1) At Sidewalks, produce a medium-coarse broom finish.
      2) At all other areas produce a fine broom finish.
   c. For slabs with synthetic fiber (fiber mesh) reinforcement, broom in one direction only, with a consistent sweeping motion to align the fibers with the broom texture.

3.13 CONCRETE SIDEWALKS

A. Concrete sidewalk construction shall be as specified in Concrete Sidewalks, Steps, and Driveways - Division 32 of these specifications.

3.14 CONCRETE SPLASH BLOCKS

A. Reinforced precast concrete splash blocks formed of 4000 psi concrete with air entrained concrete; shall be 2 inches thick x 1'-0" wide x 2'-6" long; front shall be turned up 4 inches for 6 inches overall height;

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upper corners of turned up lip shall be cut off at 45 Degree angle; wire mesh reinforcing turned up in front lip.

3.15 PERIMETER INSULATION

A. Install perimeter insulation at building foundation wall as shown on the contract drawings.

3.16 HOT WEATHER REQUIREMENTS

A. Comply with ACI 305R unless otherwise specified herein below.

B. Hot weather conditions are deemed to exist when the temperature in the forms is 75 Degrees Fahrenheit or above, or a combination of high air temperature, low relative humidity and wind velocity impair the quality of fresh or hardened concrete; take protective measures for mixing, transporting and placing concrete in accordance with ACI 305R.

C. The temperature of the concrete at the place of discharge may not exceed 85 Degrees Fahrenheit.
   1. If ice is used to lower temperature, place crushed, shaved or chipped ice directly into the mixer as part or all of the mixing water; mix until ice is completely melted.
   2. Record the concrete temperature at the time of discharge.

D. Do not add water that will cause the proportions to exceed the maximum water-cement ratio shown in Table I.
   1. Notify the Engineer before adding any water to the concrete mix.
   2. Record the amount of water added to the concrete at the jobsite.

E. Discharge concrete within 45 minutes or 100 revolutions, whichever occurs first, after the first mixing of cement and aggregates.

F. Placing and Curing:
   1. Place concrete promptly upon arrival.
   2. Provide at least one standby vibrator for each 3 vibrators in use.
   3. Protect concrete from direct sunlight; keep forms covered and moist by means of water sprinkling or the application of continuously wetted burlap or cotton mats for a minimum of 24 hours. Windbreaks and/or sunshades shall be provided as directed by the Engineer.
   4. When forms are removed, provide wet cover to the newly exposed surfaces to avoid exposure to hot sun and wind.
   5. Continue specified water curing methods for 10 days; leave covering in place 4 additional days; do not permit alternate wetting and drying cycles.
   6. For slabs on grade, beam and deck concrete, and other horizontal placements protect the surface between finishing operations using one or more of the following methods:
      a. Careful use of a fog nozzle.
      b. Spreading and removing polyethylene sheeting between finishing operations.
      c. Application of mono-molecular film after the strike-off.

G. During extremes in weather, floor slabs shall not be cast unless the slab is protected by a roof and other suitable protective measures are provided. After curing has been completed, the floor shall be exposed to the air for 48 hours prior to allowing traffic on the floors.

3.17 COLD WEATHER REQUIREMENTS

A. Comply with ACI 306.1 (R2002) unless otherwise specified herein below.

B. Cold weather is defined any time when the daily temperature is 40 Degrees Fahrenheit or lower during placement and the protection period. If at any time during the progress of the work, the temperature drops below 40 Degrees F., the Contractor shall make suitable provisions to protect the concrete by use of insulation materials such as blankets, mats, etc., and equipment for providing artificial heat.

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C. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

D. Protect concrete surfaces from freezing for at least 24 hours after placement.

E. All surfaces in contact with newly-placed concrete including formwork, reinforcement and subgrade must be above 35 Degrees Fahrenheit.

F. Use preparation methods capable of producing concrete with a temperature not more than 85 Degrees Fahrenheit, and not less than 55 Degrees Fahrenheit, at the time of placement.

G. Do not heat concrete ingredients to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, within the specified temperatures. (Do not heat water in excess of 140 Degrees Fahrenheit.)

H. Concrete shall have a temperature of not less than 55 Degrees Fahrenheit when placed; mix concrete at a temperature between:
   1. 60 Degrees Fahrenheit and 70 Degrees Fahrenheit when outside air temperature is above 30 Degrees Fahrenheit.
   2. 65 Degrees Fahrenheit and 75 Degrees Fahrenheit when outside air temperature is between 0 Degrees Fahrenheit and 30 Degrees Fahrenheit.
   3. 70 Degrees Fahrenheit and 80 Degrees Fahrenheit when outside air temperature is below 0 Degrees Fahrenheit.

I. Follow concrete placement with tarpaulins or other readily movable coverings, so only a few feet of concrete is exposed to the outside air at any time.

J. Maintain the temperature and moisture conditions specified in all parts of the newly placed concrete by covering, insulating, housing or heating; arrange for protection methods in advance of placement.

K. Maintain concrete at a temperature of not less than 55 Degrees Fahrenheit nor more than 70 Degrees Fahrenheit for a period of 3 days after placement.

L. A thermometer accurate to plus or minus 2 Degrees F shall be placed under the curing blanket. Additional insulation shall be supplied as required to maintain the temperature above 55 Degrees F.

M. After the curing period, the temperature of the exposed surface shall not be permitted to drop faster than 30 Degrees F in 24 hours.

N. Do not remove forms during the initial protection period.

O. Protect insulation against wetting that will impair its insulating value using moisture-proof cover material; keep insulation in close contact with concrete.

P. Construct enclosure to withstand wind and snow loads and be reasonably airtight; provide sufficient space between the concrete and enclosure to permit free circulation of heated air.

Q. Use vented heaters; do not permit heaters to heat or dry concrete locally. Unvented salamanders or other heaters which produce carbon dioxide as by-products shall not be permitted within enclosures or inside buildings. If heaters are used, precautions shall be taken to prevent drying of the slab through the use of water jackets or other suitable methods.

R. Maintain relative humidity above 40% within heated enclosures before construction supports are removed.

S. Monitor temperature to ensure concrete is kept within specified limits recording time and concrete temperature every 8 hours.

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T. Assure concrete has developed necessary strength before removing forms; provide additional test cylinders with the same protection as the structure they represent to verify concrete strength before construction supports are removed.

U. If water curing is used, terminate at least 12-hours before end of temperature protection period. Permit concrete to dry.

V. After the required protection period gradually reduce the concrete temperature within an enclosure or insulation at a rate not to exceed 20 Degrees Fahrenheit per day until the outside temperature has been reached.

W. Apply membrane forming curing compound to concrete surfaces during the first period of above-freezing temperatures after forms are stripped and before air temperature rises to 50 Degrees Fahrenheit; apply membrane forming curing compound to slabs as soon as finishing operations are completed, except where live steam curing is used.

3.18 DELIVERY TICKETS

A. With each load of concrete delivered to the job there shall be furnished by the ready-mixed concrete producer duplicate delivery tickets, one for the Contractor and one for the Engineer. Delivery tickets shall provide the following information:

1. Date and serial number of ticket;
2. Name of ready-mixed concrete plant;
3. Job location;
4. Contractor;
5. Type and brand name of cement;
6. Mix number or specified cement content in bags per cubic yard of concrete;
7. Truck number;
8. Time dispatched stamped by a time clock;
9. Amount of concrete in load in cubic yards;
10. Admixtures in concrete, if any;
11. Maximum size of aggregate;
12. Water added at job, if any;
13. Slump of concrete ordered

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TABLE 1
CONCRETE CLASS SCHEDULE

Parameter Value	Compressive Strength (PSI) 28-Day	Water-Cement Ratio Maximum	Air Content Range (%) Minimum-Maximum	Slump Range (Inches) Minimum-Maximum	Coarse Aggregate (Inches) Maximum
Class A	4,000	0.5	1 to 2	2 to 4	3/4
Class B	4,000	0.5	1 to 2	2 to 4	1-1/2
Class C	4,000	0.5	5 to 7	2 to 4	3/4
Class D	4,000	0.5	4 to 6	2 to 4	1-1/2
Class E (Interior)	3,000	0.5	1 to 2	2 to 4	3/4
Class F (Exterior)	3,000	0.5	5 to 7	2 to 4	1-1/2
Class G	2,000	0.67	1 to 2	4 to 6	1-1/2
Class H	5,000	0.45	1 to 2	2 to 4	3/4
Class I	5,000	0.45	1 to 2	2 to 4	1-1/2
Class J	5,000	0.45	5 to 7	2 to 4	3/4
Class K (Exterior)	5,000	0.45	4 to 6	2 to 4	1-1/2
Class L	3,000 psi @24 hours	0.40	5 to 7 4 to 6	2 to 4 2 to 4	3/4 1-1/2

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TABLE 2
CONCRETE SCHEDULE
USES AND PROPERTIES

Use	Finish	Class and Considerations
Standard Concrete (not including liquid-retaining or severe exposure structures)		
Footings,	S1 Top, W1 Sides	Class A
(Buried and non-exposed)	S1 Top, W1 Sides	Class B
Foundations walls	S2 Top, W5 Sides	Class A
(Exterior and exposed)	S2 Top, W5 Sides	Class B
Foundations walls	S1 Top, W2 Sides	Class A
(Exterior and non-exposed)	S1 Top, W2 Sides	Class B
Slabs and equipment pads and bases,	S4 Top, W5 Sides	Class C
(Exterior)	S4 Top, W5 Sides	Class D
Slabs, floors, and equipment pads and bases	S2 Top, W5 Sides	Class H
(Interior)	S2 Top, W5 Sides	Class I
Topping for precast decking (Interior)	S2 Top, W5 Sides	Class A
Housekeeping pads (interior)	S2 Top, W5 Sides	Class E
Equipment pads and bases	S2 Top, W5 Sides	Class E (Interior)
	S2 Top, W5 Sides	Class F (Exterior)
Curbing, sidewalk, driveways	S4 Top, W5 Sides	Class C
(exterior)	S4 Top, W5 Sides	Class D
Manhole bases and benches	Special Construction	Class E
Pavement base, cradles	Special Construction	Class E
and inlet walls		Class F
Mass and fill	None	Class G
Traffic areas requiring early access or use	Special Construction	Class L
Liquid-Retaining Structures (provide integral crystalline water-proofing admixture)		
Slabs and bases	S2 Top, W4 Sides	Class H
(Interior)	S2 Top, W4 Sides	Class I
Elevated slabs and integral beams	S2 Top, W4 Sides, W4 Bottom	Class H
(Interior)	S2 Top, W4 Sides, W4 Bottom	Class I
Buried walls	W2 Sides	Class H
(non-exposed)	W2 Sides	Class I
Exposed walls	S2 Top, W4 Sides	Class H
(interior of tank)	S2 Top, W4 Sides	Class I
Fillets	S2 Top, W4 Sides	Class E
	S2 Top, W4 Sides	Class F
Severe Exposure (Chemical Resistant)		
Slabs and bases	S2	Class H
(Interior)	S2	Class I
Slabs and bases	S2	Class J
(Exterior)	S2	Class K
Buried walls	W1	Class H
(Interior)	W1	Class I
Buried walls	W1	Class J
(Exterior)	W1	Class K
Exposed walls	S2 Top, W5 Sides	Class J
	S2 Top, W5 Sides	Class K
Fillets	S2 Top, W5 Sides	Class E
	S2 Top, W5 Sides	Class F

END OF SECTION

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SECTION 03 35 16
HEAVY-DUTY CONCRETE FLOOR FINISHING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Federal Specifications (FS), Specifications and Standards, Current Edition.
   2. United States Army Corp of Engineers (USACE), Standards and Specifications, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and applying heavy-duty concrete floor finishing to all exposed concrete slabs designated to receive concrete hardener.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Accessories - Division 03

C. Cast-in-Place Concrete - Division 03

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Submit manufacturer's application instructions to Engineer.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Chemical concrete hardener shall be manufactured by W.R. Grace & Company (Grace); W.R. Meadows, Inc. (SealTight); Sonneborn Division of BASF. (Sonneborn); Euclid Chemical Company (Euclid); or equal.

2.02 LIQUID CHEMICAL HARDENER

A. Clear, colorless, magnesium flurosilicate chemical hardener and dustproofer formulated to comply with Corps of Engineers Specification CE 204 or Fed. Spec. TT-C-00800;
   1. Euclid Surfhard
   2. MasterKure 300WB
   3. Sealtight Liqui-Hard
   4. Tamms Hornolith
   5. or equal.

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B. Both hardening and curing compounds shall be of same manufacturer. Manufacturer shall certify compatibility, such that the application of curing compound prior to hardening compound will have no detrimental effect upon the hardening compound application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are ready to receive work and conditions are as instructed by the manufacturer.

B. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. The concrete surface to be treated must be clean, unpainted and free from membrane curing compounds, wax, sealers, dust, oil, grease, and other foreign matter to insure maximum penetration of the chemical hardening solution.

B. New concrete floors must be thoroughly cured as recommended by the manufacturer (minimum 28 days) and completely dry before treatment.

3.03 APPLICATION

A. Apply a minimum of three applications of chemical hardener in strict accordance with the manufacturer's written instructions for dilution and procedures to be used. If the surface is rough and porous, apply a fourth, undiluted application to fully saturate and densify the surface. Apply liquid by spray or flush onto surface; distribute evenly by brush or squeegee. Remove puddles and excess solution by mopping. Allow adequate drying time between coats. Between applications and after final coat, remove white crystalline residue by mopping with clean water or with heavy bristle brush.

B. Final appearance of finished floor shall be matte (not glossy) and even appearance without white blotches or areas.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Heavy-duty concrete floor finishing shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 HEAVY-DUTY CONCRETE FLOOR FINISHING

A. Heavy-Duty Concrete Floor Finishing, Lump Sum. When so provided, payment for heavy-duty concrete floor finishing shall be made at the contract lump sum price bid.

B. Heavy-Duty Concrete Floor Finishing, Inclusive. When no quantity is provided, heavy-duty concrete floor finishing shall be considered inclusive to payment for work associated with cast-in-place concrete.

END OF SECTION

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SECTION 03 41 34
PLANT-PRECAST STRUCTURAL PRETENSIONED CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Precast prestressed concrete hollowcore floor planks at mezzanine, 3-hour rated.

B. Precast prestressed concrete hollowcore roof planks, 1-hour rated.

C. Grouting roof and floor plank joint keys.

D. Connection plates, angles, brackets, and hangers.

1.02 RELATED SECTIONS

A. Division 03 - Concrete: Concrete topping at floor plank.

B. Section 04 20 00 - Unit Masonry.

C. Section 05 50 00 - Metal Fabrications.

D. Section 07 92 00 - Joint Sealers: Caulking of butt joints of precast units at exposed underside of floor members.

E. Section 07 84 00 – Firestopping: Sealing of penetrations through floor plank at mezzanine.

1.03 REFERENCES

A. American Concrete Institute (ACI):
1. ACI 301 - Specifications for Structural Concrete.
2. ACI 318 – Building Code Requirements for Reinforced Concrete.

B. American National Standards Institute (ASTM) International:
1. ASTM A36 - Standard Specification for Carbon Structural Steel.
2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
3. ASTM A1064 - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
4. ASTM A416 - Standard Specification for Steel Strand, Uncoated Seven-Wire for Prestressed Concrete.
5. ASTM A615 - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
6. ASTM C150 - Standard Specification for Portland Cement.

C. American Welding Society (AWS):
1. AWS D1.1 - Structural Welding Code - Steel.
2. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

D. International Code Council:
1. IBC – International Building Code, 2021 edition.

E. Precast/Prestressed Concrete Institute (PCI):
1. PCI - Manual For The Design of Hollowcore Slabs.
2. PCI MNL-116 - Manual for Quality Control for Plants and Production of Structural Precast Concrete Products.
3. PCI MNL-120 – PCI Design Handbook - Precast and Prestressed Concrete.
4. PCI MNL-123 - Manual on Design of Connections for Precast Prestressed Concrete.

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5. PCI MNL-124 - PCI Design for Fire Resistance of Precast Prestressed Concrete.
6. PCI - Design Handbook - Precast and Prestressed Concrete.
7. PCI - Tolerances for Precast and Prestressed Concrete.

F. Wisconsin Commercial Building Code (WCBC), 2025.

1.04 DESIGN REQUIREMENTS

A. Design planks for superimposed loads indicated on the contract drawings. Plank manufacturer shall verify with the Engineer all anticipated superimposed design loads. Plank manufacturer shall allow for all dead loads. Precast plank units shall be hollow core concrete slabs with pretensioned reinforcement in accordance with ACI 318 Building Code Requirements.

B. Design all connections to the foundation, panel-to-panel connections and openings. Design the system to resist lateral loads.

C. Concrete strength 3,500 psi after 24 hour steam cure; 5,000 psi in 28 days.

D. Design head and jamb steel tubes at overhead door openings.

E. Design components to accommodate construction tolerances, deflection of other building structural members and clearances of intended openings.

F. Deflection under dead load of plank only shall not exceed 1/4 inch below level of supports.

G. Vertical variations between any two planks shall not exceed 1/4 inch at center of span or at any other location.

H. Maximum Allowable Live Load Deflection: L/360 span.

I. Where concrete topping is required, design of precast structural pretensioned concrete plank systems shall be based on a “non-structural topping” system with additional superimposed dead load from topping as indicated on the precast plan and/or precast plank schedule.

1.05 SUBMITTALS

A. Submit under provisions of Division 01.

B. Shop Drawings: Indicate plank locations, unit identification marks, size, shape, connection details, edge conditions, bearing requirements, support conditions, dimensions, openings intended to be field cut, and relationship to adjacent materials. Provide plans and elevations locating and defining all products to be furnished.

C. Product Data: Indicate standard component configuration, design loads, deflections, and cambers.

D. Plank manufacturer shall submit plans for submittal by the Architect to the State of Wisconsin, Safety and Professional Services (DSPS) prior to installation of planks. Furnish ENGINEER with drawings and calculations bearing the seal and signature of a registered Wisconsin Professional Engineer for submittal to DSPS. Fabrication may proceed upon receipt of approved shop drawings.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with the requirements of PCI MNL-116, PCI MNL-123, and PCI MNL-120.

B. Maintain plant records and quality control program during production of precast planks. Make records available upon request.

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1.07 QUALIFICATIONS

A. Fabricator: Company specializing in manufacturing the work of this section with five (5) years documented experience. The precast concrete manufacturing plant shall be certified by the Precast/Prestressed Concrete Institute Plan Certification Program, at the time of bidding.

B. Erector: Company specializing in erecting the work of this Section with five years documented experience approved by fabricator.

C. Design precast concrete members in accordance with PCI Manual for the Design of Hollowcore Slabs, under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Wisconsin.

D. Quality control and inspection procedures shall comply with the applicable sections of PCI MNL-116.

1.08 REGULATORY REQUIREMENTS

A. Conform to ACI 318 and the State of Minnesota Building Code for design load and on-site construction requirements.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling:
1. Deliver all hollowcore wall panel units to project site in such quantities and at such times to ensure continuity of erection.
2. Handle and transport units in a position consistent with their shape and design in order to avoid stresses which would cause cracking or damage.
3. Lift or support units only at the points shown on the shop drawings.
4. Place non-staining resilient spacers of even thickness between each unit.
5. Support units during shipment on non-staining shock absorbing material.
6. Do not place units directly on ground

B. Storage at Jobsite:
1. Store and protect units to prevent contact with soil, staining and physical damage.
2. Store units, unless otherwise specified with non-staining, resilient supports located in same positions as when transported.
3. Store units on firm, level, and smooth surfaces.
4. Place stored units so that identification marks are discernible, and so that product can be inspected.

1.10 COORDINATION

A. Coordinate work under provisions of Division 01.

B. Coordinate the Work of framing components not post tensioned but directly associated with the Work of this section.

C. Coordinate field cut openings with affected section.

D. Coordinate location of hanger tabs and devices for mechanical and electrical work.

1.11 WARRANTY

A. Supplier shall furnish Owner with a written guarantee stating that if plank(s) develop a permanent deflection in excess of ACI specified limits, under design load conditions, within a period of one year after erection, that at Owner's option, supplier agrees to provide all materials and labor necessary to replace plank(s), including replacement of topping, and replacement of all disturbed adjacent/associated materials or surfaces at no cost to the Owner.

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PART 2 PRODUCTS

2.01 FABRICATORS

A. Spancrete, Inc., Green Bay, Wisconsin.

B. County Materials, Wisconsin.

C. Architectural Precast Inc, Browntown WI.

D. Or equal.

2.02 MATERIALS

A. Concrete:
   1. Portland Cement:
      a. ASTM C150, Type I, gray color for backup concrete. Concrete color for the face mix shall match the existing concrete color on the precast panel on the existing Filter Building #6.
      b. For exposed surfaces, use same brand, type, and source of supply throughout.
   2. Water reducing, retarding, accelerating, high range water reducing admixtures: ASTM C494.
   3. Backup Concrete Aggregates: ASTM C33 or C330.
   4. Water: Free from deleterious matter that may interfere with the color, setting or strength of the concrete.

B. Reinforcing Steel:
   1. Prestressing Strand: ASTM A416, Grade 250.

C. Cast-in Anchors and tube steel:
   1. Materials:
      a. Structural steel: ASTM A36.
      b. Bolts: ASTM A307 or A325.
      c. Welded headed studs: AWS D1.1 – Type B.
      d. Deformed bar anchors: ASTM A496.

D. Sandwich Panel Insulation: Extruded polystyrene, 4 inches thick, R-20 for the panel.

E. Non-Shrink Grout: Non-metallic, minimum compressive strength of 10,000 psi at 28 days.

2.03 CONCRETE MIXES

A. Concrete Properties:
   1. Mix shall be in accordance with ACI 211.3.
   2. Exterior wythe mix: Minimum 4,000 PSI 28 day compressive strength; color to match approved sample.
   3. Hollowcore backup mix material measurement limits:
      a. Cement: ±1%.
      b. Water: ±1%.
      c. Fine aggregate: ±2%.
      d. Coarse aggregate: ±2%.
      e. Admixtures: ±3%

2.04 ACCESSORIES

A. Connecting and Supporting Devices: Conforming to PCI MNL-123 plates, angles, and inserts.

B. Bearing Pads: High density plastic, 1/8 inch thick, smooth on one side.

2.05 FABRICATION

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A. Manufacturing procedures shall be in general compliance with PCI MNL-116.

B. Cover:
   1. Provide at least 3/4 inch cover for reinforcing steel, unless otherwise.
   2. Provide embedded anchors, inserts, plates and other cast-in items with sufficient anchorage and embedment for design requirements.

C. Prestressing:
   1. Prestress strands shall be pretensioned by a single strand jacking system.
   2. Detention prestress strands when concrete reaches a compressive strength of 3000 PSI or greater as required by design. Verify compressive strength by testing.
   3. Prestress exterior wythe to a minimum compression of 120 PSI.

D. Curing:
   1. Natural cure panels.

E. Acceptance:
   1. Provide clean, smooth, and straight units without fins, broken edges, spalling or structural defects.

F. Panel Identification:
   1. Mark each precast panel to correspond to identification mark on shop drawings for panel locations.
   2. Mark each precast panel with date cast.

2.06 CONCRETE TESTING

A. Make one compression test at 28 days for each day's production of each type of concrete.

B. Specimens:
   1. Provide two test specimens for each compression test.
   2. Obtain concrete for specimens from actual production batch.
   3. 3 inch x 6 inch concrete test cylinder, ASTM C31.
   4. Cure specimens using the same methods used for the precast concrete units until the units are stripped, then moist cure specimens until tested.

C. Keep quality control records available for the Architect upon request for two (2) years after final acceptance.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify site conditions under provisions of Division 1.

B. Verify that site conditions are ready to receive work and field measurements are as indicated on shop drawings.

C. Verify supporting structure is ready to receive work.

3.02 PREPARATION

A. Prepare support devices for the erection procedure and temporary bracing.

3.03 ERECTION

A. Erect members without damage to structural capacity, shape, or finish. Replace or repair damaged members.

B. Align and maintain uniform horizontal and end joints, as erection progresses.

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C. Maintain temporary bracing in place until final connection is made. Protect members from staining.

D. Install bearing pads at bearing ends of planks, unless noted otherwise

E. Adjust differential camber between precast members to tolerance before final attachment and grouting.

F. Adjust differential elevation between precast members to tolerance before final attachment.

G. Fasten precast units in place.

H. All planks shall be grouted by a mixture of not less than 1 part cement to 3 parts of fine sand. Grout shall be placed to fill entire joint, top to bottom. Planks shall be grouted within 72 hours of erection. Trowel grout smooth on top surface.

I. Fill the bottom of all floor plank joints with a non-staining, non-shrinking thermoplastic putty, as recommended by plank manufacturer. Putty shall be paintable.

3.04 TOLERANCES

A. Manufacture and erect members so that each member after erection complies with the dimension tolerances listed in PCI MNL-116.

3.05 PROTECTION OF FINISHED WORK

A. Protect finished Work under provisions of Division 1.

B. Protect members from damage caused by field welding or erection operations.

C. Provide non-combustible shields during welding operations.

D. The erector shall be responsible for any chipping, spalling, cracking or other damage to the units after delivery to the jobsite unless damage is caused in site storage by others. After installation is completed, any further damage shall be the responsibility of the general CONTRACTOR.

3.06 REPAIR AND CLEANING

A. Repair exposed exterior surface to match color and texture of surrounding concrete and to minimize shrinkage.

B. Clean weld marks, dirt, or blemishes from surface of exposed members.

C. After installation, clean soiled precast concrete wall panel exterior surfaces with detergent and water using fiber brush and sponge. Rinse thoroughly with clean water.

END OF SECTION

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SECTION 03 62 00
NON-SHRINK GROUTING

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing a non-shrink fluid precision grout material, forming, placing and curing where shown on the contract drawings or required by equipment manufacturers, equipment bases shall be grouted in position.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS (NONE)

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specification. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 NON-SHRINK GROUTING

A. Non-shrink grouting shall be as manufactured by Master Builders, U.S. Grout Corporation, or equal.

PART 3 EXECUTION

3.01 PREPARATION AND INSTALLATION

A. Concrete foundation shall be rough and relatively level. Contractor shall remove laitance down to sound concrete and prepare concrete in accordance with manufactured recommendations.

B. Preparation of grout shall be in paddle type mortar mixer or other suitable mechanical mixer.

C. Placing of grout shall be at temperatures of 45 Degrees Fahrenheit to 75 Degrees Fahrenheit. Temperature shall be maintained above 40 Degrees Fahrenheit until strength exceeds 4000 psi.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Non-shrink grouting shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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4.02 NON-SHRINK GROUTING

A. Non-Shrink Grouting, Inclusive. When no quantity is provided, non-shrink grouting shall be considered inclusive to payment for work associated with the related equipment.

END OF SECTION

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SECTION 04 05 13
MASONRY MORTAR

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Mortar for masonry.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 - Unit Masonry: Installation of mortar.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Mortar for masonry.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar.
2. ASTM C150 - Standard Specification for Portland Cement.
3. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
4. ASTM C270 - Standard Specification for Mortar for Unit Masonry.
5. ASTM C387 - Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
6. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
7. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.
8. ASTM C1072 - Standard Test Method for Measurement of Masonry Flexural Bond Strength.
9. ASTM C1314 - Standard Test Method for Compressive Strength of Masonry Prisms.
10. ASTM C1329 - Standard Specification for Mortar Cement.
11. ASTM C1357 - Standard Test Method for Evaluating Masonry Bond Strength.
12. ASTM E518 - Standard Test Methods for Flexural Bond Strength of Masonry.

B. International Masonry Industry All-Weather Council (IMIAC):
1. Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. The Masonry Society (TMS):
1. ACI 530/530.1 - Building Code Requirements and Specifications for Masonry Structures and Related Commentaries.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Submit on the pre-mixed mortar to be used: cement, lime, sand and pigment to be used.

C. Samples: Submit 3/8”x3/8”x4” colored mortar samples illustrating the colors available for selection by the Architect.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

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B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Hot and Cold Weather Requirements: TMS MSJC Specification.

B. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

PART 2 PRODUCTS

2.01 MATERIALS

A. Mortar: Premixed Portland cement, lime, sand and pigment: SpecMix or BMI complying with ASTM C270. Factory mixed with products complying with the following:
   1. Portland Cement: ASTM C150, Type I, gray color.
   2. Mortar Aggregate: ASTM C144, standard masonry type.
   3. Hydrated Lime: ASTM C207, Type S.
   4. Pigment:
      a. Prism, SGS or approved equal.
      b. Colors may be selected from full range of standard and premium colors.
      c. Colors from Prism 10, 20 and 40 series colors.
      d. Colors from SGS Solomon Colors shall include A, H and X series colors.
      e. If SpecMix and BMI do not have a color in their line up of colors then a color will be selected from SGS Solomon Colors, Inc.

B. Water: Clean and potable.

C. Masonry cement and site mixed mortars as not permitted.

2.02 MORTAR COLOR

A. Mortar for the decorative concrete units shall be colored.

B. Color shall be as selected by AE.

C. Mortar for the plain grey concrete masonry shall be standard gray.

2.03 ADMIXTURES

A. Water Repellent:
   1. Dry-Block by Grace Construction Products or BASF MasterPel 240MA.
   2. No substitutions – shall match product provided integral with veneer masonry units.

2.04 MORTAR MIXING

A. Thoroughly mix portland cement-lime mortar ingredients in accordance with ASTM C270 property specification requirements.

B. Use Type S (1800 psi) mortar for all work, except for the locations noted below:
   1. Masonry below grade: Type M (2500 psi)
   2. Decorative Masonry Units for veneer: Type N (750 psi)

C. Add water repellant in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

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D. Do not use anti-freeze compounds to lower the freezing point of mortar.

E. If water is lost by evaporation, re-temper only within two (2) hours of mixing.

F. Use mortar within two (2) hours after mixing at temperatures of 90 degrees F, or two-and-one-half (2½) hours at temperatures under 40 degrees F.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

3.02 INSTALLATION

A. Install mortar to requirements in Section 04 20 00.

END OF SECTION

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SECTION 04 05 16
MASONRY GROUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Grout for masonry.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 - Unit Masonry: Installation of grout.

1.03 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Grout for concrete block.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C150 - Standard Specification for Portland Cement.
   2. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
   3. ASTM C404 - Standard Specification for Aggregates for Masonry Grout.
   4. ASTM C476 - Standard Specification for Grout for Masonry.
   5. ASTM C1019 - Standard Test Method for Sampling and Testing Grout.

B. International Masonry Industry All-Weather Council (IMIAC):
   1. Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. The Masonry Society (TMS):
   1. TMS 402/602 - Building Code Requirements and Specifications for Masonry Structures.

1.05 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Submit product data on the pre-mixed grout to be used or if using ready mix then submit the mix design showing conformance with ASTM C476.

1.06 QUALITY ASSURANCE

A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Hot and Cold Weather Requirements: TMS MSJC Specification.

B. Cold Weather Requirements: IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction.

C. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

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PART 2 PRODUCTS

2.01 MATERIALS

A. Grout:
   1. Premixed or Ready mix complying with ASTM C476 Standard Specification
   2. Fine or Coarse Aggregate: ASTM C404.
   3. Premixed in bags or silos:
      a. Quikrete Commercial Grade Core Fill Grout – Fine or Coarse.
      b. Spec Mix Core Fill Masonry Grout – Fine or Coarse.
   4. Ready Mix: Mix to comply with ASTM C476 Proportion method or strength method.
   5. Compressive strength: 3000 psi minimum at 28 days.
   6. Slump: 8-inch minimum to 11-inch maximum.

B. Water: Clean and potable.

2.02 GROUT MIXING

A. Use a mechanical batch mixer. Hand mixing is not allowed.

B. Thoroughly mix grout ingredients in accordance with ASTM C476 in quantities needed for immediate use.

C. Do not use anti-freeze compounds to lower the freezing point of grout.

D. Use the grout within 1.5 hours of initial mixing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Prior to grouting request inspection from Architect/Engineer of spaces to be grouted.

3.02 INSTALLATION

A. Install grout to the requirements in Section 04 20 00 – Unit Masonry.

END OF SECTION

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SECTION 04 20 00
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Masonry: plain above grade, plain below grade, and decorative above grade veneer.

B. Reinforcement, Anchorage, and Accessories.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 05 50 00 - Metal Fabrications: Steel lintel masonry weld-on tie.

1.03 WORK INSTALLED BUT FURNISHED UNDER OTHER SECTIONS

A. Section 03 20 00 - Concrete Reinforcement: Reinforcing bars.

B. Section 04 05 13 – Masonry Mortar: Mortar.

C. Section 04 05 16 – Masonry Grout: Grout.

D. Section 05 05 23 - Metal Fastenings.

E. Section 05 50 00 - Metal Fabrications: Loose steel lintels.

F. Section 07 21 13 - Board Insulation: Insulation for cavity spaces.

G. Built-in Items Furnished by Other Sections.

1.04 RELATED SECTIONS

A. Section 05 05 23 - Metal Fastenings: Anchor bolts.

B. Section 07 27 26 - Fluid-Applied Membrane Air/Vapor Retarder.

C. Section 07 84 00 - Firestopping: Fire-rated masonry control joints and penetrations.

D. Section 07 92 00 - Joint Sealers: Backer rod and sealant at control joints.

E. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System: FRP door frame wall openings.

F. Section 09 96 23 – Weather Graffiti-Resistant Coatings

G. Division 22 - Plumbing: Plumbing installed in walls and wall openings.

H. Division 23 - Heating, Ventilating, and Air Conditioning: Conduit installed in walls and wall openings.

I. Division 26 - Electrical: Conduit installed in walls and wall openings.

J. Division 40 – Process Integration: Wall openings.

K. Division 44 – Pollution Control Equipment: Wall openings.

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1.05 REFERENCES

A. American Society of Civil Engineers (ACI) International:
   1. TMS 402/602- Building Code Requirements and Specification for Masonry Structures.

B. American Society for Testing and Materials (ASTM) International:
   1. ASTM A153 – Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
   2. ASTM A580 - Standard Specification for Stainless Steel Wire.
   3. ASTM A641 - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   4. ASTM A951 - Standard Specification for Steel Wire for Masonry Joint Reinforcement.
   5. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units.
   6. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
   7. ASTM C140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.

C. International Code Council:
   1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

D. The Masonry Society (TMS):
   1. TMS MSJC - Building Code for Masonry Structures (TMS 402), Specification for Masonry Structures (TMS 602) and Commentaries.

E. National Concrete Masonry Association:
   1. TEK Manual for Concrete Masonry Design and Construction.

1.06 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Samples: Submit samples of decorative block to illustrate color, texture, and extremities of color range.

C. Product Data: Submit on all accessories and reinforcement.

D. Test Data: Submit on concrete masonry units.

E. Shop Drawings: Submit reinforcing shop drawings for reinforced concrete masonry wall and lintel construction.
   1. Submit detailed reinforcing drawings prepared in accordance with TMS 402, including bar schedule with bar marks and bends indicated.
   2. Show bar schedules, stirrup spacing, diagrams of bent bars and arrangements of concrete masonry reinforcement.
   3. Verify dimensions and make proper allowance for fitting together work of other trades.
   4. Submit a certification attesting that reinforcing steel meets the requirements of ASTM A615, including Supplementary Requirements S1.
      a. Submit certified copies of mill reports, tensile and bend tests for reinforcing steel on projects where the quantity of reinforcing exceeds 15 tons.
      b. For information only, submit manufacturer's data and instruction for proprietary items, including reinforcement and accessories.
   5. Submit shop drawings for Shelf Angle Thermal Bracket. Drawings shall include shelf angle supports and shelf angles.

1.07 QUALITY ASSURANCE

A. Perform Work in accordance with TMS MSJC Code and TMS MSJC Specification.

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1.08 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three (3) years documented experience.

1.09 MOCK-UP

A. Section 01 45 00 - Quality Control : Mockup provisions.

B. A 4-foot long by 4-foot 0-inch-tall mock-up shall be constructed. The mock-up shall be constructed as a freestanding unit on the construction site and shall not be part of the building.
   1. Pour a 16-inch wide by 6 inch thick by 4-foot-long concrete footing on which to construct the mock-up.
   2. The mock shall consist of the decorative block and block cavity wall construction including the flashing, mortar, block, ties, sealant, weeps, control joint, and insulation.
      a. A control joint shall be placed center of the mockup.
      b. The liquid-applied air/vapor retarder system is not required to be part of the mock-up.
   3. The units shall be cleaned.
      a. The mock-up shall be used for level of cleaning of the building.
   4. If the mock-up is not constructed in accordance with the plans and specifications and to the acceptance of the Owner and Architect, it shall be rebuilt at no cost to the Owner.
   5. The mock-up when complete and accepted will be used as a measure of quality and performance for the work to be built.
   6. The mock-up shall remain until work of this section is completed.
   7. The mock-up shall be used for demonstration of the installation of the weather/graffiti coating.
   8. Demolish and remove the mock-up from the site after work of this section is complete.

1.10 PRE-INSTALLATION MEETINGS

A. Section 01 30 00 - Administrative Requirements: Requirements for attending a pre-construction conference prior to commencing work of this section.

B. Convene minimum one (1) week prior to commencing work of this section.

C. The Engineer/Architect, general contractor on-site foreman, the on-site mason foreman, and the mason project manager must be in attendance at this meeting.

D. Review conditions of installation, installation procedures, and coordination required with related work.

E. All submittals must be submitted for all items and must have been accepted prior to this meeting.

F. No masonry work shall begin on site until after this meeting occurs.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Concrete block and other materials stored on-site must be stored off the ground and be covered with plastic to prevent the material from becoming wet or covered with ice and snow. The material shall remain covered until it is used.
   1. The plastic wrap that masonry is shipped in must be removed at least long enough prior to placement of block that the block is no longer visibly wet. Visibly wet masonry shall not be installed. Stored block shall be covered with fully plastic, allowing for ventilation.

1.12 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

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B. Hot and Cold Weather Requirements: International Building Code and The Masonry Society ACI 530.

1.13 COLD WEATHER PROTECTION

A. When the ambient air temperature is below 40 degrees F implement cold weather procedures and comply with ACI 530 specifications for cold weather construction.

B. Temporary enclosures shall be constructed around the areas of work.

C. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

1.14 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Coordinate masonry work with installation of window and door anchors.

1.15 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements: Spare parts and maintenance products.

B. Supply the following quantity of veneer block for future owner use (shall be palleted and packaged separately from the block to be used on this project.
1. Type 1: 180 units
2. Type 2: 60 units
3. Type 3: 16 units

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Hollow Loadbearing Block Units: ASTM C90, normal weight, 3250 psi minimum compressive strength on the net area.

B. Nonloadbearing Units: ASTM C129, hollow, normal weight, 3250 psi minimum compressive strength on the net area.

C. Fire-rated concrete block units shall be normal weight. 8-inch block units shall be 75 percent solid and normal weight or as required to obtain 3-hour fire rating at the location required on the drawings. 12-inch block units shall be normal weight or as required to obtain 3-hour fire rating. Lightweight block shall not be used.

D. Masonry Units: Modular sized to thickness as indicated on drawings; provide special units for 90-degree corners, bond beams, sash units, end units, lintels, etc.

E. Decorative Block Units: ASTM C90, normal weight, 2500 psi minimum compressive strength on the net area, integral color as selected by Architect, from manufacturer's standard colors, integral waterproofing of Dry-Block by Grace Construction Products or Rheomix Rheopel by Master Builders (product shall be same as provided for mortar). Color will be standard or premium, selected by architect to match existing building.
1. Type 1: Split face block, Color 1
2. Type 2: Smooth face block, Color 2
3. Type 3 (not shown on the Drawings): Smooth, standard gray for first course on the shelf angle – below top of foundation wall.

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2.02 REINFORCEMENT AND ANCHORAGE

A. Joint Reinforcement for Single Wythe Interior Walls: Single width, ladder-type; ASTM A580 Type 304 stainless steel; all 9-gauge wires.
   1. #120 Truss-Mesh by Hohmann and Barnard.
   2. Series 300 Truss Mesh by Wire-Bond

B. Joint Reinforcement for Exterior Cavity Walls – Back-Up Wythe: Single width, ladder-type; ASTM A580, type 304 stainless steel; all 9-gauge wires.
   1. #270 Ladder-Type by Hohmann and Barnard.
   2. Series 800 Level-Eye Ladder (Hook & Eye) by Wire-Bond

C. Joint Reinforcement for Decorative Block Veneer: Single width, truss- or ladder-type; ASTM A580 type 304 stainless steel; all 9-gauge wires.
   1. #1100 Ladder Type Wall Reinforcing by Heckmann
   2. #120 Truss-Mesh by Hohmann and Barnard
   3. #220 Ladder-Mesh by Hohmann and Barnard.
   4. Series 300 Truss Mesh by Wire-Bond.
   5. Series 200 Ladder Mesh by Wire-Bond

D. Veneer Tie: Adjustable thermal veneer ASTM A580 stainless steel anchor with ASTM A580 type 304 stainless steel pintle that has been designed and tested to withstand over 200-lbf, in tension or compression, at maximum allowed offset of 1-1/4-inch (disengagement of the pintle from the veneer anchor). Anchor shall be steel with reinforced plastic-coated wings (for thermal break) with 1-1/2 inch diameter washer bonded to wings with anchor barrel through insulation and washer seal at wall surface. Pintle shall be 3/16-inch wire and provide minimum 2-1/2-inch embedment in the masonry with minimum 5/8-inch mortar coverage. Seismic wire is not required.
   1. #75TC Pos-I-Tie ThermalClip with #282-N Pintle Wire Tie by Heckmann.
   2. Thermal Concrete 2-Seal Wing Nut Anchor with 2X-Hook by Hohmann and Barnard.
   3. #4532 Sure Tie WS Tapcon and #4515 SureTie WS Double Hook by Wire-Bond.

E. Steel Beam Lintel Weld-On Tie: ASTM A641, mill galvanized, 0.10 oz/ft^2 coating; 1/4-inch diameter weld-on tie, continuous. To be provided to Division 05 for installation.
   1. #317 Continuous Weld-On Anchor Rod by Heckmann
   2. #359-C Weld-on Tie by Hohmann and Barnard
   3. #1002 Type 1 Continuous Weld-On by Wire-Bond

F. Steel Beam Lintel Wall Tie: ASTM A580 type 304 stainless steel; 3/16-inch diameter wire wall tie; length as required to provide 2-1/2-inch embedment with minimum 5/8-inch mortar coverage.
   1. #316 Triangle Tie by Heckmann
   2. #VWT Vee Wall Tie by Hohmann and Barnard.
   3. #1100 Triangular Tie by Wire-Bond

G. Reinforcing Steel: Type as specified in Section 03 20 00.

H. Rebar Positioner: Mill galvanized, 9 gauge wire.
   1. Wire Bar Positioner (376) by Heckmann
   2. #RB Rebar Positioner by Hohmann and Barnard.
   3. #3403 Figure 8 Single Rebar Positioner (only available for 6” and 8” block) by Wire-Bond

I. Acceptable Manufacturers:
   1. Hohmann & Barnard
   2. Heckmann Building Products, Inc.
   3. Wire-Bond
   4. Or equal

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2.03 MASONRY FLASHINGS

A. Flashing: 40 mil thick by 24-inch wide roll, self-adhering, self-sealing, and self-healing flexible composite membrane with a release sheet with a wall primer.
   1. Grace Construction Products Perm-A-Barrier Wall Flashing and Perm-A-Barrier WB Primer.
   2. Hohmann & Barnard Textroflash and Primer-SA.
   3. Substitutions: None.

B. Drip Plate: 2-inch minimum wide, 26 gauge Type 304 stainless steel drip plate extending 1/2-inch and hemmed bent down at 45 degrees drip edge.
   1. #1007 Hemmed Drip-Edge Flashing by Heckmann
   2. Hohmann and Barnard Drip Plate (DP)
   3. #4165 Drip Edge Flashing by Wire-Bond

C. Termination Bar: 1-inch to 1.5-inch tall, 26 gauge Type 304 stainless steel bar with a 3/8-inch bent top edge for sealant and 1/4-inch diameter holes at 8-inches on center for fasteners.
   1. #T2 by Hohmann & Barnard
   2. #4210 Termination Bar by Wire-Bond

D. Fasteners: Type 304 stainless steel.
   1. Powers Fasteners Zamac Nailin stainless steel mushroom head 1/4-inch x 1.25-inch fasteners for masonry walls.

E. Sealant:
   1. Tremco Dymonic
   2. Master Builders MasterSeal NP 1

2.04 ACCESSORIES

A. Preformed Control Joints: Extruded rubber, ASTM D-2000 2AA-805, preformed control joint.
   1. RS Series Rubber Control Joint by Hohmann and Barnard
   2. 2901 Rubber Control Joint by Wire-Bond
   3. Or equal

B. Control Joint Material at Interior Fire Rated Wall: Ceramic Fiber Felt (Aluminum-silica Fiber).

C. Hot-Dip Galvanizing Touch-Up Paint: Yield shall be 94% pure zinc metallic powder; meet ASTM B-117-64 salt spray (2000 hours); meets performance requirements of MIL-D-46105 and DOD-P-21035A.
   1. Crown Premium 7007 by Aevoe Industries
   2. Or equal approved prior to bidding

D. Building Paper: (at steel lintel bearing for slip plane) 15# asphalt saturated felt.

E. Thermal Brackets: Manufactured product designed specifically for structural support of off-set masonry veneer shelf angle provided under Division 05. All components shall be hot dipped galvanized; fasteners may be type 304 stainless steel.
   1. FAST Thermal Bracket by FERO. An offset shelf angle for continuous insulation. System includes bracket, shelf angle supports, shim plates, fasteners, etc.
      a. Installer is responsible for sizing FAST system to suit wall assembly and field conditions.
      b. Bracket depth shall be as appropriate for wall cavity and insulation as shown in the Drawings.

F. Shelf Angle: Stainless steel as noted on Drawings, furnished under Division 05.

G. Expansion Joint Material: Closed cell neoprene foam, resiliency recovery of 95 percent, if not compressed more than 50 percent of original thickness. 3/8-inch thick by 3-inch deep.
   1. #354 Neoprene Expansion Joints by Heckmann
   2. NS - Closed Cell Neoprene Sponge by Hohmann & Barnard

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3. #3300 Expansion Joint by Wire-Bond
4. Or equal

H. Weeps: Polyester with 90% open weave mesh, flame retardant, anti-microbial, 3 1/2-inch by 3 1/2-inch (or 2-5/8-inch), 3/8-inch thick (or 1/2-inch thick). Color as selected by Architect from manufacturer's standard colors, shall be available in a minimum of six (6) standard colors.
1. Mortar Trap Weep Vents by Hohmann & Barnard
2. WeepVent by Mortar Net Solutions
3. 3610 Mortar Net Weep Vent by Wire-Bond
4. Or equal

I. Mortar Net (Mortar Deflector): Polyethylene (HDPE) or nylon woven open mesh, geometric patterned core, 10-inch high.
1. Weep-Thru Mortar Deflector (84) by Heckmann, provide in 1" thick and 1/2" thick for all locations.
2. Mortar Trap by Hohmann and Barnard, provide in 1-1/2" thick
3. MortarNet WallDefender by Mortar Net Solutions, provide in 1-1/2" thick
4. Or equal
5. Wire-Bond does not have a product in the appropriate thickness.

2.05 MASONRY CLEANING SOLUTION

A. Decorative Concrete Masonry Unit Cleaning Solution: Sure Klean Custom Masonry Cleaner.

2.06 LINTELS

A. Concrete block bond beams and lintels - size and reinforcement as shown.

B. Steel lintels, hot-dip galvanized - provided under Section 05 50 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify field conditions are acceptable and are ready to receive work.

C. Verify items provided by other sections of work are properly sized and located.

D. Verify built-in items are in proper location and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied to other sections.

B. Establish lines, levels, and coursing. Protect from disturbance.

C. Furnish temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent support.

3.03 COLD WEATHER CONSTRUCTION

A. Temporary enclosures shall be constructed around the areas of work.

B. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelope. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

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C. When the ambient air temperature is below 40 degrees F implement cold weather procedures and comply with the following:
   1. Preparation - Comply with the following requirements prior to conducting masonry work:
      a. Do not lay masonry units having either a temperature below 20°F (-6.7°C) or containing frozen moisture, visible ice, or snow on their surface.
      b. Remove visible ice and snow from the top surface of existing foundations and masonry to receive new construction. Heat these surfaces above freezing, using methods that do not result in damage.
   2. Construction - These requirements apply to work in progress and are based on ambient air temperature. Do not heat water or aggregates used in mortar or grout above 140°F (60°C). Comply with the following requirements when the following ambient air temperatures exist:
      a. 40°F to 32°F (4.4°C to 0°C).
         1) Heat sand or mixing water to produce mortar temperature between 40°F (4.4°C) and 120°F (48.9°C) at the time of mixing.
         2) Heat grout materials when the temperature of the materials is below 32°F (0°C).
      b. Below 32°F to 25°F (0°C to -3.9°C):
         1) Heat sand and mixing water to produce mortar temperature between 40°F (4.4°C) and 120°F (48.9°C) at the time of mixing. Maintain mortar temperature above freezing until used in masonry.
         2) Heat grout aggregates and mixing water to produce grout temperature between 70°F (21.1°C) and 120°F (48.9°C) at the time of mixing. Maintain grout temperature above 70°F (21.1°C) at the time of grout placement.
         3) Heat AAC units to a minimum temperature of 40°F (4.4°C) before installing thin-bed mortar.
      c. Below 25°F to 20°F (-3.9°C to -6.7°C): Comply with Paragraph 3.03 C.3.b and the following:
         1) Heat masonry surfaces under construction to a minimum temperature of 40°F (4.4°C).
         2) Use wind breaks or enclosures when the wind velocity exceeds 15 mph (24 km/h).
         3) Heat masonry to a minimum temperature of 40°F (4.4°C) prior to grouting.
      d. Below 20°F (-6.7°C): Comply with Paragraph 3.03 C.3.c and the following: Provide an enclosure and auxiliary heat to maintain air temperature above 32°F (0°C) within the enclosure.
   3. Protection - These requirements apply after masonry is placed and are based on anticipated minimum daily temperature for grouted masonry and anticipated mean daily temperature for ungrouted masonry. Protect completed masonry in the following manner:
      a. Maintain the temperature of glass unit masonry above 40°F (4.4°C) for the first 48 hour after construction.
      b. 40°F to 25°F (4.4°C to -3.9°C): Protect newly construction masonry by covering with a weather-resistive membrane for 24 hours after being completed.
      c. Below 25°F to 20°F (-3.9°C to -6.7°C): Cover newly constructed masonry completely with weather-resistive insulating blankets, or equal protection, for 24 hours after completion of work. Extend time period to 48 hours for grouted masonry, unless the only cement in the grout is Type III portland cement.
      d. Below 20°F (-6.7°C): Maintain newly constructed masonry temperature above 32°F (0°C) for at least 24 hours after being completed by using heated enclosures, electric heating blankets, infrared lamps, or other acceptable methods. Extend time period to 48 hours for grouted masonry, unless the only cement in the grout is Type III portland cement.

3.04 COURSING

A. Place masonry to lines and levels indicated.

B. Maintain masonry courses to uniform dimension. Make vertical and horizontal joints equal and of uniform thickness.

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C. Lay concrete masonry units in running bond for all exposed block walls, unless noted otherwise on drawings. Course one block unit and one mortar joint to equal 8 inches. All mortar joints shall be tooled concave (including concealed joints).

3.05 PLACING AND BONDING

A. Lay masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

B. Buttering corners of joints and deep or excessive furrowing of mortar joints are not permitted.

C. Remove excess mortar as Work progresses.

D. Back bevel decorative block when placing in cavity wall.

E. Fully bond intersections at external and internal corners.

F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.

G. Perform job site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Take care to prevent breaking masonry unit corners or edges.

H. Cut mortar joints flush where a finished base is scheduled.

3.06 CAVITY WALL

A. Build inner wythe ahead of outer wythe to receive air/vapor retarder system and cavity insulation.

B. Install steel lintels as provided under Section 05 50 00. Galvanized coating shall be touched up as required.

C. Install base of wall shelf angle and thermal bracket as required by Drawings and bracket manufacturer.

D. Install insulation as required in Section 07 21 13 after installation of air/vapor retarder system in Section 07 27 26.

E. Do not install veneer until air/vapor retarder system of Section 07 27 26 and insulation of Section 07 21 13 are installed.

F. Install weeps in veneer at 16 inches on center horizontally above through wall flashing at shelf angles, lintels, or top of walls and at bottom of walls. Set face of weep back 3/8 inch from face of exterior wall to be flush with face of tooled mortar joint.

G. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes. Back bevel mortar on cavity wall side of decorative block.

H. Install mortar deflector at base of wall and at lintels above openings.

3.07 TOLERANCES

A. Variation from Unit to Adjacent Unit: 1/32 inch maximum.

B. Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.

C. Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.

D. Variation from Level Coursing: 1/8 inch in 3 feet.

E. Variation of Joint Thickness: 1/8 inch in 3 feet.

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F. Maximum Variation from Cross Sectional Thickness of Walls: Plus or minus 1/4 inch.

3.08 REINFORCEMENT AND ANCHORS

A. Install horizontal joint reinforcement 16 inches on center, unless noted otherwise.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend 16 inches minimum each side of opening.

C. Place joint reinforcement continuous in first and second joint below top of walls.

D. Lap joint reinforcement ends minimum 6 inches. Extend 16 inches minimum each side of opening.

E. Do not extend horizontal joint reinforcement across control or expansion joints, unless noted otherwise.

F. Reinforce all bond beams with two (2) #5 bars placed 1 inch from bottom web, unless noted otherwise. Extend vertical reinforcement 6 inches into bond beams at all vertical reinforcing locations.

G. Place reinforcing bars supported and secured against displacement. Maintain position within 1/2 inch of true dimension. Use rebar positioners to secure vertical reinforcement bars in place.

H. Vertical reinforcing bars shall be centered in unit core and grouted solid, unless noted otherwise.

I. At all wall openings: Install one (1) #5 bar vertically in core closest to opening up to bottom of lintel. In next adjacent core, install one (1) #5 bar vertically full height of wall.

J. At corners: Install one (1) #5 bar vertically in core full height of wall.

K. At control joints when shown on the drawings install vertical rebar in the core adjacent to control joint full height of wall.

L. Lap reinforcing bars (splice lap lengths) as follows unless noted otherwise on the drawings:
1. #3 bars: 19 inch
2. #4 bars: 25 inch
3. #5 bars: 31 inch
4. #6 bars: 37 inch

M. Verify that anchorages embedded in concrete attached to structural steel members are properly placed. Embed anchorages in every second joint.

N. Reinforce corners and intersections by lapping horizontal joint reinforcement or by using preformed pieces.

O. Anchors and wall ties at metal stud and existing masonry construction shall be placed at 16 inches on center vertically and horizontally.

3.09 MASONRY FLASHINGS

A. Install membrane flashing per manufacturer's instruction.

B. Apply primer to substrate. Allow to dry.

C. Install a stainless steel drip edge at the face of the veneer. Set drip in two beads of sealant. Flexible flashing to adhere on top of drip. Flashing shall extend to the wall face.

D. Form water dams located at the end of all flashing runs over door and window openings.

E. Provide flashings at all penetrations through the exterior wall.

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F. Flashing to be installed before the air/vapor retarder system.

G. Install termination bar the full length of the flashing at the top edge. Secure with fastener at 8-inches on center. Apply sealant along the top edge for the entire length.

3.10 LINTELS

A. Install loose steel lintels as scheduled and furnished under Section 05 50 00. Steel angles for veneer shall be set back minimum 1/2-inch from face of veneer to allow for installation of sealant at bearing edges.

B. All steel lintels shall be hot-dip galvanized after fabrication, unless noted otherwise, under Section 05 50 00. Touch up marks and scratches on lintels with hot-dip galvanizing spray paint prior to placement in wall construction.

C. Install reinforced unit masonry lintels over openings where steel lintels are not scheduled or unless otherwise shown. Construct lintels using grout fill and reinforcing. Maintain minimum 8-inch bearing on each side of opening.

D. Use single piece reinforcing bars only.

E. Place and consolidate grout fill without displacing reinforcing.

F. Allow masonry lintels to attain specified strength before removing temporary supports.

3.11 GROUTED COMPONENTS

A. Install grout as provided under Section 04 05 16 – Masonry Grouting.

B. Remove excess mortar from grout spaces.

C. Place and consolidate grout fill without displacing reinforcing.

D. At bearing locations, fill masonry cores with grout for a minimum 12 inches either side of opening, unless noted otherwise.

E. Work grout into masonry cores and cavities to eliminate voids.

F. Do not grout in lifts greater than 12 inches without consolidating grout by rodding.

G. Top of lift shall terminate a minimum of 1-1/2 inches from mortar joint, except at opening or top of wall.

H. Install grout per ACI 530.

3.12 PREPARATION TO GROUT

A. Block cells do have to align but it is best. See ACI 530-02, S-23 and S-24 for minimum grout space required and grout pour height.

B. Must allow enough time for mortar to set so enough strength is gained to withstand the pressure of the fluid grout. For grout pours from 1 to 5 feet, wait 12 to 18 hours before grouting. For 12 inch and less pours, you can grout as each course is laid.

C. Prevent excess mortar from extruding or falling into grout spaces. Mortar that projects more than 1/2 inch into the grout space shall be removed.

D. At the foundation:
   1. Grout must come in contact with the foundation.
   2. Dowels in foundation must align with cores to be grouted.

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E. Lap rebar shall be in accordance with ACI-530-02.

F. Place rebar in rebar positioners.

3.13 GROUTING

A. Grout to be provided from a ready-mix truck at the site or from a silo located on site. Trucking in tubs from an off-site location is not acceptable.

B. Grout should be moved from the mixer to the point of deposit as fast as practical.

C. Test grout slump. Must be 8 to 11 inch slump. (See TEK 9.4.)

D. Place grout within 1-1/2 hours of mixing and prior to initial set.

E. Grout lift height not to exceed 5 feet.

F. Grout pour height not to exceed ACI 530-02 Table 7 page S-24 in each day.

G. Consolidate and reconsolidate grout.
   1. Consolidate grout pours 12 inches or less in height by mechanical vibration or puddling. Puddle with a wooden stick.
   2. Consolidate pours exceeding 12 inches in height by mechanical vibration and reconsolidate by mechanical vibration after initial water loss and settlement has occurred.
   3. Use a low velocity vibrator with a 3/4-inch head. The vibrator is activated for one to two seconds in each grout cell.
   4. Reconsolidation should generally take place between 3 and 10 minutes after placement. It must be done before plasticity is lost.

H. Grout may be placed by pouring from a bucket.

I. Stop lift at minimum 1-1/2 inch above or below a bed joint except the final pour.

3.14 CONTROL JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints, unless noted otherwise.

B. Use preformed control joint block (sash) units on both sides of control joint, unless shown otherwise on Drawings.

C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.

3.15 BUILT-IN WORK

A. As work progresses, build in metal door and glazed frames fabricated metal frames, window frames, wood nailing strips, anchor bolts, plates, lintels, columns, beams, and other items furnished by other Sections.

B. Build in items plumb and level.

C. Do not build in organic materials subject to deterioration.

3.16 CUTTING AND FITTING

A. Cut and fit for chases, pipes, conduit, sleeves and ground. Coordinate with other Sections of work to provide correct size, shape, and location.

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B. Obtain Architect/Engineer approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.17 CLEANING

A. The decorative masonry block and concrete block shall be cleaned with water and non-metallic tools at the end of each workday or within 24 hours of laying the units of excess mortar and mortar smears.

B. Cleaning of decorative masonry block shall be completed after 14 days and before 28 days of initial placement, the masonry shall be cleaned of all excess mortar, smears, and residue with a masonry cleaning solution.

1. Extreme caution must be taken with cleaning the wall since damage to the masonry and mortar can result. The mortar must be maintained in a condition that after cleaning, the “skin” still remains on the mortar and no discoloration occurs to the mortar, brick, stone, or other components in or around the wall. The mason will take full responsibility for all damage that occurs during cleaning which could result in the requirement to replace the masonry construction.
2. All cleaners utilized must be acceptable to the brick manufacturer.
3. Follow the brick manufacturers and cleaning solution manufacturers procedures and recommendations.
4. The cleaning solution must be premixed at the mason’s shop in 55-gallon drums to the recommended dilution rate by the cleaning products manufacturer’s recommendations.
5. A small test area of the building will be cleaned with the solution.
6. The wall is to be washed starting at the top and working all the way down to the bottom. Before applying the cleaning solution, the wall must be thoroughly soaked with water.
7. The wall must be thoroughly rinsed with water to remove the masonry cleaning solution.

C. Power washing of any kind is not acceptable.

3.18 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 50 00 - Temporary Facilities and Controls: Protection of provisions.

B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

C. At day’s end, cover unfinished walls to prevent moisture infiltration.

END OF SECTION

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SECTION 05 05 23
METAL FASTENINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing metal fastenings as shown on the contract drawings and as required by equipment manufacturers.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Plant Precast Structural Pretensioned Concrete - Division 03

C. Masonry – Division 04

D. Metal Fabrications - Division 05

E. Ladders - Division 05

F. Railings - Division 05

G. Wood – Division 06

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
    a. ASTM A193 - Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature or High Pressure Service and Other Special Purpose Applications.
    b. ASTM A307 - Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
    c. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 METAL FASTENINGS

A. Stainless Steel. Metal fastenings shall be B8T, Stabilized 18 Chromium 8 Nickel conforming to the requirements of ASTM A193, furnished with brass nuts.

B. Zinc Plated Steel. Metal fastenings shall be S.A.E. Grade 5.

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C. High-Strength. Metal fastenings shall be ASTM A325.

D. Standard Metal Fastenings shall be ASTM A307.

PART 3 EXECUTION

3.01 METAL FASTENINGS

A. Stainless steel, high strength, and standard metal fastenings shall be used where shown on contract drawings, called for under Special Procedures - Division 01 and Equipment - Division 40.

B. Metal fastenings furnished by equipment manufacturers shall be installed in accordance with manufacturers recommendations.

C. Metal fastenings in contact with pressure treated wood shall be hot-dip galvanized or stainless steel (where concealed).

D. Zinc plated steel Metal Fastenings shall be installed in all other locations.

PART 4 MEASUREMENT AND PAYMENT

4.01 METAL FASTENINGS

A. General. Metal fastenings shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Metal Fastenings, Inclusive. When no quantity is provided, metal fastenings shall be considered inclusive to payment for work associated with the related equipment or construction.

END OF SECTION

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SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing the fabricated metal as described in this section and as shown on the contract drawings.

B. For non-factory designed and fabricated ladders (see Section 05 51 53), Contractor shall design members, connections, fasteners, etc., per requirements listed on Drawings. Design shall be performed by a Professional Engineer Licensed in the State of Wisconsin. Submit calculations and detail drawings to Engineer.

C. For railing systems (see Section 05 52 00), Contractor shall design members, connections, fasteners, etc., per requirements listed on Drawings. Design shall be performed by a Professional Engineer Licensed in the State of Wisconsin. Submit calculations and detail drawings to Engineer.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fastenings - Division 05

D. Ladders – Division 05

E. Railings - Division 05

F. High Performance Coatings - Division 09

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. The Aluminum Association (AA), Specifications and Standards:
      a. AA Sections 6 and 7 - Aluminum Construction Manual, Specifications for Aluminum Structures, Current Edition.
   2. American Institute of Steel Construction (AISC), Specifications and Standards:
      a. AISC Section 1.23 - Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction), Current Editions.
   3. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Editions.
      a. ASTM A36 - Standard Specification for Carbon Structural Steel, Current Edition.
      b. ASTM A123 - Standard Specification for Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products, Current Edition.
      c. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware, Current Edition.
      d. ASTM A240 - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications, Current Edition.

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e. ASTM A283 - Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Current Edition.
f. ASTM A325 - Standard Specifications for Structural Bolts, Steel, Heat-Treated, 120/105 ksi Minimum Tensile Strength, Current Edition.
g. ASTM A380 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems, Current Edition.
h. ASTM A385 - Standard Practice for Providing High-Quality Zinc Coatings (Hot-Dip), Current Edition.
i. ASTM A530 - Standard Specification for General Requirements for Specialized Carbon and Alloy Steel Pipe, Current Edition.
j. ASTM A554 - Standard Specification for Welded Stainless Steel Mechanical Tubing, Current Edition.
k. ASTM A633 - Standard Specification for Normalized High-Strength Low-Alloy Structural Steel Plates, Current Edition.
l. ASTM A666 - Standard Specifications for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, Flat Bar, Current Edition.
m. ASTM A743 - Standard Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistant, for General Application, Current Edition.
n. ASTM A895 - Standard Specification for Free Machining Stainless Steel Plate, Sheet, and Strip, Current Edition.
o. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, Current Edition.
p. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes, Current Edition.
q. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire, Current Edition.
r. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes, Current Edition.
s. ASTM B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles, Current Edition.
t. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube, Current Edition.
u. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel, Current Edition.
v. ASTM B766 - Standard Specification for Electrodeposited Coatings of Cadmium, Current Edition.

4. American Welding Society (AWS) Specifications and Standards, Current Edition.
   a. AWS A5.1 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding, Current Edition.
   b. AWS A5.10 - Specification for Bare Aluminum and Aluminum-Alloy Welding Electrodes and Rods, Current Edition.

1.05 SUBMITTALS

A. The Contractor shall submit such submittals and/or catalog cuts required for the construction and installation of the materials. These drawings shall be accurate in every detail and shall contain all information necessary to relate the materials to the specifications.

B. Submittals shall indicate the intended materials arrangement, major support requirements, plot area and all intricate or detailed construction requirements. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

C. Calculations: Submit signed and sealed engineering calculations for each non-factory designed ladder being provided.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

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PART 2 PRODUCTS AND MATERIALS

2.01 METAL SURFACES, GENERAL

A. For fabrication of miscellaneous metal work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness.

2.02 STEEL

A. Steel for structural components and assemblies shall meet the requirements of the applicable ASTM Standards as follows:

Product and Material	Standard
Carbon Steel Plates of Structural Quality	ASTM A283, Grade C
Structural Steel	ASTM A36

2.03 GALVANIZING

A. Zinc coatings on products fabricated from rolled, pressed, and forged steel shapes, plates, bars and strip, 1/8 inch thick and heavier shall conform to ASTM A123.

B. Zinc coatings on assembled steel products shall meet the requirements of ASTM A123 and shall be applied in conformance with ASTM A385 for the recommended practice for providing high quality zinc coatings on assembled products, unless otherwise specified.

C. Zinc coatings on iron and steel hardware shall meet the requirements of ASTM A153 except that bolts, screws and other fasteners, 1/2 inch or less in diameter, may be coated with electro-deposited zinc or cadmium coating meeting the requirements of ASTM B633, Type RS, or ASTM B766, Type TS unless otherwise specified.

2.04 ALUMINUM ALLOY

A. Aluminum alloy products, unless otherwise specified, shall be Alloy 6061-T6. Aluminum alloy products shall meet the requirements of the applicable ASTM Standard as follows.

Product and Material	Standard
Sheet and plate	ASTM B209
Drawn seamless tubes	ASTM B210
Rolled or cold-finished bars, rods and wire	ASTM B211
Extruded bars, rods, wire, shapes and tubes	ASTM B221
Standard structural shapes	ASTM B308
Extruded structural pipe and tube	ASTM B429

2.05 BOLTS

A. High strength bolts, nuts and washers shall conform to ASTM A325. When galvanized or zinc-coated bolts are specified, the zinc coating shall meet the requirements of ASTM A153; except that bolts 1/2 inch or less in diameter may be coated with electro-deposited zinc or cadmium coating meeting the requirements of ASTM B633, Type RS, or ASTM B766, Type TS unless otherwise specified.

2.06 WELDING ELECTRODES

A. Steel welding electrodes shall conform to the requirements of AWS A5.1, “Specification for Mild Steel Covered Arc-Welding Electrodes”, except that they shall be uniformly and heavily coated (not washed) and shall be of such a nature that the coating will not chip or peel while being used with the maximum amperage specified by the manufacturer.

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B. Aluminum welding electrodes shall conform to the requirements of AWS A5.10, “Specification for Aluminum and Aluminum-Alloy Welding Rods and Bare Electrodes”.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. Take field measurements prior to preparation of submittals and fabrication, where possible without delay to job progress. Allow for trimming and fitting wherever taking field measurements before fabrication.

B. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay. See Division 03 - Concrete and Division 04 - Masonry of these specifications for installation of inserts and anchorage devices.

C. Preassemble items in 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 installation.

3.02 FABRICATION

A. Steel shall be structural quality unless otherwise specified. Castings shall be thoroughly cleaned and subjected to careful inspection before installation. Finished surfaces shall be smooth and true to assure proper fit.

B. Fabrication of structural steel shall meet the requirements of Section 1.23 of the “Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (Riveted, Bolted and Arc-Welded Construction)”, American Institute of Steel Construction.

C. Fabrication of structural aluminum shall meet the requirements of Sections 6 and 7 of the Aluminum Construction Manual, “Specifications for Aluminum Structures”, The Aluminum Association.

3.03 ERECTION

A. The frame of metal supports shall be carried up true and plumb. Temporary bracing shall be placed wherever necessary to resist all loads to which the structure may be subjected, including those applied by the installation and operation of equipment. Such bracing shall be left in place as long as may be necessary for safety.

B. As erection progresses the work shall be securely bolted up, or welded, to resist all dead load, wind and erection stresses. The Contractor shall furnish such fitting up bolts, nuts and washers as may be required.

C. All field welding shall be done in conformance to the requirements for shop fabrication, except those that expressly apply to shop conditions only. Galvanized items shall not be cut, welded or drilled after the zinc coating is applied.

3.04 PROTECTIVE COATINGS

A. Items specified to be galvanized shall be completely fabricated for field assembly before the application of the zinc coatings.

B. Items specified to be painted shall be shop primed with a rust inhibitive primer and field painted in accordance with High Performance Coatings - Division 09 of these specifications.

C. All aluminum items to be in contact with concrete or masonry shall have a bituminous coating.

D. All steel lintels to be installed in masonry walls shall be hot-dip galvanized after fabrication.

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PART 4 MEASUREMENT AND PAYMENT

4.01 METAL FABRICATIONS

A. General. Metal fabrications shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Metal Fabrications, Lump Sum. When so provided, payment for metal fabrication shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. Metal Fabrications, Inclusive. When no quantity is provided, metal fabrication shall be considered inclusive to payment for work associated with the related construction.

END OF SECTION

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SECTION 05 51 33
LADDERS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover providing and installing ladders at all locations shown on contract drawings and as specified herein.

B. For custom fabricated ladder systems, not required for manufactured ladders, Contractor shall design members, connections, fasteners, etc., per requirements listed on Drawings. Design shall be performed by a Professional Engineer Licensed in the State of Wisconsin. Submit calculations and detail drawings to Engineer.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fasteners – Division 05

D. Metal Fabrications - Division 05

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.04 APPLICATIONS PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American National Standards Institute (ANSI), Standards, Current Edition.
   2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.

1.05 SUBMITTALS

A. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the materials and all components. These drawings shall be accurate in every detail and shall contain all information necessary to relate the materials to the specifications.

B. Submittals shall indicate the intended materials arrangement, dimensions, major support requirements, plot area, and all intricate or detailed construction requirements. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project.
   1. Record of successful in-service performance.
   2. Sufficient production capacity to produce required units.
   3. Professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.

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B. Installer Qualifications: Competent and experienced firm capable of selecting fasteners and installing ladders to attain designed operational and structural performance.

C. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect products from corrosion, deformation, and other types of damage.

B. Store items in an enclosed area free from contact with soil and weather.

C. Remove and replace damaged items with new items.

1.08 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurement before fabrication.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, indicate established dimensions on shop drawing submittal and proceed with fabrication.

1.09 DESIGN REQUIREMENTS

A. Provide structural engineering design for all custom fabricated ladders shown or detailed on the Drawings, including connections and fasteners.

B. Coordinate design loads as listed on Contract Drawings and listed herein.

1.10 WARRANTY

A. Manufacturer has responsibility for an extended Corrective Period for work of this Section for a period of 5 years commencing on the shipment date of the product against all the conditions indicated below, and when notified in writing from Owner, manufacturer shall promptly and without inconvenience and cost to Owner correct said deficiencies.
   1. Defects in materials and workmanship.
   2. Deterioration of material and surface performance below minimum OSHA standards as certified by independent third party testing laboratory. Ordinary wear and tear, unusual abuse or neglect excepted.
   3. Within the warranty period, the manufacturer shall, at its option, repair, replace, or refund the purchase price of defective ladder.

B. Manufacturer shall be notified immediately of defective products, and be given a reasonable opportunity to inspect the goods prior to return. Manufacturer will not assume responsibility, or compensation, for unauthorized repairs or labor. Manufacturer makes no other warranty, expressed or implied, to the merchantability, fitness for a particular purpose, design, sale, installation, or use, of the ladder; and shall not be liable for incidental or consequential damages, losses of or expenses, resulting from the use of ladder products.

1.11 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 LADDERS

A. Ladders shall be aluminum alloy ladders as manufactured by:
   1. Alad Ladder Company, 1448 South Signal Drive, Pomona, California;
   2. O'Keefe's, Inc., 75 Williams Avenue, San Francisco, California;
   3. Or equal.

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B. Design Requirements:
   1. Ladder shall be regular tread type.
   2. Treads shall be uniform, evenly spaced.
   3. Treads shall be non-slip with non-slip nosing.
   4. Handrails shall be provided on both sides. The minimum clear width at and below the handrails shall be 20 inches, unless noted otherwise. The handrail shall extend a minimum of 42-inches above the ladder top tread.
   5. Live Load:
      a. The ladder and landing system shall be designed to support a minimum concentrated load of 300-pounds and a live-load of 5x the anticipated load, with a minimum 1000-pound point load.
      b. Handrail shall be capable of withstanding a single concentrated load of 200-pounds or a uniform load of 50-pounds per linear foot applied in any direction at any point on the rail.

C. Ladders shall conform to the requirements of 29 CFR Chapter XVII, Part 1926 OSHA 1926.450 and meet the loading and configuration requirements of the "Safety Code for Fixed Ladders", ANSI A14.3-56.

2.02 FABRICATION

A. Shop Assembly: The ladder and landing shall be factory-fabricated as much as practical to minimize field assembly.

B. Workmanship: All cuts, bonds, and connections shall be smooth, free of burrs, and finished with a resin-rich coating to maintain corrosion resistance.

C. Rung Connections: Ensure rung-to-side-rail connections are bonded and mechanically fastened (e.g., pinned or dowel-rodded) to prevent rotation or pullout.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. Take field measurements prior to preparation of Submittals and fabrication, where possible without delay to job progress. Allow for trimming and fitting wherever taking field measurements before fabrication.

B. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay. Division 03 - Concrete and Division 04 - Masonry of these specifications for installation of inserts and anchorage devices.

C. Preassemble items in 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 installation.

3.02 INSTALLATION

A. All installation procedures shall conform to manufacturer's specifications.

B. First tread shall not be more than 12 inches above the lower floor level.

C. Top tread shall be flush with top floor level where not associated with any roof hatch.

D. Top tread shall be at least 3 inches below the surface of any roof hatch.

E. Install with non-corroding expansion anchors at spacing recommended by manufacturer. Space for maximum number of anchors and provide anchor within 6 inches of ladder top and bottom.

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3.03 FIELD QUALITY CONTROL

A. Testing: Perform any field testing as required by the contract documents or applicable codes to ensure the system meets load requirements.

B. Inspection: Visually inspect all connections and hardware to ensure they are properly tightened and installed.

3.04 CLEANING

A. Clean the finished ships ladder system using a mild soap and water solution and a soft cloth, following the manufacturer's recommendations. Do not use abrasive or alkaline cleaners.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

PART 4 MEASUREMENT AND PAYMENT

4.01 LADDERS

A. General. Ladders shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Ladders, Lump Sum. When so provided, payment for ladders shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. Ladders, Inclusive. When no quantity is provided, ladders shall be considered inclusive to payment for work associated with the related construction.

END OF SECTION

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SECTION 05 52 00
RAILINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work under this section shall cover design, engineering, fabrication and installation of all guardrail at all locations shown on contract drawings and specified herein. The complete guardrail system shall include posts, rails, toe plates, and all necessary internal and external fittings and fasteners for a complete, functional installation.

B. The work under this section includes structural engineering of guardrails. Design includes engineering and selection of individual members, connections, fasteners, welding, etc., per requirements listed on Drawings and herein. Design shall be performed by a Professional Engineer Licensed in the State of Wisconsin. Submit signed and sealed calculations and detail drawings to Engineer.

1.02 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fastenings - Division 05

D. Metal Fabrications - Division 05

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. The Aluminum Association (AA), Specifications and Standards:
      a. AA Sections 6 and 7 - Aluminum Construction Manual, Specifications for Aluminum Structures, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM B136 - Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum, Current Edition.
      b. ASTM B137 - Standard Test Method for Measurement of Coating Mass Per Unit Area on Anodically Coated Aluminum, Current Edition.
      c. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate, Current Edition.
      d. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes, Current Edition.
      e. ASTM B211 - Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire, Current Edition.
      f. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes, Current Edition.
      g. ASTM B308 - Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles, Current Edition.
      h. ASTM B429 - Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube, Current Edition.
      i. ASTM B457 - Standard Test Method for Measurement of Impedance of Anodic Coatings on Aluminum, Current Edition.

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j. ASTM B580 - Standard Specification for Anodic Oxide Coatings on Aluminum, Current Edition.

3. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.

4. State of Wisconsin Commercial Building Code, 2025.

1.05 SUBMITTALS

A. Contractor shall submit such shop drawings and/or catalog cuts required for the construction and installation of the materials and all components. These drawings shall be accurate in every detail and shall contain all information necessary to relate the materials to the specifications. Submittals shall include test data showing railings comply with OSHA requirements.

B. Submittals shall indicate the intended materials arrangement, dimensions, major support requirements, plot area and all intricate or detailed construction requirements. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

C. Shop Drawings: Details and drawings depicting configuration and construction, including members, connections, fasteners, etc.

D. Product Data: Submit manufacturer's product data sheets, including resin system information, color, and mechanical properties of all FRP components.

E. Calculations: Submit signed and sealed engineering calculations or load test data from certified laboratory/testing facility for type of railing being provided.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 MATERIALS

A. Handrails and railings shall be 1-1/2 inch round, 6063 anodized aluminum alloy, Schedule 40 pipe size. Use only materials which are smooth and free of surface blemishes including pitting, seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding or by welding and grinding.

B. Post members shall be one continuous piece and spaced not more than 6 feet on center.

C. Toe boards to be 1/4-inch by 4-inch high aluminum plate.

D. Rail and connection shall be designed to resist a 200-pound load applied at any point on the handrail system, and additional requirements per the Wisconsin Commercial Building Code requirements.

PART 3 EXECUTION

3.01 QUALITY ASSURANCE

A. Take field measurements prior to preparation of shop drawings and fabrication, where possible, without delay to job progress. Allow for trimming and fitting wherever taking field measurements before fabrications.

B. Furnish inserts and anchoring devices which must be set in concrete or built into masonry for installation of miscellaneous metal work. Provide setting drawings, templates, instructions, and directions for installation of anchorage devices. Coordinate delivery with other work to avoid delay. See Concrete - Division 03 and Masonry - Division 4 of these specifications for installation of inserts and anchorage devices.

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C. Preassemble items in 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 installation.

3.02 FABRICATION

A. Where details are not shown, top of top rail shall be 42 inches above floor or 36 inches above stair treads measured vertically at the stair riser line.

B. Fit and shop assemble components in largest practical sizes, for delivery to site.

C. Fabricate components with joints tightly fitted and secured.

D. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

E. Railings shall have mechanical connections consisting of internal plugs with stainless steel screws or rivets. Railings shall be mechanically fastened to the building structure.

F. Continuously seal joined pieces by continuous welds.

G. Form exposed work true to line and level with accurate angles and surfaces and straight, true edges. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise shown on the contract drawings. Form bent-metal corners to the smallest radius possible without causing grain separation of otherwise impairing the work. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline.

H. Accurately form components, to each other and to building structure.

I. Toe boards to be attached to railings with stainless steel bolts. Joints shall be provided as necessary to allow for expansion and contraction of toe board.

J. Fabrication of structural aluminum shall meet the requirements of Sections 6 and 7 of the Aluminum Construction Manual, “Specifications for Aluminum Structures”, The Aluminum Association.

3.03 INSTALLATION

A. Perform cutting, welding and fitting required for installation. Set the work accurately in location, alignment and elevation, plumb, level, true and free of rack. Fit exposed connections accurately together to form tight hairline joints.

B. Do not weld, cut or abrade the surfaces of units which have been coated or finished after fabrication, and are intended for field connections.

C. Adjust railings prior to securing in place to ensure proper matching at butting joints and correct alignment throughout their length.

D. Space posts not more than 6 feet on centers, unless otherwise shown on the contract drawings. Plumb posts in each direction. Secure posts and rail ends to building construction as shown on drawings.

E. Expansion joints shall be installed at 24 feet maximum centers.

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PART 4 MEASUREMENT AND PAYMENT

4.01 HANDRAILS AND RAILINGS

A. General. Handrails and railings shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Handrails and Railings, Lump Sum. When so provided, payment for handrails and railings shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. Handrails and Railings, Inclusive. When no quantity is provided, handrails and railings shall be considered inclusive to payment for work associated with related construction.

END OF SECTION

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SECTION 06 10 00
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural wall framing.

B. Pressure treated lumber.

C. Blocking, nailers, and fasteners.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry.

1.03 REFERENCES

A. American Lumber Standards Committee (ALSC):
   1. Softwood Lumber Standards.

B. American National Standards Institute (ANSI):
   1. ANSI A135.4 - Basic Hardboard.
   2. ANSI A208.1 - Wood Particleboard and Flakeboard: Types, Grades, and Uses.

C. American Plywood Association (APA).

D. American Wood Protection Association (AWPA) U1-18.

E. National Forest Products Association (NFPA).

F. National Institute of Standards and Technology (NIST):
   1. NIST PS 20 - American Softwood Lumber Standard.

G. Southern Pine Inspection Bureau (SPIB):
   1. SPIB - Standard Grading Rules for Southern Pine Lumber.

H. Western Wood Products Association (WWPA):
   1. WWPA G5 - Western Lumber Grading Rules.

1.04 SUBMITTALS

A. Submit product data on the sawn lumber for wall studs and wood sheathing for wall construction.

1.05 QUALITY ASSURANCE

A. All lumber and plywood shall bear a grading stamp exposed to view.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

PART 2 PRODUCTS

2.01 LUMBER MATERIALS

A. Lumber Grading Rules: SPIB and WWPA.

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B. Lumber and rafter framing: 19 percent maximum moisture content.
2x4s, 2x6s, 2x8s: SPF No. 1/ No. 2 or better, F_b = 875 psi.
2x10s and 2x12s: SP or DF No. 1 or better, F_b = 1000 psi.

C. Nailers and Blocking: Spruce-Pine-Fir or Hem Fir No. 2 or better, 19 percent maximum moisture content.

D. Pressure Treated Lumber: Southern Pine No. 2 or better, preservative treated conforming to the U1-18 Standards of the American Wood Protection Association. Each piece shall be treated in accordance with AWPA standards and certified by an approved inspection agency. The wood shall be pretreated to the following Use Categories:
1. Wood in an interior location in with concrete or masonry: UC2
2. Wood in an exterior location in contact with concrete or masonry: UC4A.

2.02 SHEATHING MATERIALS

A. Pressure Treated Plywood: APA Rated Sheathing, Grade C-D, Exterior, unsanded, Group 2, preservative treated same as lumber.

2.03 ACCESSORIES

A. Masonry Screws: DeWalt (Powers Fasteners) Tapper 304 1/4-inch diameter by 3.25 inch long stainless steel.

B. Metal Connectors:
1. Hot dipped galvanized steel.
2. Connector type as noted on the drawings.
3. Manufactured by Simpson Strong-Tie.
4. Or equal by MiTek (USP Structural Connectors).

C. Nails. Hot dipped galvanized or stainless steel in contact with pressure treated lumber.

D. Sill Gasket: Closed cell polythene foam in continuous rolls. Gasket shall be as wide as wall plate.

PART 3 EXECUTION

3.01 FASTENERS AND CONNECTORS

A. Fasteners and connectors in contact with treated wood shall be hot dipped galvanized steel or stainless steel.

B. Reference IBC 2015 Table 2304.10.1 Fastening Schedule for minimum fastening requirements.

3.02 FRAMING

A. Set structural members level and plumb, in correct position.

B. Anchor the bottom wall plate to the concrete foundation with one wall framing base plate anchor at 32 inches on center. Install one anchor within at a maximum of 6 inches from each end of a plate and 12 inches from each corner. Concrete must be 21 days old prior to installing the anchors.

C. Anchor wall plates to the top of masonry walls with 1/2-inch diameter headed anchor bolts at 24- inch on center embedded in continuous reinforced and grout-filled masonry bond beams with 4-inch minimum embed. Install one anchor within at a maximum of 6-inch from each end of a plate and 12-inch from each corner.

D. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.

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E. Place horizontal members crown side up.

F. Set members level and plumb, in correct position.

G. Fasten members in place:
   1. Anchor lumber together with nails.
   2. Anchor treated lumber with hot dipped galvanized nails approved for use with the treatment type of the lumber.
   3. Anchor treated lumber to masonry and concrete with stainless steel masonry screws or bolts as specified.

H. Provide pressure treated lumber at all locations in contact with concrete or masonry.

I. Pressure treated lumber that is cut or drilled shall have the cut or drilled areas filed coated with a preservative treatment.

J. Anchors to be used in contact with treated sheathing and lumber shall be hot dipped galvanized or stainless steel.

K. Place sill gasket directly on concrete foundation and concrete masonry units.

L. For any walls with vertical cavities taller than 10 feet, provide equally spaced continuous horizontal solid wood blocking at no more than 10 feet on center.

3.03 WALL SHEATHING

A. At wood studs and ends of wood trusses, nail 6 inches on center along panel edges and 12 inches on center at intermediate support with 8d-2 ½" common nails. Provide blocking between studs and between trusses for panel edge fastening at all panel joints.

B. Allow 1/8 inch spacing at panel ends and 1/4 inch at panel edges, unless otherwise recommended by the panel manufacturer.

3.04 NAILERS

A. Fasten wood nailers to masonry with stainless steel masonry screws. Use one (1) screw at 24 inches on center for 2x4's. Use two (2) screws at 24 inches on center for 2x6's, 2x8's, and plywood on top of masonry walls. Fasten to metal with self-drilling, self-tapping wood to metal screws.

B. Pressure treated lumber that is cut or drilled shall have the cut or drilled areas filed coated with a preservative treatment.

3.05 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

END OF SECTION

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SECTION 06 16 13
STRUCTURAL INSULATED SHEATHING (SIS)

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Structural insulated sheathing (SIS) with for above grade exterior walls, including panels, fasteners, and accessories.

B. SIS panels shall consist of air- and water-resistive barrier, structural sheathing, and continuous insulation.

1.02 RELATED SECTIONS

A. Section 06 10 00 – Rough Carpentry: Mounting substrate

B. Section 07 25 00 – Weather Barriers: In lieu of flashing, sealing, taping, etc., of the factory applied air- and weather-resistive barrier, contractor may install weather-barrier specified under this section.

C. Section 07 46 33 – Plastic Siding: Siding.

D. Section 07 92 00 – Joint Sealants.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials International (ASTM):
1. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter
2. ASTM C1304 - Standard Test Method for Assessing the Odor Emission of Thermal Insulation Materials
3. ASTM C1338 - Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
4. ASTM D137 - Standard Test Method for Evaluating Properties of Wood based Fiber and Particle Panel Materials, Section 15: Nail Head Pull Through.
5. ASTM D1761 - Standard Test Methods for Mechanical Fasteners in Wood" modified for Shear
6. ASTM D1929 - Standard Test Method for Determining Ignition Temperature of Plastics
7. ASTM E72 - Standard Test Method of Conducting Strength Tests of Panels for Building Construction
8. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials
9. ASTM E96 - Test Method for Water Vapor Transmission of Materials
10. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials
11. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors under Specified Pressure Differences across the Specimen
12. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
13. ASTM E2357 - Air Leakage of Building Assemblies

B. ASHRAE 90.1-2013 - Energy Standard for Buildings Except Low-Rise Residential Buildings

C. NFPA International:
1. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

D. Testing Application Standard (TAS):
1. TAS 202-94 - Impact & Nonimpact Resistance Building Envelope Components using Uniform Static Air Pressure
2. TAS 203-94 - Criteria for Testing Products Subject to Cyclic Wind Pressure Loading

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1.04 SUBMITTALS

A. Section 01 33 00 – Submittals: Submittal provisions.

B. Manufacturer Product Data: Submit data sheets for structural insulating sheathing and accessories. Include instructions for handling, storage, installation, and protection.

C. Manufacturer Installation Instructions: Indicate special handling criteria, installation sequence, cleaning procedures, and standard installation procedures.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Manufacturer shall be a company that regularly manufactures and assembles structural insulated sheathing in its own fabrication and owned facilities.

B. Field Quality Control Plan:
   1. Visually inspect fasteners, flashings, and waterproofing.
   2. Photographically document observations and maintain record of observations.

C. Installer Qualifications: Company specializing in performing the work of this Section with minimum 3 years of experience.

1.06 DELIVERY STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Transport and handle items in accordance with manufacturer's instructions.

C. Coordinate deliveries in order to avoid delay in, or impediment of, progress of the Work.

D. Store packaged materials in original containers with seals unbroken and labels, including grade seal, intact until time of use, in accordance with manufacturer's instructions. Do not stack.

E. Store installation system materials in a dry location and handle in a manner to prevent chipping, breakage, and contamination.

F. Store structural insulating sheathing boards off ground, under cover, and keep dry. Pallets shall sit on even gravel or concrete surface when able.

G. Maximum panel stack height 30 panels. Do not double stack pallets.

H. Long term panel storage shall be kept in warehouse condition.

I. Protect latex additives, organic adhesives, epoxy adhesives and sealants from freezing or overheating in accordance with manufacturer's instructions; store at room temperature when possible.

J. Protect insulated panels from prolonged UV and weather exposure prior to installation. Edges of panels shall remain covered in factory wrapped packaging prior to installation. Outdoor storage prior to installation requires a waterproof tarpaulin and elevated storage above ground level a minimum of four (4) inches if removed from factory pallet shipping platform.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Sheathing panels may be installed at any temperature.

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C. Special consideration shall be followed for accessory sealants. Follow manufacturer's instructions for temperature limitations on seam sealant requirements.

1.08 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Provide manufacturer Limited Ten-Year Warranty.

1.09 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Closeout provisions.

B. Warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. DuPont

B. Or equal.

2.02 INSULATED SHEATHING

A. ArmorWall Plus:
   1. Type: UL Classified and Audited Production
      a. Magnesium Oxide (MgO) Board Facer, 1/2-inch thick.
   2. Fused Rigid Foam Insulation
      a. Class 1 Rated Urethane Insulation
      b. Fused directly to rear face of sheathing layer
         1) Laminations are not acceptable.
      c. Closed Cell Content equal to or greater than 90%
   3. Air and Water-Resistive Barrier:
      a. Factory applied vapor permeable:
      b. ASTM E96 Method B Water Vapor Transmission: 18 perms at 10 mils.
      c. ASTM E2178 Air Permeance: 0.0005 cfm/sf at 1.57 psf.
   4. Panel Size: 4 feet by 8 feet (1220 mm by 2440 mm).
   5. Thickness / R-Value per ASTM C518:
      a. 3-3/4-inch (95.25 mm) composite thickness with R-Value of R-21.

2.03 PANEL FASTENERS

A. Fasteners shall be approved ArmorWall panel fasteners. Fasteners are corrosion resistant type with oversized heads. Length of fasteners shall be as determined by the panel manufacturer. Corrosion resistant type.
   1. ArmorWall panels require Concealor Low Profile Fasteners #14-13 DP1 with Tri-Seal Long-Life Coating
      a. For use in concrete substrates
         1) Pre-drill panel and concrete substrate using a 3/16-inch masonry drill bit.
         2) Install fastener using a 2,000 RPM hammer drill.
         3) Minimum embedment depth into substrate of 1-inch.
         4) Do not exceed 1-1/2-inch embedment.

2.04 ACCESSORIES

A. Joints and Fastener Heads shall be covered with manufacturer required sealant and/or coating.
   1. ArmorSeal Sealant gunnable grade polyether sealant.

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B. Rough Openings in Fire Rated Assemblies and Walls
   1. ArmorBoard Plus returns factory sized to width of full rough opening depth.
   2. ArmorBoard Plus shall be field trimmed to width of full rough opening depth.

C. Window and Door Sills shall be coated with manufacturer required coating.
   1. ArmorSeal Sealant trowel grade polyether sealant.

2.05 ADDITIONAL MATERIALS

A. At perimeter of openings and other areas requiring (2) wood 2x blocking as shown on the Drawings: Provide one of the following options as part of the work of this section.
   1. Remove insulation from behind exterior sheathing and install shim behind sheathing to flush out with wood blocking.
   2. Cut SIS back at edge of blocking and install 3/4-inch wood sheathing over blocking.
   3. Where permitted, omit 2x blocking and provide full depth return per manufacturer's installation instructions.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the work of this section.

B. Do not begin installation until exterior walls have been properly prepared.

C. Verify that all exterior wall assembly construction has been completed to the point where the insulation may correctly be installed.

D. Verify built-in items, penetrations and rough openings are correct and properly located.

3.02 PREPARATION

A. Protect surrounding area from possible damage during installation of structural insulated sheathing.

B. Remove projections, protruding fasteners, and loose or foreign matter that might interfere with proper installation.

C. If deficiencies exist, consult Architect. Correct deficiencies in accordance with manufacturer's recommendations.

D. Beginning installation constitutes Contractor's acceptance of existing conditions.

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Clean adjacent boards and surfaces from dust, debris, and soil prior to striking seams and application of below grade panel to panel sealant.

C. Install without gaps or voids. Do not compress insulation.

D. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

E. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

F. Exposed insulation must always be protected from open flame and kept dry.

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G. Fasten structural insulated sheathing to the structural base wall.

H. Exterior wall insulation layer is not intended to be left exposed for extended periods of time in excess of fifteen (15) days without adequate protection. If extended exposure is anticipated all exposed foam surfaces including corners, window and door openings, should be covered with a compatible waterproof tape. Contact DuPont for guidance on exposed materials.

I. Install ArmorSeal gunnable sealant at all fastener heads, seams, inside and outside corners providing a one-inch seal in either direction of each seam or opening.

J. Countersink all fasteners.

K. At perimeter of openings and other areas requiring (2) wood 2x blocking as shown on the Drawings: Provide one of the following options as part of the work of this section.
   1. Remove insulation from behind exterior sheathing and install shim behind sheathing to flush out with wood blocking.
   2. Cut SIS back at edge of blocking and install 3/4-inch wood sheathing over blocking.
   3. Where permitted, omit 2x blocking and provide full depth return per manufacturer's installation instructions.

3.04 FIELD QUALITY CONTROL AND TOLERANCES

A. See Section 01 40 00 – Quality Requirements, for additional requirements.

B. Perform field quality control inspection as specified in Part 1, Quality Assurance.

C. Joint thickness: No gaps greater than 1/4-inch allowed without installation of supplemental low-rise field applied foam insulation and backer rod for sealants.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Cover the top and edges of unfinished wall panel work to protect it from the weather and to prevent accumulation of water in the cores of the panels.

C. Wet panels shall be allowed to completely dry prior to application of cladding.

D. Do not leave factory coated air and weather barrier surfaces exposed to weather longer than one hundred eighty (180) days without approval from manufacturer.

E. Repair or replace damaged products before Substantial Completion.

END OF SECTION

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SECTION 06 41 00
ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fabricated custom casework and countertops of high-pressure decorative laminate finish with hardware:
   1. Base and wall cabinets.
   2. Countertops.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Concealed blocking.

B. Division 22 – Plumbing: Drop in sink.

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A156.9 - Cabinet Hardware.
   2. ANSI A208.1 - Mat-Formed Wood Particleboard.

B. Architectural Woodwork Standards (AWS), latest edition.

C. International Code Council:
   1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

D. National Electrical Manufacturers Association (NEMA):
   1. NEMA LD 3 - High Pressure Decorative Laminates.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Shop Drawings: Indicate plans and elevations, materials, profiles, assembly methods, joint details, fastening methods, accessories, hardware, and schedule of finishes.

C. Product Data: Submit data for hardware accessories. Submit data for laminates.

D. Samples: Laminate.

1.05 QUALITY ASSURANCE

A. Perform work in accordance with Architectural Woodwork Standards.

B. Work in this Section shall comply with the Premium Grade of the current edition of the AWS.

1.06 QUALIFICATIONS

A. Contractors and their personnel engaged in the work shall be able to demonstrate successful experience with the work of comparable extent, complexity and quality to that shown and specified.

B. Woodwork manufacturer shall have no less than 5 years of production experience similar to this project, whose qualifications indicate the ability to comply with the requirements of this section.

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C. The woodwork manufacturer must have at least two projects in the past 5 years where the value of the woodwork was within 50% of the cost of woodwork on this project.

1.07 WARRANTY

A. The woodwork manufacturer shall provide a written 5 year warranty on all of the woodwork products produced under this section. The manufacturer shall, without charge to the owner, repair or replace any woodwork that is defective or develops problems within the warranty time. Defectives or problems shall include, but not limited to, high pressure laminate delamination from the substrate, woodwork joint failure, hardware issues, and adjustments to doors and drawers.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Protect units from moisture damage according to AWS.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

1.10 FIELD MEASUREMENTS

A. The woodwork manufacturer is responsible for details and dimensions not controlled by job conditions and shall show on the shop drawings all required field measurements beyond their control. The general contractor and the woodwork manufacturer shall cooperate to establish and maintain these field dimensions.

B. Verify field dimensions prior to fabrication.

1.11 COORDINATION

A. Coordinate the work applicable mechanical and electrical trades and rough-in.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Core shall be 45 lb. density particleboard meeting the requirements of AWS.

B. Plastic laminate shall meet the requirements of AWS for its intended use.
   1. Type/Grade:
      a. General Purpose Grade 10 (HGS), 0.044 inch thick: For horizontal surfaces.
      b. Horizontal Postforming Grade 12 (HGP), 0.035 inch thick: For countertops with curved edges.
      c. Vertical Surface (VGS), 0.028 inch thick: For vertical surfaces.
   2. Color and Pattern: Selected by Architect from manufacturer's standard.
   3. Manufacturers: Formica, Pionite, Wilsonart.

C. Edge band for Door and Drawer Front Edging: 3mm PVC. Color selected by Architect.

D. Adhesive: Type II.

E. Hardware:
   1. Pulls:
      a. Wire pull, 4-inch, metal, satin nickel finish, Liberty Hardware Part #P604BCC-SN-C or equal.

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2. Drawer Guides:
   a. Typical drawer: Grass DynaPro, soft close damping, self-closing, ball bearing, full extension, 100 pound loading. or
   b. Paper store drawer: Accuride Heavy Duty Slide 9301, ball bearing, full extension, 300-pound loading.
3. Hinges: Heavy duty, five knuckle, Grade I, 2-3/4-inch institutional type hinge, 120-degree minimum opening, AWS compliant. One pair on doors up to 48 inches tall, one- and one-half pair on doors over 48 inches tall.
4. Adjustable Shelf Supports: twin pin design, anti-tip 5 mm minimum steel pins, 250 load rating.
5. Door Catches (required if hinges are not self-closing): Stanley SP41 (US28).
6. Door and drawer bumpers: Clear, self-adhesive.

2.02 FABRICATION

A. Plastic Laminate Casework:
   1. AWS Premium Grade.
   2. AWS Construction Type A frameless, and cabinet and door interface style 1, flush overlay.
   3. Exposed interior surfaces shall be HPDL.
   4. Semi-exposed surfaces: Low-pressure melamine overlay.
   5. Drawers shall meet the requirements of AWS.

B. Countertops:
   1. AWS Premium Grade.
   2. Core shall be #45 particleboard meeting the requirements of AWS.
   3. Triple cove unless noted otherwise on the drawings.

C. The following requirements are in addition to and/or above the AWS requirements:
   1. Cabinet backs shall be minimum 3/8-inch thick for base units and minimum 1/2-inch thick for wall units.
   2. Ends, tops, and bottoms shall be 3/4-inch thick.
   3. Drawer sub-fronts and backs shall be 3/4 inch thick.
   4. Drawer bottoms shall be minimum 3/8-inch thick.
   5. Shelves shall be 3/4-inch thick for widths up to 42-inches and 1-inch thick for widths over 42-inches.

D. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.

E. Apply plastic laminate finish in full-uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 2 feet from sink cut-outs.

F. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

G. Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal contact surfaces of cut edges.

H. Provide solid wood blocking at 24 inches on center in base of all base cabinets to support cabinet bottom.

I. Provide two (2) bumper pads at each drawer and door.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify mechanical, electrical, and building items affecting work of this section are places and ready to receive this work.

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C. Verify adequacy of backing and support framing.

D. Verify locations and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

A. Installation shall be in accordance with AWS Premium Grade.

B. Set and secure casework in place; rigid, plumb, and level.

C. Use fixture attachments in concealed locations for wall mounted components.

D. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.

E. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.

F. Secure cabinet bases to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing provisions.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Final cleaning.

B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

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SECTION 06 65 02
PLASTIC SIMULATED WOOD TRIM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Cellular PVC trim boards for wall base at wood framed wall infill construction locations.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wall construction and blocking.

B. Section 07 92 00 – Joint Sealants

C. Section 09 29 00 – Gypsum Board: Wall construction.

D. Section 09 96 00 - High Performance Coatings: Field finishing.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Section 01 33 00 – Submittals: Submittal provisions.

B. Product Data: Manufacturer's data sheets on each product used.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Material and Equipment: Product storage and handling provisions.

B. Material should be stacked on edge or laid flat on a smooth, level surface. Edges and corners should be protected from chipping. Store products off the ground, on a flat surface, and under waterproof covering. If sheets should become wet, allow to dry thoroughly before installing.

1.06 WARRANTY

A. Warranty: Furnish minimum 10-year manufacturer's limited warranty. Warranty shall include coverage from cracking, rotting, delamination, and excessive swelling from moisture.

PART 2 MATERIALS

2.01 MANUFACTURER

A. AZEK by Vycom Corporation.

2.02 TRIM BOARDS

A. General
   1. Edges must be square, and top and bottom surfaces shall be flat with no convex or concave deviation.
   2. Uniform surface free of cupping, warping, and twisting.
   3. Smooth finish. 3/4 inch thick. 3-1/2-inch wide.

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B. Material: Free foam cellular PVC material with a small-cell microstructure. PVC shall be homogeneous and free of void, holes, cracks, and foreign inclusions and other defects.

C. Performance and physical characteristic requirements:
1. Density.....0.55 g/sq cm (ASTM D702)
2. Water Absorption.....0.15% (ASTM D570)
3. Nail Hold .....35 Lbf/in (ASTM D1761)
4. Screw Hold.....680 Lbf/in (ASTM D1761)
5. Gardner Impact .....103 in-lbs (ASTM D5420)
6. Charpy Impact (at 23O C) .....4.5 in-lbs (ASTM D256)
7. Coefficient of Linear Exp.....3.2x10-5 (ASTM D696)
8. Burning Rate .....No burn when flame removed (ASTM D635)
9. Flame Spread Index.....< 25 (ASTM E84)

D. Trim: AZEK Trimboards by Vycom Corporation, 801 Corey Street, Moosic, PA 18507.

2.03 ACCESSORIES

A. Fasteners
1. Use fasteners designed for wood trim and wood siding (thinner shank, blunt point, full round head) with AZEK products.
2. Use a highly durable fastener such as stainless steel or hot-dipped galvanized.
3. Staples, small boards and wire nails must not be used as fastening members.
4. The fasteners should be long enough to penetrate the solid wood substrate a minimum of 11/2".
5. Standard nail guns work well with AZEK trim products.
6. Use 2 fasteners per every framing member for trimboard applications. Trimboards 12" or wider, as well as sheets, will require additional fasteners.
7. Fasteners must be installed no more than 2" from the end of the board.
8. AZEK products should be fastened into a flat, solid substrate. Fastening AZEK material into hollow or uneven areas must be avoided.
9. Pre-drilling is typically not required unless a large fastener is used or product is installed in low temperatures.

B. Adhesives:
1. Glue all AZEK to AZEK joints with AZEK Adhesive, a cellular pvc cement, to prevent joint separation.
2. The glue joint should be secured with a fastener and/or fastened on each side of the joint to allow adequate bonding time.
3. AZEK Adhesive has a working time of 10 minutes and will be fully cured in 24 hours.
4. If standard pvc cements are used, keep in mind these products typically cure quickly which will result in limited working time and may reduce adhesive strength.
5. Surfaces to be glued should be smooth, clean and in complete contact with each other.
6. To bond AZEK material to other substrates, various adhesives may be used. Consult adhesive manufacturer to determine suitability.

C. Sealants:
1. Acrylic latex sealant shall be applied per manufacturer's installation instructions at joints and fasteners.
2. For perimeter sealant, use urethane, polyurethane or acrylic based sealants without silicone as specified under Section 07 92 00.

PART 3 EXECUTION

3.01 PREPARATION

A. Correct conditions detrimental to timely and proper completion of work.

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3.02 INSTALLATION GENERAL

A. Install per manufacturer's recommendations.

B. Fasteners shall be installed at 16-inch on center.

C. Counter-sink all fasteners.

D. Install in longest pieces possible.

E. Joints between boards shall not occur within 12 inches of corner on one side.

3.03 PLASTIC TRIM

A. Glue all joints with adhesive.

B. A glue joint shall be secured with fastener on each side of joint.

C. Surfaces to be glued shall be smooth, clean, and in complete contact with each other.

D. Use a minimum of 2 fasteners per every framing member.

E. Fasteners shall be installed no more than 2 inches from the end of each board.

F. Allow for expansion and contraction at the ends of the run, where board ends are glued.

G. Install 1/2-inch above finished floor to allow for joint sealant to be installed below base.

3.04 FINAL FINISHING

A. Fill nail holes flush with sealant prior to final finishing.

B. Correct dents and gouges before applying final coating. Mild dents can be corrected with delicate use of a heat gun.

C. Cleaning: If moldings get dirty during installation, clean with a soft bristle brush and a bucket of soapy water. For stubborn stains, mold or mildew, use a cleaner suitable for PVC products

D. Final finish under Section 09 96 00 - High Performance Coatings

E. Sealant shall be installed at top and bottom board perimeter under Section 07 92 00 after final finish is applied.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion

END OF SECTION

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SECTION 07 13 00
SHEET WATERPROOFING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Elastomeric Bituthene waterproofing membrane.

B. System in Section 07 14 00 may be used for below grade wall waterproofing system in lieu of products specified in this section.

1.02 RELATED WORK

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

B. Section 31 23 23 – Backfill and Compaction.

C. Section 07 21 13 - Board Insulation: Protection board.

D. Section 07 27 26 – Fluid-Applied Membrane Air/Vapor Retarder: Exterior masonry cavity wall membrane.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Submit Product Data: Indicate properties of primer, bitumen, and mastic.

C. Submit manufacturer's installation instructions.

D. Warranty.

1.04 ENVIRONMENTAL REQUIREMENTS

A. Maintain ambient and surface temperatures above 40 degrees F for 24 hours before application and continuously until waterproofing has cured.

1.05 QUALITY ASSURANCE

A. Membrane Manufacturer: Company specializing in waterproofing sheet membranes with minimum three (3) years documented experience.

B. Applicator: Company specializing in performing work of this section with minimum three (3) years documented experience and approved by manufacturer.

1.06 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Product warranties and product bonds.

B. Furnish five (5) year manufacturer warranty for waterproofing failing to resist penetration of water.

C. For warranty repair work, remove, and replace materials concealing waterproofing.

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PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Grace Construction Products.

B. W.R. Meadows, Inc.

C. Carlisle.

2.02 MATERIALS

A. Below Grade Wall Membrane Waterproofing: Bituthene 3000 or Bituthene Low Temperature Below Grade Waterproofing Membrane by Grace Construction Products.

B. Wall Membrane Primer: Bituthene Primer WP-3000 or Primer B2 by Grace Construction Products.

C. Under Floor Slab Membrane Waterproofing: Preprufe 300 R by Grace Construction Products.

D. Liquid Termination: Bituthene Liquid Membrane by Grace Construction Products.

E. Protection Board: Board insulation per Section 07 21 13.

F. Adhesive: Protection Board Adhesive PBA-3000 by Grace Construction Products.

G. Termination: Polymer Batten Strip by Firestone or equal and stainless steel fasteners.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify surfaces are solid, free of frozen matter, loose particles, cracks, pits, rough projections, and foreign matter detrimental to adhesion and application of waterproofing.

B. Do not apply waterproofing to damp, frozen, dirty, dusty, or deck surfaces unacceptable to applicator.

C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

D. Beginning of installation means acceptance of substrate.

3.02 PREPARATION

A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.

B. Apply primer as recommended by manufacturer.

3.03 APPLICATION

A. Install waterproofing system in strict accordance with manufacturer's instructions.

B. Install transitions between wall and under slab/footing waterproofing system in strict accordance with manufacturer's installation instructions.

C. Install liquid termination for wall waterproofing at locations recommended by manufacturer.

D. Terminate wall waterproofing system below grade. Apply rigid termination and fasteners at top edge of membrane.

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E. Install protection board at locations not protected by rigid insulation under Section 07 21 13 - Board Insulation.

3.04 PROTECTION

A. Protect in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 07 14 00
FLUID-APPLIED WATERPROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fluid applied waterproofing system for below-grade foundation.

B. System in this section may be used in lieu of sheet membrane waterproofing for Below Grade Wall Waterproofing system specified in Section 07 13 00.

1.02 RELATED SECTIONS

A. Section 31 23 23 – Backfill and Compaction.

B. Section 03 30 00 - Cast-in-Place Concrete: Substrate.

C. Section 07 13 00 - Sheet Waterproofing: Under concrete floor slab waterproofing.

D. Section 07 21 13 – Board Insulation: Protection Board.

E. Division 40 – Process Integration: Through-wall penetrations.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C836 – Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
2. ASTM C898 – Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Separate Wearing Course.
3. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
4. ASTM D903 – Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
5. ASTM D1644 - Standard Test Methods for NonVolatile Contents of Varnishes.
6. ASTM D3767 – Standard Practice for Rubber – Measurements of Dimensions.
7. ASTM D5295 - Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems.

B. International Code Council:
1. IBC – International Building Code, 2021 edition, and referenced standards with 2025 State of Wisconsin amendments.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Submit showing details of all typical conditions and intersections with other waterproofing systems and materials.

C. Manufacturer's Product Data: Submit for membrane and other components, including technical data, tested physical and performance properties, temperature and other limitations.

D. Manufacturer's Installation Instructions: Submit, include evaluating, preparing, and treating substrate, and other recommendations.

E. Submit installer's certification.

1.05 QUALITY ASSURANCE

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A. Installer Qualifications:
   1. Firm specializing in performing Work of this section with minimum three (3) years documented experience.
   2. The air barrier contractor and each installing worker shall be certified by the product manufacturer.
   3. Each Lead Certified Applicator can supervise a maximum of five (5) registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all waterproofing work on the project.

B. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing the product.

C. Products shall comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

D. Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed membrane unless it has been inspected and approved.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

C. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by the manufacturer. Protect stored materials from direct sunlight.

D. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.

E. Clean spills and leave area as it was prior to spill.

1.07 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials.

B. Place materials defined as hazardous or toxic waste in designated containers.

C. Ensure emptied containers are sealed and stored safely for disposal away from children.

1.08 WARRANTY

A. 01 77 00 - Closeout Procedures: Warranty provisions.

B. Furnish five (5) year manufacturer's written material warranty.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fluid Applied Waterproofing Membrane: Synthetic rubber, spray applied.
   1. Procor® fluid-applied membrane by Grace Construction Products.

B. Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with the membrane for a complete system.

C. Furnish materials recommended by the manufacturer for connection to the under floor slab and footing waterproofing system of Section 07 13 00.

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D. Completed system shall be capable of withstanding hydrostatic pressure without leaking.

E. Other Acceptable System Manufacturers:
   1. Equal systems by Henry Building Envelope Systems or Rubber Polymer Corporation.
   2. Equal systems shall be compatible with protection boards of Section 07 21 13.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions under which waterproofing system will be applied, with Installer present, for compliance with requirements. 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.
   1. Do not proceed with installation until after minimum concrete curing period recommended by the manufacturer.
   2. Ensure that:
      a. surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
      b. concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
   3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
   4. Notify Architect in writing of anticipated problems using waterproofing over substrate.

B. Verify items which penetrate surfaces to receive waterproofing are securely installed.

C. Beginning of installation means acceptance of substrate.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Surface shall be as required by manufacturer for installation of waterproofing system.

B. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at protrusions according to manufacturer's written instructions.

3.03 INSTALLATION

A. Procor®
   1. Install materials in strict accordance with manufacturer's instructions.
   2. Treat construction joints and install flashing as recommended by manufacturer.
   3. Spray apply a continuous uniform film at 60 mils wet film thickness using multiple, overlapping passes.
   4. When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
   5. When spraying use high pressure, multi-component, airless spray equipment approved by material manufacturer.
   6. Seal all penetrations as work progresses.

3.04 PROTECTING AND CLEANING

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

B. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

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C. Protect waterproofing system from damage during application and remainder of construction period, according to manufacturer's written instructions.

D. Protect membranes to avoid damage from other trades, and construction materials during subsequent operations.

E. Protect waterproofing from exposure to the elements as required by the manufacturer.

F. Schedule work to ensure that the waterproofing system is covered as soon as possible after installation. If the membrane cannot be covered with protection board within 30 days after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

G. Install protection boards of Section 07 21 13. Protection boards may be installed on the same day as the Procor membrane, after the membrane is no longer tacky. Extruded polystyrene insulation boards are compatible with Procor membranes; confirm insulation adhesive is compatible with membrane.

END OF SECTION

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SECTION 07 21 13
BOARD INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Board insulation at perimeter foundation wall, cavity wall construction, frost protected stoop construction, and wall waterproof membrane protection.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Section 04 20 00 - Unit Masonry: Insulation materials for cavity wall construction.

1.03 RELATED SECTIONS

A. Section 03 30 00 - Cast-in-Place Concrete: Slab and foundation construction.

B. Section 04 20 00 - Unit Masonry: Cavity wall construction.

C. Section 07 13 00 - Sheet Waterproofing: Below grade water-retaining tank wall waterproofing membrane protection board.

D. Section 07 14 00 - Fluid Applied Waterproofing: Below grade water-retaining tank wall waterproofing membrane protection board.

E. Section 07 27 26 - Fluid-Applied Membrane Air/Vapor Retarder: Masonry cavity wall air- and vapor- retarder system.

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C240 - Standard Test Methods of Testing Cellular Glass Insulation Block.
2. ASTM C272 - Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
3. ASTM D1621 - Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
4. ASTM D2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
5. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
6. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.

B. International Code Council:
1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.
2. IECC - International Energy Conservation Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

C. National Fire Protection Association (NFPA):
1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc. (UL):
1. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.

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B. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 INSULATION MATERIALS

A. Polystyrene Insulation Type A: ASTM C578 Type IV; extruded cellular type, conforming to the following:
1. Thermal Resistance: 5-year aged R-values of 5.4 and 5.0 minimum per inch thickness at 40°F and 75°F, respectively.
2. Water Absorption: In accordance with ASTM C272, 0.1 percent by volume maximum.
3. Compressive Strength: Minimum 25 psi.
4. Flame Spread Index: Less than 75.
5. Smoke-Developed Index: Less than 450.
6. Thickness: Thickness indicated in schedule.

B. Polystyrene Insulation Type B: ASTM C578 Type VI; extruded cellular type, conforming to the following:
1. Thermal Resistance: 5-year aged R-values of 5.4 and 5.0 minimum per inch thickness at 40°F and 75°F, respectively.
2. Water Absorption: In accordance with ASTM C272, 0.1 percent by volume maximum.
3. Compressive Strength: Minimum 40 psi.
4. Flame Spread Index: Less than 75.
5. Smoke-Developed Index: Less than 450.
6. Thickness: Thickness indicated in schedule.

C. Manufacturers:
1. DiversiFoam Products.
2. Dow Chemical: Styrofoam brand.
3. Foamular.
4. Owens Corning.

2.02 ADHESIVES

A. Adhesive: Type recommended by insulation manufacturer for application.

B. Acceptable Manufacturer's products:
1. Henkel Loctite PL300 Foam Board Adhesive
2. Henkel Loctite PL Premium Construction Adhesive.
3. BASF MasterWeld 420.
4. DAP Beats the Nail Panel and Foam Construction Adhesive.

2.03 FOAM SEALANT

A. Polyurethane insulating foam sealant; one-component, gun or straw applied; UL classified; containing no solvents, CFC's or VOC's; moisture-resistant.

B. Products:
1. Great Stuff Pro by Dow Chemical Company.
2. Handi-Foam by FOMO.
3. Kwik Foam by DAP, Inc.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

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B. Verify substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.

C. Verify substrate surface is flat, free of fins, irregularities, and materials or substances that may impede adhesive bond.

3.02 INSTALLATION

A. Foundation Perimeter:
1. Adhere insulation to wall by applying 2 inch diameter spots of adhesive to insulation boards at 16 inches on center both ways.
2. Butt edges and ends tight to adjacent board and to protrusions.
3. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

B. Cavity Walls:
1. Apply 2-inch diameter daubs of adhesive spaced approximately 12 inches on center both ways on inside face of insulation boards.
2. Butter all edges of insulation board with adhesive to provide continuous vapor barrier.
3. Do not install until air/vapor barrier system of Section 07 27 26 installation is complete.
4. Install boards horizontally between wall reinforcement.
5. Press insulation firmly into liquid-applied air/vapor retarder substrate. At locations where liquid-applied air/vapor barrier is not the substrate, apply 2-inch diameter daubs of adhesive spaced approximately 12 inches on center both ways on inside face of insulation.
6. Place boards in a method to maximize contact bedding. Stagger joints. Butt edges and ends tight to adjacent board and to protrusions.
7. Cut and fit insulation tight to protrusions or interruptions to insulation plane.
8. Install foam sealant at insulation joints and around penetrations through insulation. Once foam has set up, cut foam back to plane of insulation, so that it does not protrude beyond face of insulation.

3.03 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 77 00 –Closeout Procedure: Protection of finished Work provisions.

B. Do not permit Work to be damaged prior to covering insulation.

3.04 SCHEDULES

A. Perimeter Tank Wall Waterproofing Protection Insulation: Type A, extruded polystyrene, 1-1/2-inch thick, square edges.

B. Perimeter Foundation Wall Insulation: Type A, extruded polystyrene, , square edges full:
1. (1) layer 3-inch thick height of foundation wall
2. Additional (2) layers of 24-inch deep, 2-inch thick just below block on top of foundation wall insulation.

C. Under Exterior Frost Protected “Floating” Stoop Slab: Type B, extruded polystyrene, 2-inch thick, square edges.

D. Cavity Wall Insulation: Type A, extruded polystyrene, 3-inch thick, square edges.

END OF SECTION

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SECTION 07 21 16
BLANKET INSULATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Batt insulation for filling wood framed roof curb, perimeter door and window shim spaces, crevices in exterior wall and roof assembly, and other miscellaneous areas.

1.02 RELATED WORK

A. Section 04 20 00 - Unit Masonry.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 27 13 – Sheet Membrane Air/Vapor Retarder.

D. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
   2. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. International Code Council:
   1. IBC - International Building Code, 2021 Edition, and referenced standards with 2015 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

C. National Fire Protection Association (NFPA):
   1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc. (UL):
   1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Submit data on product characteristics, performance criteria, and limitations.

1.05 COORDINATION

A. Section 01 30 00 - 01 31 13 - Project Coordination: Coordination and project conditions.

B. Coordinate the Work Section 07 27 13 for installation of vapor retarder.

PART 2 PRODUCTS

2.01 BATT INSULATION

A. Batt Insulation: ASTM C665; preformed fiberglass; unfaced. Owens Corning Fiberglas Thermal Batts.

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PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify substrate adjacent materials and insulation are dry and ready to receive installation.

C. Verify mechanical and electrical services within walls have been installed and tested.

3.02 INSTALLATION

A. Install in accordance with manufacturer's recommendations.

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Fit insulation tight in spaces and tight to exterior side of mechanical and electrical services within plane of insulation.

END OF SECTION

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SECTION 07 25 00
WEATHER BARRIERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Continuous weather resistive barrier as indicated on Drawings for temporary knock-out wall panel infill construction.

B. Product may not be required where Structural Insulated Sheathing has integral weather barrier system and tape and flashings are used per manufacturer instructions.

1.02 RELATED WORK

A. Section 06 16 13 – Structural Insulated Sheathing: Weather resistive barrier substrate.

1.03 REFERENCES

A. American Society of Civil Engineer (ASCE):
   1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. American Society for Testing and Materials (ASTM):
   1. ASTM C920 - Standard Specification for Elastomeric Joint Sealers.
   2. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Difference Across the Specimen.
   3. ASTM E330 - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Submit data on material characteristics, performance criteria, and limitations.

C. Manufacturer's Installation Instructions: Submit preparation, installation requirements and techniques, and product storage and handling criteria.

D. Warranty: Unconditional guarantee against weather and construction damage.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Project condition provisions.

B. Maintain temperature and humidity recommended by materials manufacturers before, during, and after installation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Acceptable Manufacturer:
   1. Typar Building Wrap.
   2. DuPont Tyvek HomeWrap.

B. Fasteners: Per manufacturer's recommendation.

C. Tape: Per manufacturer's recommendation.

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D. Head, Jamb, and Sill Wraps: Manufacturer's standard.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify surfaces are ready to receive Weather resistive barrier.

B. Beginning of installation means acceptance of substrate.

3.02 INSTALLATION

A. Install full height of wall.

B. Upper rolls should overlap bottom rolls by 6 inches minimum.

C. Bottom edge should extend over seam between the sill plate and foundation.

D. Secure barrier according to manufacturer's recommendations.

E. Tape all seams.

3.03 PROTECTION

A. Section 01 77 00 - Closeout Procedures: Protecting installed construction.

B. Weather resistive barrier is to be protected per manufacturer's recommendation.

END OF SECTION

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SECTION 07 27 13
PLASTIC SHEET MEMBRANE AIR/VAPOR RETARDER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. A continuous vapor retarder to the inside face of the wood framed roof curb.

B. A continuous vapor retarder to the inside face of the wood studs at the knock-out wall infill construction.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry System.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 92 00 - Joint Sealants: Penetration sealing.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
2. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
3. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.

B. International Code Council:
1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.
2. IECC - International Energy Conservation Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Vapor retarder:
1. 3-ply laminate combining 2 layers of low-density polyethylene with a high-strength cord grid.
   a. Griffolyn Type-65 by Reef Industries (800) 231-6074.
   b. Stego Wrap 10-mil or 15-mil
   c. Permalon Ply X-150
   d. VaporBlock 15
   e. Husky Yellow Guard Vapor Barrier, 20 mil

B. Tape:
1. 3M 8087 Construction Seaming Tape.
2. Heavy-duty, weather-resistant, double sided asphaltic mastic tape.
   a. Fab Tape by Reef Industries, (800) 231-6074.

PART 3 EXECUTION

3.01 INSTALLATION

A. Secure vapor retarder to inside face of the studs with staples.

B. Seams shall be lapped with 4 inches minimum. Tape all seams. Tape the seam at the transition between the ceiling and wall.

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C. Provide buytl type tape at all uneven surfaces.

D. Completely seal any tears and punctures with tape.

E. Seal all penetrations vapor-tight with tape and/or sealant.

END OF SECTION

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SECTION 07 27 26
FLUID-APPLIED MEMBRANE AIR/VAPOR RETARDER

PART 1 GENERAL

1.01 SECTION INCLUDES

A. This section includes the following material and installation for a complete air/vapor retarder system for exterior masonry cavity wall.
   1. Work includes, but is not limited to, liquid-applied air/vapor retarder system located in the non-accessible part of the wall, sheet rubberized-asphalt self-adhered air/vapor retarder membrane, and other materials to bridge and seal air leakage pathways and gaps.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Masonry back-up walls and wall openings.

B. Section 06 10 00 - Rough Carpentry: Top of wall plates and accessories. Infill wall construction substrate.

C. Section 07 92 00 - Joint Sealants: Joint and penetration perimeter sealant materials and installation.

D. Division 22 - Plumbing: Through-wall fixture penetrations.

E. Division 23 - Heating, Ventilating, and Air Conditioning: Through-wall penetrations and wall openings.

F. Division 26 - Electrical: Through-wall penetrations.

G. Division 40 – Process Integration: Through-wall penetrations.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C836 – Standard Specification for High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane for Use with Separate Wearing Course.
   2. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers – Tension.
   3. ASTM D903 – Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
   4. ASTM D1644 – Standard Test Methods for Nonvolatile Content of Varnishes.
   5. ASTM D1970 – Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as a Steep Roofing Underlayment for Ice Dam Protection.
   6. ASTM D3767 – Standard Practice for Rubber – Measurement of Dimensions.
   7. ASTM D4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   8. ASTM D4541 - Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
   9. ASTM D5295 – Standard Guide for Preparation of Concrete Surfaces for Adhered (Bonded) Membrane Waterproofing Systems.
   10. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
   11. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
   12. ASTM E2178 – Standard Test Method for Air Permeance of Building Materials.
   13. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

B. Wisconsin Commercial Building Code, Current Edition.

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1.04 PERFORMANCE REQUIREMENTS

A. Provide air/vapor retarder constructed to perform as a continuous air/vapor retarder, and as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration. Membrane shall accommodate movements of building materials by providing expansion and control joints as required, with accessory air seal materials at such locations, changes in substrate and perimeter conditions.

B. Provide an air retarder assembly that has been tested in accordance ASTM E2357 to provide air leakage results not to exceed: 0.06 cfm/sf at 0.30 inch H_2O.

C. Provide vapor retarder assembly that has been tested in accordance with ASTM E96, Method B, to provide results not to exceed: 0.08 perms.

D. Provide seamless, monolithic air/vapor retarder assembly to a thickness of 60 mils.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
   1. The air retarder contractor and each installing worker shall be certified by the product manufacturer.
   2. Each Lead Certified Applicator can supervise a maximum of five (5) registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air retarders of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor retarder work on the project.

B. Air/vapor retarder installers must be trained and certified by the product manufacturer.

C. Single-Source Responsibility: Obtain air/vapor retarder materials from a single manufacturer regularly engaged in manufacturing the product.

D. Products shall comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

E. Section 01 30 00 - Administrative Requirements: Meeting requirements.

F. Preconstruction Meeting: Convene minimum one (1) week prior to commencing Work of this section.

G. Cooperate and coordinate with the Owner's inspection and testing agency. Do not cover any installed air and vapor retarder membrane unless it has been inspected, tested, and approved.

H. Manufacturer's representative shall visit the site to review the installed work prior to the work being covered. Manufacturer shall issue a letter stating that installation and workmanship complies with manufacturer's requirements and written installation instructions.

1.06 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Shop Drawings: Submit showing locations and extent of air/vapor retarder and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.

C. Manufacturer's Product Data Sheets: Submit for each type of membrane, including 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.

D. Manufacturer's Installation Instructions: Submit.

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E. Submit certification by air/vapor retarder manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).

F. Submit certification of compatibility by air/vapor retarder manufacturer, listing all materials on the project that it connects to or that come in contact with it.

G. Samples: Submit 3-inch by 4-inch minimum size, for each air/vapor retarder material required for Project.

H. Submit test results of air permeability testing of primary air retarder material (ASTM E2178 or ASTM E283).

I. Submit installer's certification from product manufacturer.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.

C. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by air/vapor retarder manufacturer. Protect stored materials from direct sunlight.

D. Avoid spillage. Immediately notify Owner, Architect if spillage occurs and start clean up procedures.

E. Clean spills and leave area as it was prior to spill.

1.08 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials.

B. Place materials defined as hazardous or toxic waste in designated containers.

C. Ensure emptied containers are sealed and stored safely for disposal away from children.

1.09 PROJECT CONDITIONS

A. Section 01 60 00 - Product Requirements.

B. Environmental Conditions: Apply air/vapor retarder within range of ambient and substrate temperatures recommended by air/vapor retarder manufacturer. Do not apply air/vapor retarder to a damp or wet substrate, unless the manufacturer specifically permits that for the product.
   1. Do not apply air/vapor retarder in snow, rain, fog, or mist.
   2. Do not apply air/vapor retarder when the temperature of substrate surfaces and surrounding air temperatures are below those recommended by the manufacturer.

1.10 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Warranty provisions.

B. Furnish 2-year manufacturer's warranty for liquid and membrane materials.

PART 2 PRODUCTS

2.01 MATERIALS

A. Liquid Air/Vapor Retarder: Synthetic rubber, spray applied. Vapor Impermeable.

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1. Air-Bloc 16MR Air and Vapor Barrier as manufactured by Henry Building Envelope Systems.
2. Perm-A-Barrier® NPL 10/ NPL 10 LT Fluid-applied impermeable air and vapor barrier membrane by GPC (Grace Construction Products).
3. Rub-R-Wall Airtight Air/Vapor Retarder liquid-applied 100% rubber copolymer membrane as manufactured by Rubber Polymer Corporation.
4. Equal Products:
   a. Air-Shield LM (polymer modified) or LSR (synthetic rubber) by WR Meadows.
   b. R-Guard VB by Prosoco.
   c. ExoAir 120 SP (asphaltic) or ExoAir 130 (synthetic acrylic) by Tremco.
5. Products Not Considered Equals:
   a. By Performance:
      1) Products that do not provide a finished 60 mil thickness.
      2) Products with water vapor permeance exceeding 0.1 perms (dry cup) or 1 perm (wet cup).
      3) Products with air permeability that exceed 0.0004 cfm/ft^2 (ASTM E2178).
   b. Products that are not considered equal:
      1) Poly-Guard, Poly-Guard AirLock Flex.
      2) BASF, Enershield-I.
      3) TK-Airmax 2102 NP.

2.02 AUXILIARY MATERIALS

A. Furnish auxiliary materials recommended by air/vapor retarder manufacturer for intended use and compatible with the air/vapor retarder membrane for a complete air- and vapor-retarder system.

B. Self-Adhesive Membrane Flashing: 32 mils of self-adhesive rubberized asphalt integrally bonded to 8 mil cross-laminated, high density polyethylene film to provide a minimum 40 mil thick membrane shall be interleaved with disposable silicone-coated release paper until installed:
1. Blueskin® SA by Henry Building Envelope Systems.
2. Perm-A-Barrier® Wall Flashing by Grace Construction Products.
3. Rub-R-Wall SA by Rubber Polymer Corporation.

C. Primer:
1. Water based liquid primer for extruded polystyrene, concrete, masonry, gypsum sheathing, wood, metal, and painted substrates;
   a. Aquatac Primer as manufactured by Henry Building Envelope Systems.
   b. Perm-A-Barrier® WB Primer by Grace Construction Products.
2. Solvent based, VOC compliant primer for concrete, masonry, gypsum sheathing, wood, metal, and painted substrates:
   a. HE573 as manufactured by Henry Building Envelope Systems.
   b. Bituthene Primer B-2 by Grace Construction Products.
   c. Rub-R-Wall Primer by Rubber Polymer Corporation.

D. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes as recommended by self-adhesive membrane flashing or liquid membrane air retarder material manufacturer.

E. Substrate Filler for Rub-R-Wall: Rub-R-Wall Mastic manufactured by Rubber Polymer Corporation.

F. Sealants provided under Section 07 92 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions under which air/vapor retarder systems will be applied, with Installer present, for compliance with requirements. Verify that surfaces and conditions are suitable prior to

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commencing work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Do not proceed with installation until after minimum concrete curing period recommended by air/vapor retarder manufacturer.
2. Ensure that:
   a. surfaces are sound, dry, even, and free of oil, grease, dirt, excess mortar or other contaminants
   b. concrete surfaces are cured and dry, smooth without large voids, spalled areas or sharp protrusions.
   c. masonry joints are flush and completely filled with mortar, and all excess mortar sitting on masonry ties has been removed.
3. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D4263.
4. Notify Architect in writing of anticipated problems using air/vapor retarder over substrate.

3.02 SURFACE PREPARATION

A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air/vapor retarder application.

B. Prime masonry substrates with conditioning primer when installing modified asphalt membrane transition membranes.

C. Prime wood, metal, and painted substrates with primer recommended by membrane manufacturer.

D. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through air/vapor retarder and at protrusions according to air/vapor retarder manufacturer's written instructions.

3.03 INSTALLATION

A. Air Bloc 32MR:
   1. Install materials according to manufacturers instructions.
   2. Transition joints: Prior to the application of the Air Bloc 32MR, seal transitions with primer and Blueskin TWF transition strip at beams, columns, changes in substrate material, and similar joints or connections to provide continuity of air/vapor retarder assembly. Generally, apply transition strips so that a minimum of 3 inches coverage is achieved over both substrates. Position strip over firm bearing.
   3. Apply air/vapor retarder membrane within recommended application temperature ranges. Consult manufacturer when membrane cannot be applied within these temperature ranges.
   4. Apply Air Bloc 32MR by air assisted spray equipment in a continuous unbroken film at a wet film thickness of 1/8 inch to the substrate. Imbed insulation as work progresses.
   5. Ensure that Air Bloc 32MR is applied in full contact around protrusions such as brick ties.
   6. Overlap Blueskin TWF transition membrane a minimum of 1 inch.
   7. Complete application of membrane to provide a seamless, monolithic surface to a thickness of 40 mils *[60 mils on masonry walls].*

B. Perm-A- Barrier® Liquid:
   1. Install materials in accordance with manufacturer's instructions.
   2. Apply waterproofing over concrete block. Fill all voids and holes, particularly in the mortar joints, with a lean mortar mix, non-shrinking grout or parge coat.
   3. Treat construction joints and install flashing as recommended by manufacturer.
   4. Spray apply a continuous uniform film at 60 mils wet film thickness using multiple, overlapping passes.
   5. When spraying use a cross-hatching technique (alternating horizontal and vertical passes) to ensure even thickness and coverage.
   6. When spraying use high pressure, multi-component, airless spray equipment approved bay material manufacturer.

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7. Carry membrane into any openings a minimum of 2 inches.
8. Seal all brick-ties and other penetrations as work progresses.

C. Application of Transition Membrane for Perm-A- Barrier® Liquid:
1. After allowing the Fluid Applied Membrane to cure to tack-free, apply transition membrane with a minimum overlap of 3 inches onto each surface at all beams, columns and joints as indicated in detail drawings.
2. Tie in to window and door frames, spandrel panels, roof and floor intersections and changes in substrate.
3. Use pre-cut, easily handled lengths for each location.
4. Remove silicone-coated release paper and position flashing carefully before placing it against the surface.
5. When properly positioned, place against surface by pressing firmly into place by hand roller.
6. Overlap adjacent pieces 2 inches and roll all seams with a hand roller.
7. Seal top edge of transition membranes and flashing with termination mastic
8. Apply liquid membrane to all fastener heads, overlapping board by 1 inch.

D. Rub-R-Wall:
1. Install materials in accordance with manufacturer's instructions.
2. Transition joints: Seal with primer and transition strip at changes in substrate material and similar joints or connections to provide continuity of air/vapor retarder assembly. Generally, apply transition strips so that a minimum of 3 inches coverage is achieved over both substrates. Position strip over firm bearing.
3. Apply air/vapor retarder membrane within recommended application temperature ranges. Consult manufacturer when membrane cannot be applied within these temperature ranges.
4. Using airless spray equipment having a minimum pressure of 3000 psi, apply prime coat of air/vapor retarder membrane over outer surface of inner wythe masonry.
5. Use alternating horizontal and vertical passes to ensure complete coverage of substrate and transition strips. Seal masonry anchors or other penetrations air tight.
6. Check surfaces again and if necessary, fill any remaining gaps with mastic substrate filler prior to covering with membrane.
7. Complete application of membrane to provide a seamless, monolithic surface to a thickness of [40 mils] 60 mils on masonry walls.
8. Adhere insulation to air/vapor retarder membrane after initial set time of approximately 1 to 2 hours, and while membrane is still tacky, to prevent convection currents occurring behind the insulation.

E. Built-in Door Frames: Do not apply air/vapor retarder to door frame. Run air/vapor retarder up to edge of door opening to a location which will not be exposed after perimeter sealant is installed.

F. Window and Door Frames Not Built In: Lap transition strip from wall substrate with 3 inches of full contact over firm bearing into window or door frame opening with full 1 inch to be installed under installed windows or door frames, unless noted otherwise. Coordinate installation depth at opening with product or supplier. Membrane shall not be exposed within building.

G. Wall/Roof Junction: Prime all surfaces. Lap transition strip from wall substrate with 6 inches of full contact over firm bearing to roof air seal membrane with 4 inches of full contact.

H. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

3.04 PROTECTING AND CLEANING

A. Protect air/vapor retarder system 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.

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C. Protect air/vapor retarder from exposure to the elements as required by the manufacturer.

3.05 PROTECTION AND CLEANING

A. Remove any masking materials after installation. Clean any stains on materials that would be exposed in the completed work using procedures as recommended by manufacturer.

B. Protect membranes to avoid damage from other trades, and construction materials during subsequent operations. Protection products may be installed on the same day as the membrane. Extruded polystyrene insulation boards are compatible with membranes. Bonding of the insulation is achieved if the insulation products are installed when the membrane is tacky; generally within 1 to 2 hours after the Procor membrane is installed.

C. Schedule work to ensure that the air and vapor retarder system is covered as soon as possible after installation. Protect air and vapor retarder system from damage during subsequent operations. If the air and vapor retarder system cannot be covered within 60 days, or shorter time as recommended by manufacturer after installation, apply temporary UV protection such as dark plastic sheet or tarpaulins.

END OF SECTION

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SECTION 07 46 33
PLASTIC SIDING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Vinyl siding for knock-out wall panel infill.

B. Related trim, flashings, accessories, and fastenings.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 06 16 13 – Structural Insulated Sheathing: Substrate.

C. Section 07 25 00 – Weather Barrier: Substrate.

D. Section 07 92 00 - Joint Sealants: Sealant at perimeter openings and dissimilar materials.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM D3679 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Samples: Submit actual color samples for selection by Architect.

PART 2 PRODUCTS

2.01 MATERIALS

A. Siding:
   1. Vinyl Lap Siding: Conform to ASTM 3679. Solid vinyl, double 4-inch, wood grain texture. Minimum thickness: 0.044 inch.

B. Trim:
   1. Miscellaneous: Starter strip, closers, and all other trim as required for a complete and weather-tight installation.

C. Manufacturers: CertainTeed, or Mastic.

D. Color: As selected by Architect from manufacturer's standard colors.

2.02 ACCESSORIES

A. Nails: Hot dipped galvanized or Aluminum type; non-staining, of size and strength to securely and rigidly retain the work.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify substrate is ready to receive siding.

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B. Beginning of Work means acceptance of existing substrate.

3.02 INSTALLATION

A. Install siding in accordance with manufacturer's requirements.

B. Fasten siding in place, level and plumb. Blind nail except on over trim. Nail to aligned pattern.

C. Install siding for natural watershed.

D. Install closures and trim.

3.03 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Remove site cuttings from finish surfaces.

C. Clean and wash prefinished surfaces with mild soap and rinse or as recommended by manufacturer; rinse with clean water.

END OF SECTION

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SECTION 07 53 23
EPDM MEMBRANE ROOFING - FULLY ADHERED

PART 1 GENERAL

1.01 WORK INCLUDED

A. Adhesive attached single ply EPDM membrane roofing over insulation.

B. Flashing of all roof penetrations.

C. Termination bars.

D. Walkway pads and other accessories.

1.02 RELATED WORK

A. Section 03 41 33 - Precast Structural Pretensioned Concrete: Precast concrete roof deck.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 62 00 - Sheet Metal Flashing and Trim.

D. Section 07 72 33 - Roof Hatches.

E. Division 22 – Plumbing: Plumbing vent penetrations through the roof.

F. Division 23 – Heating, Ventilating, and Air Conditioning: Equipment on the roof and penetrations through the roof.

G. Division 26 - Electrical: Equipment on the roof and penetrations through the roof.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
2. ASTM C578 - Standard Specification for Rigid, Cellular Polystrene Thermal Insulation.
3. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
4. ASTM D695 - Standard Test Method for Compressive Properties of Rigid Plastics.
5. ANSI/ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.

B. Factory Mutual Corporation (FM):
1. FM Global Property Loss Prevention Sheets I-28.

C. Underwriters Laboratories, Inc. (UL).

1.04 QUALITY ASSURANCE

A. Applicator: Company specializing in installation of sheet roofing membranes approved by membrane manufacturer.

B. The applicator shall be a company specializing in installation of single-ply roof membranes with five (5) years of documented experience.

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C. The roofing system must be applied by a roofing contractor authorized by the roof system manufacturer.

D. All components used in the roofing system shall be approved by the membrane manufacturer.

E. Manufacturer Representative shall visit the site at the following milestones and provide written documentation of findings:

1. At start of new membrane installation, roof manufacturer's representative shall visit the job site to ensure that the installation begins correctly with all installation procedures and guidelines being followed and notify the Owner in writing of his findings. Failure to notify hereby constitutes acceptance of the work of his licensed applicator (the contractor) by the manufacturer.
2. Upon 50 percent completion of the project, the roof manufacturer's representative shall inspect the installation for adherence to installation procedures and guidelines.
3. Upon substantial completion of the installation, an inspection shall be made by a representative of the membrane manufacturer to ascertain that the roofing system has been installed according to the applicable roof manufacturer's specifications and details.
4. All the above indicated job visits shall be documented in writing by the roof manufacturer's representative indicating all problems, concerns, recommendations, and directives given to the roofing contractor regarding the roofing system installation. Copies shall be provided to the Architect/Engineer within five days of the inspection date. It is the roofing contractor's responsibility to arrange the above inspections.

1.05 REGULATORY REQUIREMENTS

A. Underwriters Laboratories, Inc. (UL): Class B Fire Hazard Classification.

B. Factory Mutual Corporation (FM): Wind uplift requirement of I-90 in accordance with FM Construction Bulletin I-28.

1.06 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Submit product data for sheet membrane, insulations, adhesives, fasteners, primers, vapor barrier, warranty, membrane flashing and accessories.

C. Submit tapered insulation layout drawing.

D. Submit roof plan shop drawing showing the sheet and seam layout.

E. Submit shop drawings detailing special joint or termination conditions and conditions of interface with other materials.

F. Prior to commencement of installing any roofing, submit a written statement from the roof membrane manufacturer stating that they have reviewed the project plans and specifications and that they accept the roofing system as specified and detailed.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Store materials in weather protected environment clear of ground and moisture.

1.08 PRECONSTRUCTION CONFERENCE

A. Attend a preconstruction conference prior to commencing work of this Section under provisions of Section 01 33 00.

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B. Require attendance of parties directly affecting work of this Section

C. Review conditions of installation, installation procedures, and coordination required with related work.

1.09 WARRANTY

A. Membrane Manufacturer's Total System Warranty:
   1. The membrane manufacturer shall warrant that they will pay all costs of repair or replacement of the roof system and elastic flashings which occur during a period of twenty (20) years from the date of completion, as a result of workmanship or deterioration of the membrane system, flexible membrane flashings, fasteners, adhesives, and insulation.
   2. The warranty shall be a total system warranty.
   3. Include coverage of materials and installation resulting from failure to resist penetration of moisture.
   4. Provide no dollar limit warranty.
   5. The warranty shall cover labor and materials.
   6. The warranty shall cover sustained winds and wind gusts to 72 MPH.
   7. The metal flashings as specified in Section 07 62 00 are not to be covered in this warranty.

B. Provide twenty (20) year manufacturer's membrane material warranty. Warranty shall be same as described for 20-year warranty.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Apply roofing membrane during cold weather in accordance with the manufacturer's instructions.

B. Do not apply roofing membrane to damp or frozen deck surface.

C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

PART 2 PRODUCTS

2.01 SINGLE PLY ROOFING SYSTEM - FULLY ADHERED

A. Acceptable Manufacturers:
   1. Carlisle Syntec Systems
   2. Holcim Elevate.

B. No substitutions (this includes Versico, Genflex, Mule Hide and John Mansville).

2.02 MEMBRANE MATERIALS

A. Membrane: 0.060 inch thick, black, non-reinforced, EPDM.

B. Seaming Materials: As recommended by membrane manufacturer.

C. Night Seal: Roofing membrane as recommended by membrane manufacturer which must be compatible between the new and existing roof membranes.

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2.03 INSULATION MATERIALS

A. Isocyanurate Board Insulation: Tapered and flat rigid roof insulation panel composed of a closed cell polyisocyanurate foam laminated to a specially coated, inorganic, fiberglass facer. Insulation shall meet ASTM C1289 Type II Class II and shall meet FM Class 1 and UL Class A approvals. The insulation shall have an LTTR-value of 5.6 per inch, a density of 2.0 lb. per cu. ft., a compressive strength of 20 psi, and shall be approved by the roof membrane manufacturer. Thickness and slope shall be as shown on the drawings, square edges.
   1. Elevate ISO 95+ GL
   2. Carlisle HP-H Polyiso.

2.04 ADHESIVE MATERIALS

A. Insulation Adhesive: Foam adhesive as recommended by Carlisle or Elevate for the substrate and insulation.

B. Membrane Adhesives: CavGrip spray adhesive or Elevate Jet Bond Spray Adhesive.

C. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

2.05 ACCESSORIES

A. Seam tape, sealants, membrane flashings: As recommended by membrane manufacturer.

B. Mechanical Fasteners for Insulation at wood curbs only: Appropriate to purpose intended and approved by UL; length required for thickness of material; with metal washers; corrosion resistant. Length shall be varied with insulation thickness.

C. Aluminum Bar: Continuous 6063-T6 alloy aluminum extrusion with pre-punched slotted holes; miters welded; injection molded EPDM splices to allow thermal expansion

D. Flashing membranes, adhesives, and other materials as required, including mastics, curb flashing, joint covers, inside/outside corners, pipe seals, etc. Pitch pockets (pourable sealant) are not permitted.

E. Premolded boot membrane flashing for all pipe penetrations, except hot pipes. Provide stainless steel adjustable clamp at top edge, in addition to sealant/mastic. Prefabricated flashing, and rain cap, for hot pipes shall be provided by associated equipment manufacturer and flashing into roofing under this Section.

F. Walkway pads: 30-inch by 30-inch Elevate QuickSeam Walkway Pad or Carlisle Sure-Seal EPDM Pressure-Sensitive Molded Walkway Pads.

G. Nail-in fasteners: zinc coated steel ¼ inch diameter and length to suit application.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains, valleys, or eaves.

B. Verify roof openings and penetrating elements through roof are solidly set, wood nailing strips are in place. Verify deck is supported and secured.

C. Do not apply primer or other roofing materials to a wet or damp deck.

D. Do not apply roofing materials to damp, frozen, dirty, dusty, or deck surfaces unacceptable to manufacturer.

E. Beginning installation means acceptance of substrate.

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3.02 PREPARATION

A. Prepare substrate in accordance with manufacturer's written instructions.

3.03 INSULATION APPLICATION

A. Place insulation in accordance with insulation manufacturer's instructions. Lay second layer of insulation with joints staggered from first layer.

B. Lay insulation boards to moderate contact without forcing joints. Cut insulation to fit neatly to perimeter blocking and around protrusions through roof.

C. Lay tapered Cut boards to slope to establish pitch to drains.

D. Adhere the insulation to concrete deck and to other layers of insulation.

E. At the roof drains field cut a taper to the roof drain around the entire perimeter of the roof drain at a slope of 4/12.

3.04 MEMBRANE INSTALLATION

A. Adhere membrane using adhesive to the insulation in accordance with manufacturer's instructions.

B. Continue membrane up vertical surfaces and secure in place in accordance with the manufacturer's instructions.

C. Seal items penetrating membrane per manufacturer's instructions.

D. At roof edge conditions with a gravel stop/fascia, the membrane shall wrap over and down the edge. The galvanized water dam shall be installed over the top of the membrane. The galvanized water dam shall then be stripped in before installing the fascia cover.

E. Flash all openings through roof.

3.05 WALKWAY PADS

A. Install the walkway pads at locations required by the membrane manufacturer. Adhere in place to the membrane.

B. Provide and install walkway pads around minimum three sides of the roof access hatch opening.

3.06 FLASHING

A. All flashing shall be in accordance with roof membrane manufacturer's requirements. Inform the Architect if any details shown or requirements specified are not in compliance with the roof membrane manufacturer.

3.07 CLEANING

A. Clean all contaminants generated by roofing work from building and surrounding areas, including bitumen, adhesives, sealants, and coatings.

B. Repair or replace building components and finished surfaces damaged or defaced due to the work of this section; comply with recommendations of Manufacturers of components and surfaces.

C. Remove leftover materials, trash, debris, equipment from project site and surrounding areas.

3.08 PROTECTION

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A. Protect finished installation under provisions of Section 01 50 00.

B. Construct a watertight night seal at the end of each day between the new roofing installed and the existing roofing and roof deck. A complete watertight roofing system shall be maintained between each workday to protect the building interior from water damage and to prevent the new and existing roofing materials to remain from getting wet.

C. Where construction traffic must continue over finished roof membrane, provide durable protection, and replace or repair damaged roofing to original condition.

3.09 FIELD QUALITY CONTROL

A. Manufacturer shall provide technical backup, on-site assistance, and inspections at start-up, during application and at completion. Manufacturers shall submit a written inspection report to the Architect.

B. Inspection shall be performed under provisions of Section 01 40 00.

C. Perform all corrections necessary for issuance of warranty.

END OF SECTION

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SECTION 07 62 00
SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 WORK INCLUDED

A. Includes sheet metal flashing and trim as shown on the drawings, specified herein, and as needed for a complete and proper installation. Including, but not limited to:
   1. Top of wall fascia
   2. Termination bars, except where provided under Section 07 53 23.
   3. Miscellaneous flashings.

1.02 RELATED WORK

A. Section 04 20 00 - Unit Masonry.

B. Section 06 10 00 - Rough Carpentry.

C. Section 06 16 13 – Structural Insulated Sheathing: Flashing at base of wall.

D. Section 07 25 00 – Weather Barrier: Flashing at base of wall.

E. Section 07 46 33 – Plastic Siding: Flashing at base of knock-out panel wall infill.

F. Section 07 53 23 - EPDM Membrane Roofing - Fully Adhered.

G. Division 23 - Mechanical: Flashing all roof penetrations.

H. Division 26 - Electrical: Flashing all roof penetrations.

1.03 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
   1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
   2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
   3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
   4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

B. American Society for Testing and Materials (ASTM):
   1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

C. National Roofing Contractors Associates (NRCA):
   1. NRCA - Roofing Manual.

D. Sheet Metal and Air Conditioning Contractors (SMACNA):
   1. SMACNA - Architectural Sheet Metal Manual, 6th Edition.

E. Aluminum Association (AA) - Aluminum Construction Manual:
   1. Aluminum Sheet Metal Work and Building Construction.

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1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Submit manufacturer's product data, including installation instructions.

C. Shop Drawings: Submit manufacturer's shop drawings, including plans, elevations, sections, and details, indicating dimensions, materials, components, fasteners, finish, and accessories.

D. Samples: Submit manufacturer's full line of actual metal color chips.

E. Manufacturer's Installation Instructions: Submit for manufactured products.

F. Warranty: Submit manufacturer's warranty.

1.05 QUALITY ASSURANCE

A. Applicator: Company specializing in sheet metal flashing work with five (5) years minimum experience.

B. Manufacturer's Qualifications: Manufacturer regularly engaged in the manufacturing of gutters of similar type to that specified for a minimum of 5 years.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling requirements.

B. Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation.

C. Prevent contact with materials during storage which may cause discoloration, staining, or damage.

D. Store and handle materials in accordance with manufacturer's instructions.
   1. Keep materials in manufacturer's original, unopened containers and packaging until installation.
   2. Store materials in clean, dry area indoors.
   3. Do not store materials directly on floor or ground.

E. Protect materials and finish during storage, handling, and installation to prevent damage.

1.07 WARRANTY

A. Warranty Period, Product: 5-year workmanship warranty covering replacement or repair of products that are defective in material or workmanship.

B. Warranty Period, Finish: Limited 30-year warranty for prefinished coil-coated steel and aluminum coated with Kynar 500 standard colors covering fade, chalk, and film integrity.

C. Wind Warranty Period: Warranted length listed below in wind conditions as listed below for the following products:
   1. Fascia: Lifetime, up to 215-mph

PART 2 PRODUCTS

2.01 MANUFACTURED PRODUCTS

A. Manufacturer:
   1. Metal-Era, LLC, 1600 Airport Road, Waukesha, Wisconsin 53188. Phone 800-558-2162. www.metalera.com. info@metalera.com.
   2. Substitutions: Per Division 01

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3. Single Source: Provide materials from single manufacturer.

B. Gravel Stop/Fascia: Water dam shall be 24-gauge G-90 galvanized steel with prepunched fastener holes at 12 inches on center on front face and deck flange. Fascia cover shall be 24-gauge steel, G-90 with Kynar 500 finish, color as selected by architect from standard colors, prefabricated corner units, no exposed fasteners. Splice plates shall be 3-1/2 inch wide minimum, interlocking concealed plate, fabricated from same material as fascia. Formed lengths of 12'-0".
1. Metal-Era, Inc. Perma-Tite System 200 Crimp-on version.
2. Shop or field bent not permitted.

C. Aluminum Termination Bar: AA 6063-T6 Aluminum Termination Bar with holes at 8 inches on center and a 45 degree by 1/4-inch flange at the top to receive caulk.

2.02 SHOP BENT FLASHING

A. Shop bent flashing shall be 24 gauge galvanized steel, ASTM A525, G90, core steel with Kynar 500 finish of color as selected. Exposed fastener shall be stainless steel or have prefinished heads to match flashing.
1. Provide 20-year finish warranty.
2. Construct per SMACNA Architectural Sheet Metal Manual.

2.03 FABRICATION

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.

B. Form pieces in longest practical lengths.

C. Form shop bent material in accordance with recommendations of the SMACNA Architectural Sheet Metal Manual.

D. Fabricate vertical faces with bottom edge formed outward 1/4 inch and hemmed to form drip.

2.04 ACCESSORIES

A. Nails for Fastening Roof Edge and Counter Flashings to Roof Sheathing: Standard round wire shingle type, hot dipped zinc coated steel, minimum 3/8 inch head diameter and 10 to 12 gauge barbed shank of sufficient length to penetrate just through roof sheathing.

B. Nails for Fastening Flashings to Blocking: Hot dipped zinc coated steel type as recommended by flashing manufacturer.

C. Plastic Roof Cement: Must conform to Federal Specification SSC-153 Type I or latest revision thereof.

D. Flashing at plumbing vents and other round penetrations: Premolded fabric boot flashing.

E. Sealant: Tremco Dynomic or Sonneborn Sonolastic NP1.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips in place, and nailing strips located.

B. Verify roof termination and base flashings are in place, sealed, and secure.

C. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

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A. Install manufactured material in accordance with manufacturer's instruction.

B. Install products to allow water to drain from edge of roof.

C. Install products to allow for thermal movement.

D. Review lengths of straight pieces before cutting to avoid creating relatively short sections adjacent to full-length sections.

E. Install starter and edge strips, before starting installation.

F. Lap Lock Cleat Seam and seal all joints.

G. Conform to drawing details and details included in SMACNA and NRCA manual for installation of shop bent material.

H. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.

I. Seal metal joints watertight.

J. Conform to drawing details and details included in SMACNA and NRCA manual for installation of shop bent material.

K. Joint Sealants: Apply joint sealants in accordance with manufacturer's instructions.

3.03 CLEANING

A. Clean products promptly after installation in accordance with manufacturer's instructions.

B. Remove clear protective vinyl film.

C. Do not use harsh cleaning materials or methods that could damage finish.

3.04 PROTECTION

A. Protect installed products to ensure that, except for normal weathering, products will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

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SECTION 07 72 34
ROOF AND FLOOR HATCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Prefabricated roof hatches with integral curb, thermally broken.

B. Prefabricated floor hatches with integral curb, custom size, stainless steel construction.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry: Wood stud framed curb.

B. Section 07 53 24 - EPDM Membrane Roofing: Roofing system.

C. Section 07 62 00 - Sheet Metal Flashing and Trim: Flashing to roof system.

1.03 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Provide data on unit construction, sizes, configuration, jointing methods and locations when applicable, and attachment method.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Basis of Design: Manufacturer and model as listed for each Type (as indicated on Drawings).

B. Acceptable manufacturers, providing equal product to that listed, and complying with installation location requirements:
1. Babcock Davis.
2. Bilco Inc.
3. Nystrom
4. Or equal.

2.02 ROOF HATCHES

A. Roof Hatch Type H1: Thermally broken cover and curb. Aluminum construction.
1. Material: Cover and frame shall be 11-gauge aluminum.
2. Cover: Brakeformed, hollow-metal design with 3-inch concealed polyisocyanurate insulation (R-20+), 5-inch beaded, overlapping flange, fully welded at corners, and internally reinforced for 40-psf live load.
3. Curb: 12-inch high curb with integral capflashing, 3-inch polyisocyanurate insulation (R-20+), fully welded corners, and 5-1/2-inch mounting flange with factory holes for securing to roof deck or site built wood framed curb.
4. Gasket: Extruded EPDM rubber gasket permanently adhered to cover.
5. Hinges: Heavy-duty pintle hinges with type 316 stainless steel hinge pins.
6. Latch: Slam latch with optional interior turn knob handle and exterior keyed deadbolt cylinder lock, in lieu of padlock hasps.
7. Lift Assistance: Compression spring lift assist operators enclosed in telescopic tubes with automatic hold-open arm with grip handle release.
8. Finish: Factory applied powder coat paint finish in manufacturer's standard colors, selected by Architect from minimum of (5) available.
9. Hardware: All type 316 stainless steel, in lieu of standard.

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10. Size: See Schedule on Drawing.
11. Basis of Design: Bilco 50-TB.

2.03 FLOOR HATCHES

A. Floor Hatch Type H2: Custom size, stainless steel construction and hardware.
1. Material: Covers and frames shall be 14-gauge type 304 stainless steel.
2. Cover: Brakeformed hollow metal design with 1-inch concealed fiberglass insulation, 3-inch beaded, fully overlapping flange, fully welded at corners, and internally reinforced for 40-psf live load.
3. Curb: 12-high with fully enclosed optional liner (replaces standard capflashing), 1-inch fiberboard insulation, fully welded at corners, and 3-1/2-inch mounting flange with factory holes for mounting to concrete curb/deck.
4. Gasket: Extruded EPDM rubber gasket, permanently adhered to cover.
5. Hinges: Heavy-duty pintle hinges with type 316 stainless steel hinge pins.
6. Latch: Slam latch with interior and exterior turn handles and padlock hasps.
7. Lift Assistance: Compression spring operators enclosed in telescopic tubes. Automatic hold-open arms with grip handle release.
8. Finish: Mill finish with electrochemical passivation of welds.
9. Hardware: All type 316 stainless steel, in lieu of standard.
10. Size: See Schedule on Drawing – Custom size – see Drawings for floor opening size.
11. Basis of Design: Bilco E-50 in special size with stainless steel hardware.

2.04 FABRICATION

A. Fabricate components free of visual distortion or defects. Weld corners and joints.

B. Provide for removal of condensation occurring within components or assembly.

C. Fit components for weathertight assembly.

2.05 ACCESSORIES

A. Safety Post (provide at Roof Hatch Type H1 ladder – may not be indicated on Drawings): Bilco, LU-1 Steel, black enamel ladder safety post.

B. Roof Hatch Safety Railing (provide at Roof Hatch Type H1 – may not be not shown on Drawings): Aluminum railing with powder coat painted finish, self-closing and latching gate, non-penetrating attachment system for attachment directly to the roof hatch capflashing. 5-year warranty.
1. Bilco RL2, size appropriate for installation location.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Coordinate with installation of roofing system and related flashings for weathertight installation.

C. Apply bituminous paint on surfaces of units in contact with cementitious materials or dissimilar metals.

D. Install ladder safety post on fixed ladder under roof access hatch.

E. Install hatch safety railing at roof access hatches.

F. Install floor hatch for access to tanks on continuous waterstop gasket.

END OF SECTION

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SECTION 07 84 00
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Provide firestop systems consisting of a material, or combination of materials installed to retain the integrity the fire-resistance rated construction by maintaining an effective barrier against the spread of flame, or smoke, and/or hot gases through penetrations, blank openings, construction joints, or at the gap that is created at the building perimeter of the horizontal fire resistance rated assembly and non-fire-resistance rated exterior wall and in or adjacent to either fire-resistance or non-fire-resistance rated barriers in accordance with the requirements of the Building Code for this project.

B. Provide firestop materials including firestopping and firesafing materials, accessories, and sealants.

C. Firestop systems shall be used in locations including, but not limited to, the following:
1. Penetrations through fire-resistance-rated floor and roof assemblies requiring protected openings including both empty openings and openings that contain penetrations.
2. Penetrations through fire-resistance-rated wall assemblies including both empty openings and openings that contain penetrations.
3. Membrane penetrations in fire-resistance-rated wall assemblies where items penetrate one side of the barrier.
4. Joints in fire-resistance-rated assemblies that to allow independent movement.
5. Perimeter of the horizontal fire-resistance rated assembly and exterior wall between a rated floor/roof and an exterior wall assembly that is not fire-resistance rated.
6. Joints, through penetrations and membrane penetrations in Smoke Barriers, Smoke Partitions and those assemblies required to limit, restrict or retard the passage of smoke.

D. All penetrations and terminations shall be with UL approved penetration system.

1.02 RELATED SECTIONS

A. Section 03 41 34 – Plant Precast Structural Pretensioned Concrete: Floor construction.

B. Division 04 – Masonry: Wall construction.

C. Division 21 – Fire Suppression: Pipe penetrations requiring firestopping.

D. Division 22 – Plumbing: Pipe penetrations requiring firestopping.

E. Division 23 - Heating, Ventilating, and Air Conditioning: Mechanical penetrations requiring firestopping. Fire dampers are not required at exterior wall penetrations.

F. Division 26 - Electrical: Electrical penetrations requiring firestopping.

G. Division 40 – Process Integration: Process penetrations requiring firestopping.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
2. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.
3. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

B. International Code Council:

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1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

C. Underwriter's Laboratories Inc. (UL):
1. UL 723 – UL Standard for Safety Test for Surface Burning Characteristics of Building Materials.
2. UL 1479 - Fire Tests of Through-Penetration Firestops.
3. UL 2079 - Tests for Fire Resistance of Building Joint Systems.

1.04 PERFORMANCE REQUIREMENTS

A. Fireproofing Materials: ASTM E119 and ASTM E814 to achieve a fire rating as noted on Drawings.

B. Penetrations: Provide and install firestopping products that once installed to the tested and listed system or engineering judgment (EJ) / equivalent fire-resistance rated assembly (EFRRA) to become firestop systems or EJ/EFRRA's that are produced to resist the spread of fire, and/or the passage of smoke through breaches, gaps, openings, in fire-resistance-rated and smoke resistant assemblies according to requirements indicated, including but not limited to the following:
1. Firestop all breaches made in fire-resistance rated assemblies for penetrating items passing through fire-resistance-rated wall and floor assemblies and other locations as indicated on the drawings.
2. Provide and install complete penetration firestopping systems that have been tested and approved by a nationally recognized third-party testing agency to the listing and the manufacturers installation instructions.
3. F - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined through testing in accordance with ASTM E 814 or UL 1479, but not less than one hour or the no less than the fire-resistance rating of the construction assembly being penetrated by the penetrating item.
4. T - Rated Through-Penetration Firestop Systems: Provide firestop systems with T (temperature) ratings, in addition to F ratings, as determined per ASTM E 814 or UL 1479, where indicated and required by the applicable Building Code.
5. L – Rated Through-Penetration Firestop Systems: Provide firestop systems with Air Leakage (L) ratings, in addition to F and T ratings, as determined in accordance with UL 1479, where indicated.
   a. Required for exterior wall penetrations.
6. W – Rated Through-Penetration Firestop Systems: Provide firestop systems with W Water Resistance ratings, in addition to F, T and L ratings, as determined in accordance with UL 1479, UL 2079, where indicated.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.06 QUALITY ASSURANCE

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.

B. Installer:
1. Certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary manufacturer as having the necessary staff, training, and a minimum of 3-years experience in the installation of manufacturer's products in accordance with specified requirements.
   a. Submit documentation of this experience.
2. A manufacturer's willingness to sell its firestopping products to the Contractor or to an installer engaged by the Contractor does not in itself confer installer qualifications on the buyer.
   a. The Installer must be a trained representative of the manufacturer (not distributor or agent) in the proper selection and installation procedures.
   b. Obtain and submit installer's written certification of training and retain proof of certification for duration of firestop installation.

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1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in the original unopened packages or containers showing name of the manufacturer and the brand name.

B. Store materials off the ground, protected from damage and exposure to elements and temperatures in accordance with manufacturer requirements.

C. Remove damaged or deteriorated materials from the site.

D. Use materials within their indicated shelf life.

1.08 SUBMITTALS

A. Submit detail drawings including manufacturer's descriptive data, typical details conforming to UL Fire Resistance or other details certified by another nationally recognized testing laboratory, installation instructions or UL listing details for a firestopping assembly in lieu of fire-test data or report.
   1. For those firestop applications for which no UL tested system is available through a manufacturer, submit a manufacturer's engineering judgment, derived from similar UL system designs or other tests for review and approval prior to installation.
   2. Submittal must indicate the firestopping material to be provided for each type of application.
   3. When more than a total of 5 penetrations and/or construction joints are to receive firestopping, provide drawings that indicate location, "F" "T" and "L" ratings, and type of application.

B. Submit a written report indicating locations of and types of penetrations and types of firestopping used at each location; record type by UL list printed numbers.

C. Material Certification: Submit certificates attesting that firestopping material complies with the specified requirements. Provide certification of compliance with UL 1479 for all intumescent firestop materials used in through penetration systems.

1.09 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment.

B. Do not apply materials when temperature of substrate material and ambient air is below 60 degrees F.

C. Maintain this minimum temperature before, during, and for three (3) days after installation of materials.

D. Provide ventilation in areas to receive solvent cured materials.

1.10 SEQUENCING

A. Sequence Work to permit firestopping materials to be installed after adjacent and surrounding work is complete.

PART 2 PRODUCTS

2.01 FIRESTOPPING MATERIALS

A. Manufacturers:
   1. 3M Fire Protection Products.
   2. GE.
   3. Substitutions: Under provisions of Section 01 60 00.

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B. Firestopping materials shall be supplied from a single domestic manufacturer, consisting of commercially manufactured, asbestos-free, non-toxic products FM APP GUIDE approved, or UL listed, for use with applicable construction and penetrating items.
   1. Type recommended by manufacturer for specific material, substrate surfaces, and end use. For vertical joints, material shall be non-sagging type.

C. Comply with the following minimum requirements:
   1. Fire Hazard Classification: Provide material that has a flame spread of 25 or less, and a smoke developed rating of 50 or less, when tested in accordance with ASTM E84 or UL 723. Provide an approved firestopping material as listed in UL Fire Resistance or by a nationally recognized testing laboratory.
   2. Toxicity: Provide material that is nontoxic and carcinogen free to humans at all stages of application or during fire conditions and does not contain hazardous chemicals or require harmful chemicals to clean material or equipment.
   3. Fire Resistance Rating: Firestop systems must be UL Fire Resistance listed or FM APP GUIDE approved with "F" rating at least equal to fire-rating of fire wall or floor in which penetrated openings are to be protected. Where required, firestop systems must also have "T" rating at least equal to the fire-rated floor in which the openings are to be protected.
      a. Through-Penetrations: Firestopping materials for through-penetrations, must provide "F", "T" and "L" fire resistance ratings in accordance with ASTM E814 or UL 1479. Provide fire resistance ratings as follows:
         1) Penetrations of Fire Resistance Rated Walls and Partitions: F Rating = hour rating of wall being penetrated.
         2) Fire resistance rating of firestopping material assembly must meet or exceed the fire resistance rating of the floor or wall section being penetrated.

D. Primer: Type recommended by firestopping manufacturer for specific material, substrate surfaces, and end use.

E. Damming and backup materials, supports, and anchoring devices: In accordance with the manufacturer's recommendations, and in strict accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify openings are ready to receive the Work of this Section.

3.02 PREPARATION

A. Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of material. Ensure that substrates and surfaces are properly clean and dry and meet manufacturer's instructions in all respects.

B. Maintain insulation around pipes penetrating fire separation (without interruption of vapor barrier).

C. Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

D. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other foreign matter which may affect bond of firestopping material.

E. Remove incompatible materials which may affect bond.

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F. Install backing materials to arrest liquid material leakage.

3.03 APPLICATION

A. Install firestopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.

B. Apply firestopping material in sufficient thickness to achieve rating to uniform density and texture.

C. Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained. Locations for firestop and smoke seal include, but are not limited to, the following: penetrations through fire resistance rated masonry partitions and walls; top of fire resistance rated masonry partitions; control joints in fire resistance rated masonry partitions and walls; and around mechanical and electrical assemblies penetrating fire separations.

D. Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

E. Tool or trowel exposed surfaces to a neat finish, removing excess compound promptly as work progresses and upon completion.

3.04 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Clean adjacent surfaces of firestopping materials.

3.05 PROTECTION OF FINISHED WORK

A. Section 01 50 00 - Temporary Facilities and Controls: Protecting installed construction.

B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

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SECTION 07 92 00
JOINT SEALANTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preparing sealant substrate surfaces.

B. Sealant and joint backing.

1.02 RELATED SECTIONS

A. Division 03 - Concrete: Sealants used in conjunction with cast-in-place concrete.

B. Section 03 41 33 – Plant Precast Structural Pretensioned Concrete: Sealants used in conjunction with precast concrete.

C. Section 04 20 00 - Unit Masonry: Sealants used in conjunction with masonry.

D. Section 06 41 00 – Architectural Wood Casework: Sealants used in conjunction with countertop.

E. Section 06 65 01 – Plastic Simulated Wood Trim: Sealants used in conjunction with perimeter of wall base.

F. Section 07 46 33 - Plastic Siding: Sealants used in conjunction with siding.

G. Section 07 84 00 - Firestopping: Sealants used in conjunction with fire-rated assemblies.

H. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System: Sealants used in conjunction with door frames.

I. Section 08 81 00 – Glass Glazing: Glazing sealants and accessories.

J. Section 09 29 00 – Gypsum Board: Sealants used in conjunction with wallboard.

K. Division 22 - Plumbing: Sealants used in conjunction with plumbing penetrations, fixtures, and equipment.

L. Division 23 - Heating, Ventilating, and Air Conditioning (HVAC): Sealants used in conjunction with mechanical penetrations, fixtures, and equipment.

M. Division 26 - Electrical: Sealants used in conjunction with electrical penetrations.

N. Division 40 - Process Integration: Sealants used in conjunction with process mechanical pipe penetrations.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   2. ASTM C1193 - Standard Guide for Use of Joint Sealants.
   3. ASTM D1667 - Standard Specification for Flexible Cellular Materials – Poly (Vinyl Chloride) Foam (Closed-Cell).
   4. ASTM D1056 – Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.

B. Sealing and Waterproofers Institute (SWI):
   1. SWI - Sealant and Caulking Guide Specification.

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1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Indicate sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

C. Warranty: Include coverage for installed sealants and accessories failing to achieve watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

1.05 QUALITY ASSURANCE

A. Conform to Sealant and Waterproofers Institute requirements for materials.

B. Use adequate numbers of skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.

C. Applicator qualifications:
   1. Applicator shall have at least three (3) years experience in installing materials of types specified and shall have successfully completed at least three (3) projects of similar scope and complexity.
   2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

D. Single source responsibility for joint sealants:
   1. Obtain joint sealants from single manufacturer for each different product required to ensure compatibility.
   2. Manufacturer shall instruct applicator in procedures for intersecting sealants.

E. Perform work in accordance with ASTM C1193 guidelines, except where more stringent requirements are indicated or specified.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements.

B. Do not install solvent curing sealants in enclosed building spaces.

C. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 PRODUCT STORAGE AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Deliver the materials to the job site in the manufacturer's unopened containers with all labels intact and legible at time of use.

C. Store materials in accordance with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.

1.08 SEQUENCING AND SCHEDULING

A. Section 01 30 00 - Administrative Requirements: Work coordination provisions.

B. Coordinate the work of this Section with all Sections referencing this Section.

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1.09 SUBSTRATE CONDITIONS

A. Provide joints properly dimensioned to receive the approved sealant system.

B. Provide joint surfaces that are clean, dry, sound and free of voids, deformations, protrusions, and contaminants which may inhibit application or performance of the joint sealant.

1.10 WARRANTY

A. Deliver to the Architect signed copies of the following written warranties against adhesive and cohesive failure of the sealant and against infiltration of water and air through the sealed joint for a period of three (3) years from date of completion.
   1. Manufacturer's standard warranty covering sealant materials.
   2. Applicator's standard warranty covering workmanship.

PART 2 PRODUCTS

2.01 GENERAL

A. Compatibility:
   1. Provide joint sealants, joint fillers, and accessory joint materials that are compatible with one another and with joint substrates under project conditions.
   2. Install joint sealants, joint fillers, and related joint materials that are nonstaining to visible joint surfaces and surrounding substrate surfaces.

B. Provide colors selected by Architect from manufacturer's standard color range, unless noted otherwise.

2.02 SEALANTS

A. Low Modulus Silicone Sealant:
   Tremco Spectrem 3, GE SCS 2000, Dow 795, Pecora 895
   1. Color: Selected by Architect.
   2. Locations to be used:
      a. Exterior vertical joints which are bordered on one or both sides by a porous building material such as concrete or masonry or a non-porous building material such as painted metal, anodized aluminum, mill finish aluminum, stainless steel, vinyl siding, or PVC.
      b. Exterior door frames perimeters.
      c. Exterior window and louver perimeters.
      d. Exterior concrete masonry stone joints.
      e. Exterior wall penetrations of plumbing, HVAC, and electrical items.
   3. Primer for mortar, masonry, concrete, and other porous substrates: Tremsil Silicone Porous Primer.

B. Polyurethane Sealant:
   1. Tremco Dymonic 100, Tremco Dymonic FC, Vulkem 116, or BASF MasterSeal NP1.
   2. Color: Selected by Architect.
   3. Locations to be used:
      a. Interior vertical or horizontal joints which are bordered on one or both sides by a porous building material such as concrete or masonry or a non-porous building material such as painted metal, anodized aluminum, mill finish aluminum, stainless steel, or PVC.
      b. Interior door frames perimeters.
      c. Interior window perimeters.
      d. Interior concrete masonry joints.
      e. Interior wall penetrations of plumbing, HVAC, and electrical items.

C. Medium Modulus Silicone Sealant:
   1. Dow Corning 786, GE SCS1700 Sanitary, Tremsil 200, Sikasil N Plus.
   2. Mildew-resistant, fungicide.

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3. Color: White.
4. Locations to be used:
   a. Perimeter of countertops
   b. Perimeter of plumbing fixtures.

D. Self-Leveling Polyurethane Sealant:
1. Vulkem 45SSL, Sikaflex -1c SL.
2. For areas where the slope of the slab makes self-leveling material impractical, use Vulkem 45SSL, Sikaflex -2c NS.
3. Color: Match floor color.
4. Locations such as at interior and exterior concrete slab control and perimeter expansion joints.

2.03 ACCESSORIES

A. Primer: Non-staining type, as recommended by sealant manufacturer to suit application.

B. Joint Cleaner: Non-corrosive and non-staining type, as recommended by sealant manufacturer; compatible with joint forming materials.

C. Backer Rod: Polyethylene foam rod or rope or other compatible non-waxing, non-extruding, non-staining resilient material as recommended by sealant manufacturer, closed cell, sized 25 percent wider than joint width.

D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

E. Masking Tape: Non-staining, non-absorbent tape product compatible with joint sealants and adjacent joint surfaces that is suitable for masking.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify that joint openings are ready to receive work and field measurements are as shown on Drawings and recommended by the manufacturer.

C. Beginning of installation means acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces to receive sealants in accordance with sealant manufacturer's instructions and recommendations.

B. Examine joint sizes and correct as required to allow for anticipated movement and to achieve proper width/depth ratio per manufacturer's recommendations for specified sealant.

C. Thoroughly clean joint surfaces using cleaners approved by sealant manufacturer, whether primers are required or not.
1. Remove all traces of previous sealant and joint backer by mechanical methods, such as by cutting, grinding and wire brushing, in manner not damaging to surrounding surfaces.
2. Remove paints from joint surfaces except for permanent, protective coatings.
3. Remove wax, oil, grease, dirt film residues, temporary protective coatings and other residues by wiping with cleaner recommended for that purpose. Use clean, white, lint-free cloths and change cloths frequently.
4. Remove loose materials and foreign matter.
5. Remove dust by blowing clean with oil-free, compressed air.

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D. Verify that joint backing and release tapes are compatible with sealant.

E. Measure joint dimensions and size materials to achieve required width/depth ratios.

F. Protect elements surrounding the work of this Section from damage or disfiguration.

3.03 INSTALLATION

A. Install sealant in accordance with manufacturer's instructions, and SWI "Sealant: The Professional's Guide".

B. Where necessary to protect adjacent surfaces, mask adjacent surfaces with tape prior to priming and/or caulking.
   1. Use masking tape where required to prevent sealant or primer contact with adjoining surfaces that would be permanently stained or otherwise damaged by such contact or the cleaning methods required for removal.
   2. Apply tape so as not to shift readily and remove tape immediately after tooling without disturbing joint seal.

C. Provide backer rod uniformly to depth required by sealant manufacturer for proper joint design using a blunt instrument.
   1. Fit securely by compressing backer material 25 percent to 50 percent so no displacement occurs during tooling.
   2. Avoid stretching or twisting joint backer.
   3. Install to achieve a neck dimension no greater than 1/3 the joint width.

D. Install bond breaker where backer rod is not used or where recommended by sealant manufacturer, adhering strictly to the manufacturers installation requirements.

E. Prime joint substrates where required.
   1. Use and apply primer according to sealant manufacturers recommendations.
   2. Confine primers to sealant bond surfaces; do not allow spillage or migration onto adjoining surfaces.
   3. Prime immediately prior to caulking.

F. Install sealants immediately after joint preparation.

G. Install sealants to fill joints completely from the back, without voids or entrapped air, using proven techniques, proper nozzles, and sufficient force that result in sealants directly contacting and fully wetting joint surfaces.

H. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

I. Install sealants to uniform cross-sectional shapes with depths relative to joint widths that allow optimum sealant movement capability as recommended by sealant manufacturer.

J. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

K. Tool sealants in manner that forces sealant against back of joint, ensures firm, full contact at joint interfaces and leaves a finish that is smooth, uniform and free of ridges, wrinkles, sags, air pockets and embedded impurities. Provide concave tooled joints.

L. Remove sealant from adjacent surfaces in accord with sealant and substrate manufacturer recommendations as work progresses.

M. Protect joint sealants from contact with contaminating substances and from damages. Cut out, remove, and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of substantial completion.

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N. Clean adjacent surfaces immediately and leave work neat and clean. Remove excess and droppings using recommended cleaners as work progresses. Remove masking tape immediately after tooling of joints.

3.04 CLEANING AND REPAIRING

A. Section 01 70 00 - Execution and Closeout Requirements: Cleaning provisions.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

3.05 PROTECTION OF FINISHED WORK

A. Section 01 70 00 - Execution and Closeout Requirements: Protecting installed work.

B. Protect sealants until cured.

END OF SECTION

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SECTION 07 95 00
EXPANSION CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. Expansion joint devices for interior floor surfaces and floor-to-wall surfaces.

1.02 RELATED WORK

A. Division 03: Concrete. Coordinate with construction of buried concrete tank cover at grade to provide recess to accommodate recess for product hinge.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM B221: Standard Specifications for Aluminum and Aluminum-Alloy Extrusions."
   2. ASTM B209: Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate.
   3. ASTM E1399: Cyclic Movement and Measuring of Minimum/Maximum Joint Widths of Architectural Joint Systems.
   4. ASTM E1612: Standard Specification for Preformed Architectural Compression Seals for Buildings and Parking Structures.

B. American National Standards Institute (ANSI):
   1. ANSI A137.1/A326.3 (2018): Method for Measuring Dynamic Coefficient of Friction on Hard Flooring Materials.

1.04 QUALITY ASSURANCE

A. Manufacturer: Shall have a minimum ten (10) years experience specializing in the design and manufacture of Architectural Expansion Control Systems

B. Application: Minimum 3-years experience in work of this Section

1.05 SUBMITTALS

A. Submit shop drawings and product data.

1.06 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Manufacturer to provide protective film on all exposed cover plate components.

B. Deliver joint systems to jobsite in new, clean, unopened cartons or crates of sufficient size and strength to protect materials during transit.

C. Inspect materials upon arrival. Store components in original containers in a clean, dry location. Ensure temperature or moisture sensitive components are stored in a tempered location.

D. Contractor to provide temporary protective covers on all installed finished surfaces. Protection is required to guard against both surface abrasions as well as overloading of horizontal deck components by construction traffic.

1.07 WARRANTY

A. Standard manufacturer's limited warranty against material and manufacturing defects for a period of not less than five (5) years when installed in accordance with Manufacturer's recommendations.

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PART 2 PRODUCTS

2.01 MATERIALS

A. Extruded Aluminum: Conform to properties of ASTM B221; alloy 6063-T5 or 6063-T6

B. Moisture Protection: Provide seal for floor joint by product manufacturer, size to match joint width.

C. Fasteners: Stainless steel, size and type as recommended by manufacturer for installation location.

2.02 PRODUCTS

A. Expansion control cover shall incorporate an integral hinge feature to accommodate vertical movement between slab surfaces. Profile shall have beveled edge (without raised edge) for areas with no finished flooring material installation. Minimum exposed width of edge shall be 1 1/2 inches. Profile shall be suitable for heavy-duty application. Non-slip finish. ADA compliant. Interior application. Suitable for floor-to-floor and floor-to-wall conditions. Surface mounted (blockout-free). Available in 10'-0" lengths. 2-inch joint.
1. InPro 806SD
2. Sika Wabo HingeMount HDH

B. Elastomeric Seals: Waterproof foam seal for installation below cover plate, horizontal installation. Heat-welded seams for monolithic water protection.
1. InPro 1100 Series Foam Seal.
2. Or equal.

C. Acceptable Manufacturers:
1. InPro
2. Nystrom
3. Sika Commercial Expansion Joints
4. Tremco
5. Or equal

2.03 FINISH

A. Exposed Extruded Section on Floors: Mill finish.

B. Resilient Filler: Gray.

2.04 FABRICATION

A. Back paint components in contact with cementitious materials to prevent electrolysis.

B. Provide joint components in single lengths wherever practical. Minimize site splicing.

PART 3 EXECUTION

3.01 PREPARATION

A. Verify that project conditions are suitable for proper installation of system.

B. Provide anchoring devices for installation and embedment.

3.02 INSTALLATION

A. Install components and accessories in accordance with manufacturer's instructions.

B. Align work plumb and level, flush with adjacent surfaces.

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C. Rigidly anchor to substrate to prevent movement or misalignment.

3.03 PROTECTION

A. Protect finished installation under provisions of Section 01 50 00.

3.04 CLEAN AND INSPECT

A. Upon completing installation the contractor shall clean all exposed metal surfaces with a suitable cleaner that will not harm or attack the finish. Contact manufacturer should questions arise regarding suitability of any cleaner type prior to its use.

END OF SECTION

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SECTION 08 16 00
FIBERGLASS REINFORCED POLYESTER DOOR AND FRAME SYSTEM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fiberglass reinforced polyester doors and frames and borrow-lite frame.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Wall opening construction.

B. Section 05 50 00 - Metal Fabrications: Steel lintels.

C. Section 06 10 00 - Rough Carpentry: Wall opening construction.

D. Section 07 92 00 - Joint Sealants: Perimeter sealing.

E. Section 08 71 00 - Door Hardware.

F. Section 09 96 00 - High Performance Coatings: Field painting of door and frames.

G. Division 26 - Electrical: Electrical security hardware.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.

B. American National Standards Institute (ANSI):
   1. ANSI A117.1 - 2017 - Accessible and Usable Buildings and Facilities.

C. American Society for Testing and Materials (ASTM):
   1. ASTM C1363 - Standard Test Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus.
   2. ASTM E413 - Standard Classification for Rating Sound Insulation.

D. International Code Council:
   1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and finish.

C. Product Data: Indicate door configurations, location of cutouts for hardware reinforcement, and manufacturer literature.

1.05 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8, SDI-100 and ANSI A117.1.

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1.06 QUALIFICATIONS

A. Manufacturer: Company specializing in the manufacture of FRP doors and frames with a minimum of 10 years documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Store doors and frames at the building site off the ground, under cover with adequate ventilation. If the door wrapper becomes wet, remove immediately. Store vertically with the least possible angle. Do not stack horizontally.

1.08 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

1.09 COORDINATION

A. Coordinate work with wall opening construction, glazing, and hardware installation.

B. Coordinate electric security hardware installation and wiring connections.

1.10 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Warranty provisions.

B. Warranty:
   1. Furnish a one (1) year warranty for products to be free of defects in materials and workmanship.
   2. Furnish a 10 year corrosion warranty against degradation or failure due to corrosion.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Manufacturers - non-rated doors and frames:
   1. Chem-Pruf, Brownsville, Texas; (800) 444-6424.
   2. Corrim Company, Oshkosh, Wisconsin; (920) 231-2000.
   3. FRP Composites, Wisconsin Rapids, Wisconsin; (715) 421-3770.
   4. Simon Door Company LLC, Brownsville, Texas; 866-894-7511.
   5. Tiger Door, Inc., Omaha, Nebraska; (888) 891-4416.
   6. Special-Lite.
   7. Substitutions: None.

B. Manufacturers - rated doors and frames:
   1. Simon Door Company, LLC.
   2. Tiger Door, Inc.
   3. Substitutions: None.

C. Doors and Frames
   1. Flush type fiberglass reinforced plastic - solid core doors and frames.
   2. System Thermal Transmittance: U-value of not more than 0.087 nominal BTU per AAMA 15031.

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2.02 DOOR CONSTRUCTION

A. FRP door panels shall be made of fiberglass-reinforced plastics using resins and reinforcements tailored to the corrosive environment peculiar to particular project. Door panel shall have a fiberglass content of not less than 25 percent by weight and all exterior surfaces shall be treated with ultra-violet inhibitors. The door panels shall be flush construction having no seams or cracks. All mortises shall be provided by the manufacturer. Unless otherwise specified, door thickness shall be nominal 1-3/4 inches.

B. Face Sheets:
   1. One continuous piece of FRP material of suitable structural integrity and resin composition to provide a door panel with the ability to perform reliably in the specified environment and physical constraints.
   2. Standard face sheets shall be manufactured using a corrosion-resistant resin system with light stabilizing additives. The resin shall be reinforced with fiberglass.
   3. Face sheets shall be 0.070 inch to 0.125 inch thickness.

C. Core: All voids between the door faces shall be completely filled with expanded polyurethane foam, minimum density 4 pounds per cubic foot, maximum flame developed index less than 25 in accordance with ASTM E84.

D. Stiles and Rails: Door panels shall be constructed with the use of a full stile and rail structure. Doors that do not have an engineered stile and rail system are not acceptable. The stile and rail system is to be fabricated entirely from FRP components and shall, of themselves, provide the structural integrity for the door panels. The stile and rail system of itself shall provide an impenetrable barrier between the edge of the door and the core material. The stiles and rails shall provide the primary support for hardware accessories and attachments. Pultrusion: In compliance with pultrusion industry standards.

E. Reinforcements: Door panels shall be adequately reinforced and compression members fabricated from suitable corrosion resistant materials so as to accommodate hinges, closer units, locksets, kickplates, push pull plates, exit devices, strikes, etc. No wood blocking and steel or aluminum plates, ribs, fitting, or fasteners are to be used.

F. Thru-bolting: Doors shall contain sufficient internal reinforcing in the areas of thru-bolt hardware as specified. Reinforcement shall be a corrosion-resistant compression member with the ability to resist typical thru-bolt torquing and maintain the sealed integrity of the panel.

G. Finish: Standard coat to be gray or white, matte finish, paintable.

2.03 FRAME CONSTRUCTION

A. One-piece molded cross-section with molded stop, fabricated entirely from FRP materials.

B. Frames shall be reinforced with anchor blocks and prepared for the attachment of hinges, closer units, panic exit devices and any other pertinent hardware. Mortises for the hinges shall be prepared by the factory. All hardware reinforcements will be made from polymer materials, unless alternates are approved.

C. Corner Joints: Head and jamb members shall be standard 45 degrees miter, providing a neatly mitered corner connection, fabricated for Knocked Down (KD) field assembly. Jambs and header shall be joined at corners with hidden FRP angle chips and stainless steel flat head screws. Screws shall not be visible on interior or exterior frames faces. Chemically welded frames are acceptable.

D. Finish: Standard coat to be gray or white, minimum 15 mils thick, matte finish, paintable.

E. Provide drilled holes in frame for silencers for interior doors without weatherstripping.

F. Provide mortar guard box.

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2.04 ACCESSORIES

A. Removable Glazing Stops: Rolled FRP channel shape, batted corners; prepared for counter sink style tamper-proof stainless steel screws; stops must not extend beyond face of door.

B. Hardware: All doors and frames shall be machined using templates available from the manufacturer of specified hardware. Doors and frames shall be internally reinforced for specified surface hardware before core is installed in door. Hardware shall be field installed.

C. Fasteners: Stainless steel. Conceal fasteners wherever possible.

2.05 FABRICATION

A. Glazing: Glass support structure shall ensure that the glass area is weathersealed as to not permit moisture and contaminants to enter the core of the door. Glazing must allow for ready access for repair, in the event of damage or replacement, without affecting the sealed integrity of the cutout in the door panel itself.

B. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of material in manner which prevents damage to exposed surfaces.

C. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

D. Clearance: Door shall be manufactured with proper hinge rail clearance depending upon hinge type used, and 1/8 inch at head, 1/8 inch at lock rail, and 3/4 inch at bottom rail above finished floor without threshold.

2.06 FINISHING

A. Field finish under Section 09 96 00.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that opening sizes and tolerances are acceptable.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's requirements.

B. Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00.

C. Install doors and frames in accordance with SDI-100.

D. Coordinate installation of glass and glazing specified in Section 08 80 00.

E. Coordinate with wall construction for anchor placement.

3.03 ADJUSTING

A. Section 01 70 00 - Execution and Closeout Requirements: Adjustment provisions.

B. Adjust door for smooth and balanced door movement.

END OF SECTION

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SECTION 08 33 44
OVERHEAD COILING FIRE CURTAIN

PART 1 GENERAL

1.01 SUMMARY

A. Section includes manual, automatic rolling fire service door.

1.02 RELATED SECTIONS

A. Division 04 – Masonry

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
   1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   2. ASTM A 666 - Standard Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

B. Intertek Testing Services (Warnock Hersey Listed):
   1. WH - Certification Listings.

C. National Fire Protection Association (NFPA):
   1. NFPA 80 - Standard for Fire Doors, Fire Windows.

1.04 DESIGN REQUIREMENTS

A. Fire Rated Assemblies: Provide assemblies complying with NFPA 80 and listed in UL Directory or Intertek Testing Services (Warnock Hersey Listed) Directory.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing Work of this section with a minimum of five years experience.

B. Installer Qualifications: Company approved by manufacturer, specializing in performing Work of this section with minimum three years experience.

1.06 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Details of construction and fabrication.
   4. Installation methods.

C. Shop Drawings: Include detailed plans and elevations, details of framing members, anchoring methods, clearances, hardware, and accessories.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

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1.07 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.08 WARRANTY

A. Manufacturer’s Warranty: Provide manufacturer’s two-year limited warranty.

B. Warranty: Manufacturer’s limited door and operators System warranty of all parts and components of the system, except counterbalance spring and finish, for 3 years or 20,000 cycles, whichever comes first.

1.09 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Closeout Procedures: Closeout provisions.

B. Operation and Maintenance Data: Submit lubrication requirements and frequency, and periodic adjustments required.

PART 2 PRODUCTS

2.01 ROLLING FIRE SERVICE DOOR

A. Acceptable Manufacturers
   1. Basis of Design: Overhead Door Co., FireKing Model 634 fire door.
   2. Other Acceptable Manufacturers:
      a. Cookson Company
      b. Cornell Iron Works
      c. Raynor Door Company
      d. Rytec Corporation
      e. Substitutions: Section 01 60 00 - Material and Equipment.

B. Label: Provide fire doors certified with the following listing.

C. Rolling fire doors up to 152 sf (14.12 sm) and not exceeding 13 feet 6 inches (4.11 m) in width or height shall receive the UL 4-Hour Class A Label when face mounted to masonry opening.

D. Curtain: Interlocking roll-formed slats as specified following. Endlocks shall be attached to each end of alternate slats to prevent lateral movement.
   1. 20-gauge galvanized steel.

E. Finish:
   1. Galvanized Steel: Slats and hood galvanized steel to ASTM A 653 finished with a rust-inhibitive roll coating process, including bonderizing, a 0.2 mils thick baked prime paint, and a 0.6 mils thick baked top coat.
   2. Polyester Top Coat. Architect to select color from minimum of (4) standard available colors (gray, tan, white, or brown).

F. Bottom Bar: Two galvanized steel angles with 1-1/2 inch by 1-1/2 inch by 1/8-inch (38 mm by 38 mm by 3 mm) minimum.

G. Guides: Three structural steel angles.
   1. Finish: PowderGuard Zinc Finish for guides, bottom bar and head plate.
   2. Fastening Guides to Masonry Fire Walls: UL listed for fire in accordance with manufacturer’s listing.

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H. Brackets: Hot rolled steel to support counterbalance, curtain and hood.

I. Finish; Bottom Bar, Guides, and Brackets: Black powdercoat finish.

J. Counterbalance: Helical torsion spring type housed in a steel tube or pipe barrel, supporting the curtain with deflection limited to 0.03 inch per foot of span. Counterbalance is adjustable by means of an adjusting tension wheel.

K. Hood: Fabricate of 24 gauge galvanized primed steel minimum for wall openings thru 19 feet (5.79 m) wide.

L. Manual Operation: Manual push

M. Automatic Closure Standard Fire Door: UL approved release mechanism equipped with a 165-degree fusible link.

N. Wall Mounting Condition: Face-of-wall mounting.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination provisions and project conditions.

B. Verify opening sizes, tolerances and conditions are acceptable.

C. Examine conditions of substrates, supports, and other conditions under which this work is to be performed.
   1. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

D. Beginning installation means acceptance of substrates.

3.02 INSTALLATION

A. Use anchorage devices to securely fasten assembly to wall construction and building framing without distortion or stress.

B. Securely and rigidly brace components suspended from structure. Secure guides to structural members only.

C. Fit and align assembly including hardware; level and plumb, to provide smooth operation.

D. Install in accordance with manufacturers instructions and standards.

E. Coordinate installation of electrical service with Division 26. Complete wiring from disconnect to unit components to door operator.

F. Coordinate installation of sealants and backing materials at frame perimeter as specified in Section 07 92 00.

G. Install perimeter trim and closures.

3.03 ERECTION TOLERANCES

A. Section 01 45 00 - Quality Control: Tolerances.

B. Maintain dimensional tolerances and alignment with adjacent Work.

C. Maximum Variation From Plumb: 1/16 inch.

D. Maximum Variation From Level: 1/16 inch.

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E. Longitudinal or Diagonal Warp: Plus or minus 1/8 inch per 10 foot straight edge.

3.04 ADJUSTING

A. Section 01 77 00 - Closeout Procedures: Testing, adjusting, and balancing provisions.

B. Adjust door, hardware, and operating assemblies for smooth and noiseless operation.

3.05 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Clean door and components.

C. Remove labels and visible markings.

END OF SECTION

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SECTION 08 71 00
DOOR HARDWARE

PART 1 GENERAL

1.01 WORK INCLUDED

A. Hardware for fiberglass reinforced polyester doors and frames.

B. Thresholds.

C. Gasketting.

1.02 WORK FURNISHED BUT INSTALLED UNDER OTHER SECTIONS

A. Furnish templates to Sections 08 16 00 for door and frame preparation.

1.03 RELATED WORK

A. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System.

1.04 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI A117.1-2017 - Accessible and Usable Buildings and Facilities.
   2. ANSI A156 - Complete Set of 24 BHMA Standards (A156 Series) with Binder.

B. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.

C. Architectural Woodwork Institute (AWI).

D. Builders' Hardware Manufacturers Association (BHMA).

E. Door and Hardware Institute (DHI).

F. International Code Council:
   1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.
   2. IECC - International Energy Conservation Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

G. National Association of Architectural Metal Manufacturers (NAAMM).

H. Steel Door Institute (SDI).

I. Underwriters Laboratories Inc. (UL):
   1. UL 305 - Panic Hardware.
   2. UL - Building Materials Directory.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with the following requirements:
   1. ANSI A156 series.
   2. UL 305.

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1.06 CLOSEOUT SUBMITTALS

A. Section 01 77 00 - Execution and Closeout Requirements: Closeout provisions.

B. Project Record Documents: Record actual locations of installed cylinders and their master key code.

C. Operation and Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.

D. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.

1.07 QUALIFICATIONS

A. Manufacturers: Companies specializing in manufacturing door hardware with minimum three (3) years experience.

B. Hardware Supplier: Company specializing in supplying commercial door hardware with three (3) years documented experience.

1.08 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Submit schedule.

C. Shop Drawings: Indicate locations and mounting heights of each type of hardware.

D. Product Data: Submit catalog cuts.

1.09 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Package hardware items individually with necessary fasteners, instrumentations, and templates; label and identify package with door opening code to match hardware schedule.

C. Protect hardware from theft by cataloging and storing in secure area.

1.10 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination provisions.

B. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

C. Provide templates or actual hardware as required to ensure proper preparation of doors and frames.

D. Coordinate Owner's keying requirements during course of work, prior to submittal of shop drawings. Confirm Schlage cylinders are compatible with Owner's master key system.

1.11 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements: Warranty provisions.

B. Closer: Furnish 10 year warranty.

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1.12 MAINTENANCE MATERIALS

A. Section 01 77 00 - Execution and Closeout Requirements: Maintenance materials.

B. Furnish special wrenches and tools applicable to each different or special hardware component.

C. Furnish maintenance tools and accessories supplied by hardware component manufacturer.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Geared Hinges: Roton, Pemco, Hager.

B. Cylinder Latch Sets: Dorma, Schlage, Sargent. No substitutions.

C. Exit Devices: Dorma, Sargent, Von Duprin. No substitutions.

D. Cylinder Locks: Schlage. No substitutions.

E. Pulls: Builders Brass, Hiawatha, Rockwood.

F. Closers: Dorma, LCN. No substitutions.

G. Manual Bolts: Hager, Ives, Rockwood.

H. Thresholds: National Guard, Reese, Zero, Pemco.

I. Gasketting and Weatherstripping: National Guard, Reese, Zero, Pemco.

J. Threshold Gasket: Weather-Bloc Systems, www.weatherblocsystems.com; 414-375-8101.

K. Protection Plates: Builders Brass, Hager, Hiawatha, Rockwood.

L. Silencers: Ives, Rockwood

2.02 KEYING

A. Door Locks: Key per Owner requirements to existing master key systems at substantial completion.

B. Supply two (2) keys for each lock.

C. Supply keys per Owner requirements.

2.03 FINISHES

A. Finishes are identified in Schedule at end of this Section.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.

C. Verify that power supply is available to power operated devices.

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D. Beginning of installation means acceptance of substrates.

3.02 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and requirements of SDI, NFPA 80, and BHMA.

B. Use the templates provided by hardware item manufacturer.

C. Mounting heights for hardware from finished floor to centerline of hardware item shall comply with ADA, ANSI, and BHMA.

D. Conform to ADA and ANSI for positioning requirements for accessibility.

3.03 ADJUSTING

A. Section 01 77 00 - Execution and Closeout Requirements: Testing, adjusting, and balancing.

B. Adjust hardware for smooth operation.

3.04 PROTECTION OF INSTALLED CONSTRUCTION

A. Section 01 77 00 - Execution and Closeout Requirements: Protecting installed construction.

B. Do not permit adjacent work to damage hardware or hardware finish.

3.05 SCHEDULE (H.S. = Hardware Set)

H.S.1 (exterior single door)

1 geared hinge	780-112HD *(no door offset)*	(Hager)
1 exit device	CD 98 996L-NL (ANSI 03) xcylinder, US28	(Von Duprin)
	Key retracts latch bolt but does not unlock door	
2 cylinders	*for exterior lock and dogging*	(Schlage)
1 closer	P4040XP Spring H-Cush	(LCN)
	Install over weatherstripping	
	SRI primer and powder coat finish	
1 kickplate	190S, 12 inch, 32D	(Hager)
1 jamb seal	700S	(NG)
	Mount under closer	
1 threshold	613	(NG)
1 threshold gasket	ThresTite, 0.188"x4.5"	(Weather-Bloc)
	Install under threshold	
1 threshold seal	700S *(1.5" wide)*	(NG)
	Install on top of threshold	
1 door shoe w/ sweep	95WH	(NG)

H.S.2 (exterior double door at Chemical)

2 geared hinges	780-112HD *(no door offset)*	(Hager)
1 exit device (*active*)	CD 98 996L-NL (ANSI 03) xcylinder	(Von Duprin)
	Key retracts latch bolt but does not unlock door	
2 cylinders (*active*)	*for exterior lock and dogging*	(Schlage)
1 surface bolt (*inactive)*	SB453 12" (top of door)	(Ives)
1 surface bolt (*inactive)*	SB453 8" (bottom of door)	(Ives)
2 closers	P4040XP Spring H-Cush	(LCN)
	Install over weatherstripping	
	SRI primer and powder coat finish	
1 jamb seal	700S	(NG)

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	Mount under closer	
1 mullion seal (*active)*	5100N	(NG)
	Install to exterior of active door	
1 threshold	613	(NG)
1 threshold gasket	ThresTite, 0.188”x4.5”	(Weather-Bloc)
	Install under threshold	
1 threshold seal	700S *(1.5” wide)*	(NG)
	Install on top of threshold	
2 door shoes w/ sweep	95WH	(NG)
2 kickplates	190S, 12 inch, 32D	(Hager)

H.S.3 (interior double door at Fluoride)

2 geared hinges	780-112HD *(no door offset)*	(Hager)
2 closers	P4040XP H-Cush	(LCN)
	Install over weatherstripping	
	SRI primer and powder coat finish	
2 door pulls	8302-6, 6”	(Ives)
1 astragal seal (pair)	672A	(NG)
1 threshold	613	(NG)
1 threshold gasket	ThresTite, 0.188”x4.5”	(Weather-Bloc)
	Install under threshold	
1 threshold seal	700S *(1.5” wide)*	(NG)
	Install on top of threshold	
2 door shoes w/ sweep	95WH	(NG)

H.S.4 (Interior single FRP door at Toilet)

1 geared hinge	780-112HD *(no door offset)*	(Hager)
1 lock	ND40S (ANSI F76-privacy)	(Schlage)
1 kickdown holder	FS452	(Ives)
1 roller bumper	RB4472 *mount on wall, near top of door*	(Ives)
3 silencers	SR64	(Ives)

H.S.5 (exterior single FRP door at Electrical)

1 geared hinge	780-112HD *(no door offset)*	(Hager)
1 exit device	CD 98 996L xcylinder	(Von Duprin)
	US28	
2 cylinders	*for exterior lock and dogging*	(Schlage)
1 closer	P4040XP Spring H-Cush	(LCN)
	Install over weatherstripping	
1 kickplate	190S, 12 inch, 32D	(Hager)
1 jamb seal	700S	(NG)
	Mount under closer	
1 threshold	613	(NG)
1 threshold gasket	ThresTite, 0.188”x4.5”	(Weather-Bloc)
	Install under threshold	
1 threshold seal	700S *(1.5” wide)*	(NG)
	Install on top of threshold	
1 door shoe w/ sweep	95WH	(NG)

H.S.6 (interior single FRP door at Electrical)

1 geared hinge	780-112HD *(no door offset)*	(Hager)
1 exit device	98 996L (*always unlocked*)	(Von Duprin)
	US28	
1 closer	P4041XP H-Cush	(LCN)
3 silencers	SR64	

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H.S.7 (exterior single FRP door at Treatment)

1 geared hinge	780-112HD *(no door offset)*	(Hager)
1 exit device	CD 98 996L xcylinder US28	(Von Duprin)
2 cylinders	for exterior lock and dogging	(Schlage)
1 closer	P4040XP Spring H-Cush *Install over weatherstripping*	(LCN)
1 kickplate	190S, 12 inch, 32D	(Hager)
1 jamb seal	700S *Mount under closer*	(NG)
1 threshold	613 (NG)	
1 threshold gasket	ThresTite, 0.188"x4.5" *Install under threshold*	(Weather-Bloc)
1 threshold seal	700S *(1.5" wide)* *Install on top of threshold*	(NG)
1 door shoe w/ sweep	95WH	(NG)

H.S.8 (Exterior double door at Treatment)

2 geared hinges	780-112HD *(no door offset)*	(Hager)
1 exit device (*active*)	CD 98 996L-NL (ANSI 03) xcylinder *Key retracts latch bolt*	(Von Duprin)
2 cylinders (*active*)	*for exterior lock and dogging*	(Schlage)
1 exit device (*inactive*)	CD 98 EO (no exterior handle)	
1 cylinder (*inactive*)	*for dogging* (Schlage)	
1 mullion (*removable*)	KR 4954 *Removable steel mullion with SP28 finish* *Furnish with strikes for exit devices* *Install over threshold and threshold seal*	(Von Duprin)
1 cylinder (*mullion*)	*type required by removable mullion*	(Schlage)
2 closers	P4040XP Spring H-Cush *Install over weatherstripping* *SRI primer and powder coat finish*	(LCN)
1 jamb seal	700S *Mount under closer*	(NG)
1 mullion seal	5100N	NG
1 threshold	613	(NG)
1 threshold gasket	ThresTite, 0.188"x4.5" *Install under threshold*	(Weather-Bloc)
1 threshold seal	700S *(1.5" wide)* *Install on top of threshold*	(NG)
2 door shoes w/ sweep	95WH	(NG)
2 kickplates	190S, 12 inch, 32D	(Hager)

NOTES:

1. Finishes:
   a. US26D/32D, unless noted otherwise.
   b. Closers sprayed aluminum, unless noted otherwise.
2. Lock type design as follows, unless noted otherwise:
   a. Schlage D Series, Rhodes. Von Duprin #6 Lever.
   b. Full size interchangeable cores.
3. Closers:
   a. Parallel arm.
   b. Mount on "push" side of door, unless noted otherwise.
4. Weatherstripping:
   a. Do not cut weatherstripping at jamb or head for panic device latch or closer. These items are to be installed over the top of the weatherstripping, unless noted otherwise.

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b. Confirm undercut of door and install door and frame to provide adequate clearance between top of threshold and bottom of door bottom.

END OF SECTION

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SECTION 08 81 00
GLASS GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass and glazing for borrowed lites.

1.02 RELATED SECTIONS

A. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System.

1.03 REFERENCES

A. American National Standards Institute (ANSI):
   1. ANSI Z97.1 - Safety Performance Specifications and Methods of Test for Safety Glazing Used in Buildings.

B. American Society of Civil Engineers (ASCE):
   1. ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

C. American Society for Testing and Materials (ASTM) International:
   1. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
   2. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   3. ASTM C1048 – Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass.
   4. ASTM C1193 - Standard Guide for Use of Joint Sealants.
   5. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

D. Federal Specification Unit (FS):
   1. FS A-A-272B - Caulking Compounds.
   2. FS TT-S-01543 - Sealing Compound, Silicone Rubber Base.

E. Glass Association of North America (GANA) - formerly FGMA:
   1. GANA - Sealant Manual.
   2. GANA - Glazing Manual.

F. International Code Council:
   1. IBC - International Building Code, 2021 Edition, and referenced standards with 2025 State of Wisconsin amendments.

G. Underwriters Laboratories Inc. (UL):
   1. UL - Building Materials Directory.

1.04 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and GANA Sealant Manual for glazing installation methods.

1.05 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum three (3) years experience.

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1.06 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Environmental provisions.

B. Do not install glazing when ambient temperature is less than 50 degrees F.

C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.07 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on drawings.

1.08 COORDINATION

A. Section 01 31 13 - Project Coordination: Coordination provisions.

B. Coordinate the Work with glazing frames.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Glass:
1. Cardinal IG.
2. Libby-Owens-Ford.
3. Pilkington.
4. PPG.
5. Viracon.

2.02 GLASS MATERIALS

A. Type A: Safety glass, 1/4-inch tempered.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that openings for glazing are correctly sized and within acceptable tolerance.

C. Verify surfaces of glazing channels or recesses are clean, free of obstructions impeding moisture movement, weeps are clear, and ready to receive glazing.

D. Beginning of installation means acceptance of substrates.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Perform installation in accordance with GANA Glazing Manual.

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1. Glazing Sealants: Comply with ASTM C1193.

B. Install in accordance with glazing and frames manufacturer's instructions.

C. Interior Wet/Dry Method (Tape and Sealant) Installation:
1. Cut glazing tape to length and install against permanent stops, projecting 1/16 inch above sight line.
2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
3. Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of pane or unit.
4. Install removable stops, spacer shims inserted between glazing and applied stops at 24 inch intervals, 1/4 inch below sight line.
5. Fill gaps between pane and applied stop with elastomeric glazing sealant to depth equal to bite on glazing, to uniform and level line.
6. Trim protruding tape edge.

3.04 CLEANING

A. Section 01 77 00 - Closeout Procedures: Cleaning provisions.

B. Remove glazing materials from finish surfaces.

C. Remove labels from glass after work is complete.

D. Clean glass and adjacent surfaces.

3.05 PROTECTION OF FINISHED WORK

A. Section 01 50 00 - Temporary Facilities and Controls: Protection of finished work provisions.

B. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

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SECTION 09 29 00
GYPSUM BOARD

PART 1 GENERAL

1.01 WORK INCLUDED

A. Gypsum board and joint treatment.

B. Texture finish.

C. Labor and scaffolding required to complete satisfactorily all work of this section.

1.02 RELATED WORK

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

B. Section 04 20 00 - Unit Masonry.

C. Section 06 10 00 - Rough Carpentry: Substrate and blocking.

D. Section 07 27 13 - Sheet Membrane Air Vapor Retarder: Substrate

E. Section 09 96 00 - High Performance Coatings: Surface finish.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM) International:
1. ASTM C475 - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
2. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
3. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
4. ASTM C1396 - Standard Specification for Gypsum Board.
5. ASTM C1658 – Standard Specification for Glass Mat Gypsum Panels
6. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
7. ASTM D6329 – Standard Guide for Developing Methodology for Evaluating the Ability of Indoor Materials to Support Microbial Growth Using Static Environmental Chambers
8. ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
9. ASTM E136 – Standard Test Method for Assessing Combustibilty of Materials Using a Vertical Tube Furnace at 750^{O}C.

B. Gypsum Association (GA):
1. GA 201 – Gypsum Board for Walls and Ceilings.
2. GA 214 - Recommended Levels of Gypsum Board Finish.
3. GA 216 - Application and Finishing of Gypsum Panel Products.
4. GA 223 - Gypsum Panel Products, Types, Uses, Sizes, and Standards.
5. GA 232 - Painting for New Gypsum Board.
6. GA 253 - Application of Gypsum Sheathing.

C. Underwriters Laboratories Inc. (UL):
1. UL - Fire Resistance Directory.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

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B. Product data: Submit product on the drywall sheet products.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with ASTM C840, GA-214, GA-216, and GA-600.

1.06 QUALIFICATIONS

A. Installer: Company specializing in performing work of this section with minimum three (3) years documented experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD SYSTEMS

A. Manufacturers:
1. Celotex Corp.
2. Georgia-Pacific.
3. Gold Bond Building Products.
4. United States Gypsum Company (USG).
5. Substitutions: 01 60 00 - Material and Equipment.

2.02 GYPSUM BOARD MATERIALS

A. Manufacturers:
1. Celotex Corp.
2. Georgia-Pacific.
3. Gold Bond Building Products.
4. United States Gypsum Company.
5. Substitutions: 01 60 00 - Material and Equipment.

B. Gypsum Board for Walls: 5/8-inch thick
1. Fiberglass faced (no paper): ASTM C1658 and ASTM C1396, moisture-resistant core with coated fiberglass mat on both sides; ASTM D3273 mold resistance; ASTM D6329 microbial resistant; ASTM E136 non-combustible; tapered edges. 1/2-inch thick.
a. Georgia-Pacific DensArmor Plus Fireguard Interior Panel.
b. Gold Bond eXP Interior Extreme Gypsum Panel
c. USG Sheetrock Brand Glass-Mat Panels Mold Tough

2.03 ACCESSORIES

A. Edge Trim: Vinyl.

B. Screws: Flat Phillips head bugle drywall screws

C. Joint Materials: ASTM C475; GA-216; reinforcing tape, joint compound, adhesive, and water.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Verify that site conditions are ready to receive work.

C. Beginning of installation means acceptance of substrate.

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3.02 GYPSUM BOARD INSTALLATION

A. Install gypsum board in accordance with GA 216 and manufacturer's instructions.

B. Erect single layer gypsum board in most economical direction, with ends and edges occurring over firm bearing.

C. Use screws when fastening gypsum board to framing.

D. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials and at exposed edges or ends.

E. Provide control joints consistent with lines of building spaces, spaced not more than 30 feet apart.

3.03 JOINT TREATMENT

A. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.

B. All joints shall have tape embedded in joint compound and three separate coats of joint compound applied over all joints angles, fastener heads, and accessories. All joint compounds shall be smooth and free of tool marks and ridges.

C. Feather coats onto adjoining surfaces.

D. Install joint treatment in accordance with GA-201 and GA-216 and manufacturer's instructions.

3.04 SURFACE TEXTURE

A. Apply a light sprayed-on orange peel texture on all walls unless noted otherwise on room finish schedule or if there is a wall covering scheduled.

3.05 TOLERANCES

A. Section 01 45 00 - Quality Control: Tolerances.

B. Maximum Variation from True Flatness: 1/8 inch in 10 feet in any direction.

END OF SECTION

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SECTION 09 96 00
HIGH PERFORMANCE COATINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The Contractor shall paint all surfaces required as indicated on the contract drawings and as specified herein. The work includes painting and finishing items and surfaces and preparation of surfaces to receive coatings throughout the project as shown on the drawings and in the Painting Schedule in this section, or by direction of the Engineer.

B. Paint all surfaces exposed to view whether or not colors are designated in Painting Schedule, except where the natural finish of the material is obviously intended or specifically noted. Where items or surfaces are not specifically mentioned, paint these the same as adjacent similar materials or areas.

C. The work includes field painting of all exposed structural steel, bare and covered pipes and ducts (including color coding), hangers, exposed ferrous metal work and primed metal surfaces of equipment.

D. All process equipment, such as pumps and blowers, shall be painted the color indicated in the Color Schedule found elsewhere in this section.

E. Contractor shall paint existing surfaces damaged by construction activities and surfaces to receive work. Surface preparation and painting system shall be as scheduled in this section. Color shall be selected by Owner from samples submitted by Contractor to as closely as possible match existing surfaces.

F. Examine specifications and drawings of all other trades and become thoroughly familiar with provisions regarding their painting.

1.02 WORK NOT INCLUDED

A. Shop Priming: Unless otherwise specified, shop primer coats are included under the various sections for structural steel, miscellaneous metal, hollow metal work, architectural woodwork, and shop-fabricated or factory-built mechanical and electrical equipment, and similar items.

B. Pre-Finished Items: Unless otherwise indicated, do not paint factory-finished or pre-finished items such as (but not limited to) metal toilet enclosures, acoustic materials, architectural woodwork, finished mechanical and electrical equipment including light fixtures, switch gear and power distribution cabinets, decorative masonry units or process piping with exterior bituminous coating. All process equipment, such as pumps and blowers, shall be painted the color indicated in the Color Schedule found elsewhere in this section.

C. Concealed Surfaces: Unless otherwise directed, painting is not required on surfaces such as walls or ceilings in concealed areas and inaccessible areas (i.e., foundation spaces, furred areas, utility tunnels, pipe spaces, duct shafts, and crawl space walls).

D. Finished Metal Surfaces: Metal surfaces of anodized aluminum, stainless steel, chromium (chrome) plate, and similar finished materials will not require finish painting, except as otherwise directed.

E. Operating Parts: Do not paint any moving parts of operating units, slide and bearing surfaces, mechanical and electrical parts such as valve and damper operators, linkages, sending devices, motor and fan shafts, unless otherwise directed or; machined or polished surfaces of equipment where such surfaces are susceptible to rolling or sliding friction.

F. Labels: Do not paint over any required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates. (This does not include cast or embossed names on equipment castings.)

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1.03 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals – Division 01

C. Concrete – Division 03 (All Sections)

D. Masonry – Division 04 (All Sections)

E. Metals - Division 05 (All Sections)

F. Woods, Plastics, and Composites – Division 06 (All Sections)

G. Thermal and Moisture Protection - Division 07 (All Sections)

H. Openings - Division 08 (All Sections)

I. Finishes - Division 09 (All Sections)

J. Plumbing – Division 22 (All Sections)

K. Heating, Ventilating, and Air Conditioning – Division 23 (All Sections)

L. Electrical – Division 26 (All Sections)

M. Exterior Improvements – Division 32 (All Sections): Painting of pavement

N. Process Integration - Division 40 (All Sections)

O. Pollution Control Equipment – Division 44 (All Sections)

1.04 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.05 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto. Current edition, unless noted otherwise.
   1. American Concrete Institute
      a. ACI 347 – Guide to Formwork in Concrete
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer and Related Products.
   3. International Concrete Repair Institute (ICRI):
      a. ICRI Technical Guideline 310.2R – Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays and Concrete Repair
   4. Steel Structures Painting Council (SSPC), Specification and Standards:
      a. Steel Structures Painting Manual, Volume 2, “Systems & Specifications”, Current Edition.
      b. SSPC Guide 23, Field Methods For The Determination Of Moisture In Concrete and Masonry Walls and Ceilings
      c. SSPC-TR 3/NACE 6A192 – Dehumidification, Temperature Control, Surface Preparation
      d. SSPC-TR 2/NACE 6G198 – Wet Abrasive Blast Cleaning
      e. SSPC-TR 1/NACE 6G194 – Thermal Pre-Cleaning
      f. SSPC-SP WJ-4/NACE WJ-4 – Light Waterjetting
      g. SSPC-SP WJ-3/NACE WJ-3 – Thorough Waterjetting

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h. SSPC-SP WJ-2/NACE WJ-2 – Very Thorough Waterjetting
i. SSPC-SP WJ-1/NACE WJ-1 – Waterjetting To Bare Substrate
j. SSPC-SP 7/NACE No. 4 – Brush-Off Blast Cleaning
k. SSPC-SP 7 (WAB)/NACE WAB-4 – Brush-Off Wet Blast Cleaning
l. SSPC-SP 6/NACE No. 3 – Commercial Blast Cleaning
m. SSPC-SP 6 (WAB)/NACE WAB-3 – Commercial Wet Blast Cleaning
n. SSPC-SP 5/NACE No. 1 – White Metal Blast Cleaning
o. SSPC-SP 5 (WAB)/NACE WAB-1 - White Metal Wet Blast Cleaning
p. SSPC-SP 3 – Power Tool Cleaning
q. SSPC-SP 2 – Hand Tool Cleaning
r. SSPC-SP 16 – Brush-Off Blast Cleaning Non-Ferrous Metals
s. SSPC-SP 15 – Commercial Power Tool Cleaning
t. SSPC-SP 14 (WAB)/NACE WAB-8 – Industrial Wet Blast
u. SSPC-SP 13/NACE 6 – Surface Prep of Concrete
v. SSPC-SP 11 - Bare Metal Power Tool Cleaning
w. SSPC-SP 10/NACE No. 2 – Near-White Blast Cleaning
x. SSPC-SP 10 (WAB)/NACE WAB-2 – Near White Wet Blast
y. SSPC-SP 1 – Solvent Cleaning

1.06 DEFINITIONS

A. “Paint” as used herein means all coating systems materials, including primers, emulsions, enamels, epoxies, stains, varnishes, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

B. “Immersion” service is defined as being below the elevation of the top of the wall of a structure containing liquid.

C. “High Moisture” service is defined as an area where the humidity is typically higher than surrounding areas. Surfaces to be coated with “High Moisture” service paint will be labeled as such in the Painting Schedule.

D. Bug Holes (in concrete): Surface voids, as small or irregular cavities, usually not exceeding 5/8-inch (or 15-mm) in diameter, resulting from entrapment of air bubbles in the surface of formed concrete during placement and consolidation. Bug holes may be considered defects if the width or depth exceeds the maximum allowable sizes as defined by ACI 301.

1.07 SUBMITTALS

A. Submit manufacturer’s specifications, including label analysis and application instructions for each material specified. Furnish a complete set of color cards of proposed products to the Engineer for color selection by the Owner. The Engineer will furnish a schedule designating where various colors shall be applied.

B. Submittals for products other than those specified as the standard of quality in this specification, shall be presented ten (10) days before bid date along with manufacturer’s data sheets, and written performance criteria comparisons. No coating system shall be approved that changes generic type, thickness, number of coats or level of quality without written permission of the Engineer.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.09 DELIVERY, STORAGE, AND HANDLING

A. Material and Equipment - Division 01: Product storage and handling provisions.

B. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.

C. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing.

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D. Paint Materials: Store paint materials at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in well ventilated area, unless required otherwise by manufacturer's instructions.

E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Material and Equipment - Division 01: Environmental provisions.

B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 50 degrees F for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

C. Combustion type temporary heating devices shall be vented outside of any temporary enclosure and building envelop. Combustion gases shall not be allowed in any temporary enclosure and building envelope.

D. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.

E. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.

F. Minimum Application Temperatures for Paints: 50 degrees F, unless required otherwise by manufacturer's instructions.

1.11 QUALITY CONTROL

A. The Contractor shall submit a Quality Control Plan which identifies trained Quality Control personnel and identifies Quality Control procedures, including all tests, testing equipment, and standards, to be utilized.

B. Before proceeding with painting, finish one complete sample panel, space, room or item of each color scheme showing selected color, finish texture, and workmanship. Request review and approval by the Engineer of first finished sample panel, space, room or item. Use first acceptable sample panel, space, room or item as the standard for similar work throughout.
   1. Approved samples will be kept on job for comparison;
   2. Engineer reserves right to select unopened containers of materials furnished on job and have materials tested at an approved laboratory;
   3. Owner will pay for first tests. Retests of rejected materials and tests of replacement materials shall be paid for by Contractor. Remainder of contents of containers not required for testing will be returned to Contractor.

C. Include on label of each container:
   1. Manufacturer’s Name and Type of Material
   2. Federal Specification Number, if applicable
   3. Manufacturer’s Stock Number and Batch Number
   4. Contents by Volume of Major Pigment and Vehicle Constituents
   5. Thinning Instructions
   6. Application Instructions
   7. Color

1.12 REGULATORY REQUIREMENTS

A. Conform to Wisconsin Commercial Building Code (WCBC) for flame/fuel/smoke rating requirements for finishes as these references are applicable to materials and workmanship under this Contract.

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1.13 CLOSEOUT SUBMITTALS

A. Closeout Procedures - Division 01: Project closeout provisions.

1.14 EXTRA MATERIAL

A. Closeout Procedures - Division 01: Extra material provisions.

B. Provide a one (1) gallon container of each color, type, and finish to Owner for paint for walls and ceilings.

C. Provide one (1) quart container of each color, type, and finish to Owner for all other paint.

D. Label each container with color, texture, and room locations in addition to the manufacturer's label.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. The products listed are intended to establish a basis for comparison of products of other manufacturers. Substitutions shall comply with the requirements of the General & Supplementary Conditions and as specified herein.

B. All materials specified herein, and approved for use under this Contract shall be manufactured by one of the Manufacturers listed as follows: Tnemec, Sherwin-Williams, or equal.

2.02 MATERIALS

A. Provide the best grade (quality) of the various types of coatings as regularly manufactured by approved paint materials manufacturers. Materials not displaying the manufacturer's identification as a standard, best-grade product will not be acceptable. Refer to the Painting Schedule in this section for the types of paint and finishes to be applied to the various surfaces throughout the project.

B. Use only thinners recommended by the manufacturer and then only to the extent expressed on the latest printed data sheet.

PART 3 EXECUTION

3.01 DELIVERY, STORAGE AND PROTECTION

A. Deliver all materials to the job site in original, new and unopened packages and containers bearing manufacturer's name and label. Labels on each container shall include the following information:
   1. Manufacturer's Name and Type of Material
   2. Federal Specification Number, if applicable
   3. Thinning Instructions
   4. Application Instructions
   5. Clean-up Instructions
   6. Color

3.02 JOB CONDITIONS

A. Environmental Requirements: Comply with manufacturer's recommendations as to environmental conditions under which coating and coating systems may be applied. Do not apply paint in areas where dust is being generated.

B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures to within manufacturer's approved temperature range for at least 24-hours before, during, and 48-hours after application of finishes, unless otherwise required by manufacturer instructions.

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C. Protection: Cover or otherwise protect finished work, surfaces not being painted concurrently, or not to be painted.

D. Factory Painted Surfaces: The surface preparation and painting of materials and equipment shall be to manufacturer's standard, unless otherwise specified in applicable portions of these specifications.

E. Product Data Sheets (PDS) and Safety Data Sheets (SDS) for all materials shall be maintained on site at all times, along with manufacturer's technical bulletins that provide instructions for surface preparation and application.

3.03 SUBSTRATE EXAMINATION

A. Examine all surfaces to which paint is to be applied, and the conditions under which the work is to be performed. The Applicator shall notify the Contractor and Engineer in writing, of any conditions detrimental to the performance of this work.

B. All surfaces shall be a minimum of 5-degrees F. above the ambient dew point (and rising) prior to the application of any coatings.

C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
1. Gypsum Board: 12-percent
2. Masonry, Concrete, and Concrete Masonry Units: 12-percent
3. Wood: 15-percent (measured in accordance with ASTM D4442)

D. Test the surface of cementitious materials to verify the pH is within manufacturer's allowed range.

E. Examine cast-in-concrete surfaces for the presences of cracking. Where the type of crack is in question, moving or non-moving, consult with the Engineer prior to start of coating preparation.

F. Do not proceed with this work until unsatisfactory conditions have been corrected and are acceptable to the Applicator. Starting of painting work will be construed as the Applicator's acceptance of the surfaces and conditions.

3.04 TEMPORARY CONSTRUCTION

A. Furnish, install and remove upon completion of painting all scaffolding, ladders or other facilities required to complete painting work.

B. Provide temporary heating and ventilating facilities as required to conform to manufacturer's environmental conditions and within confined spaces; these facilities and all other methods or equipment required to facilitate painting work or afford protection of workers or work shall be furnished, installed and removed at the completion of work as part of this contract.

3.05 SURFACE PREPARATION

A. General
1. Perform preparation and cleaning procedures in strict accordance with the paint manufacturer's instructions and as herein specified, for each particular substrate condition.
2. Remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures, escutcheons, and similar items not to be painted, or provide surface applied protection prior to preparation and painting operations. Remove obstructions as necessary to permit complete painting of the items and adjacent surfaces. Following completion of painting of each space or area, install the removed items by workers skilled in the trades involved.
3. Clean surfaces to be painted before applying surface treatments. Remove all oil, grease, and foreign contaminants to meet the requirements of SSPC-SP1 prior to mechanical cleaning. Program

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the cleaning and painting so that contaminants from the cleaning process will not fall onto wet, newly painted surfaces.

B. Uncoated Steel and Iron
1. Pre-Clean all surfaces per SSPC-SP1 to remove all oil, grease and all other foreign contaminants with a cleaner/solvent recommended by the coating manufacturer.
2. Pre-Clean all surfaces to SSPC-SP1 followed by a minimum combination of SSPC-SP2 Hand Tool Cleaning/ SSPC- SP3 Power Tool Cleaning.
3. Prepare steel substrates in accordance with the Steel Structures Painting Council surface preparation number indicated in the application schedule and as outlined below, unless otherwise required by the paint manufacturer's most recent printed application instructions:
   a. SSPC-SP-1: thoroughly wipe with appropriate solvent using clean rags and solvent
   b. SSPC-SP-6/NACE 3: "Commercial Abrasive Blast
   c. SSPC-SP-6/NACE 3: surface Brush Blast using fine sand or grit to obtain finish similar to medium sand paper
   d. SSPC-SP-10: surface blast to Near-White Metal Finish
4. Prior to the application of prime coats, the surface shall meet the specified surface preparation standard. Clean and touch-up shop primer that has become marred.
5. Provide dehumidification equipment as necessary to maintain relative humidity at 40% or less.

C. Shop Primed Steel Surfaces
1. Pre-Clean all surfaces to SSPC-SP1 followed by a minimum combination of SSPC-SP2 Hand Tool Cleaning or SSPC-SP3 Power Tool Cleaning, to remove all oil, grease and all other foreign contaminants with a cleaner/solvent recommended by the coating manufacturer.
2. Touch-up paint structural steel, miscellaneous metal, hollow metal doors and frames and other materials which have been prime coated, as required, where shop coat has been damaged by welding or handling and erection; paint rivets, bolts and welds which are unpainted after assembly and erection.

D. Galvanized Steel
1. Pre-Clean all surfaces per SSPC-SP1 to remove all oil, grease and all other foreign contaminants with a cleaner/solvent recommended by the coating manufacturer.

E. Hot-Dipped Galvanized (HDG) Surfaces
1. HDG metal, which has not been weathered in an exterior environment for a minimum of 6 months and will be in an exterior exposure with a benign atmospheric exposure, shall be either abrading or etching using an approved etching cleaner.
2. HDG metal, which has weathered in exterior exposure for a minimum of 6 months, shall be cleaning as per SSPC-SP1.
3. HDG metal in a hazardous environments shall be prepared to SSPC-SP16 Brush Blasting Standards.
4. HDG hollow metal doors or decking shall be cleaned by a solvent wipe or power-washed.
5. HDG metal (shiny galvanized metal): the surface shall be cleaned with a water based degreasing agent or the appropriate solvent cleaner prior to application of primers and coatings or be prepared to SSPC-SP16 standards.
6. Touch-up galvanized coating where scratched or damaged with an approved 100-percent solids zinc-rich galvanizing paint.

F. Aluminum and Stainless Steel
1. Clean to remove surface contamination by steam or high-pressure water.
2. Remove oxidation with acid etch and solvent washing.
3. Apply etching primer immediately following cleaning.

G. Copper
1. Clean to remove surface contamination by steam, high-pressure water, or solvent washing.
2. Apply vinyl etch primer immediately following cleaning.

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H. Cementitious Materials
1. Pre-clean all surface to remove all oil, grease, efflorescence and other foreign contaminants
2. Preparing surface to SSPC-SP13/NACE 6 Concrete Surface preparation Standards.
3. Surface profile of surfaces to be painted shall be based on manufacturer's instructions and ICRI Guideline 310.2R Standards.
4. The pH of the concrete shall be a minimum of 10 prior to the application of repair products, primers or coatings.
5. Where the surface test for pH indicates surfaces are not within allowable range by the paint manufacturer, apply appropriate Alkali Resistant Primer per manufacturer's instructions.
6. Cementitious Materials (mortar, concrete, etc.) shall be cured a minimum of 28 days prior to the application of primers, paints and coatings.
7. Fill all voids, bug holes, non-moving cracks, and other surface defects using an approved cementitious mortar or epoxy filling compound per manufacturer's instructions to provide uniform surface texture prior to application of block filler or primer.
8. Apply block filler to surface of concrete masonry units, precast-concrete plank, and cast-in-place concrete to achieve a pinhole free surface prior to application of top coats.

I. Wood
1. Clean wood surfaces to be painted of all dirt, soil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required.
a. Sandpaper smooth those finished surfaces exposed to view, and dust off;
b. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other approved sealer, before application of the priming coat;
c. Apply knot sealer to all pitch pockets and resinous sapwood before priming coat is applied;
2. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

J. Asphalt or Bituminous
1. Clean to remove foreign particles.

K. Insulated Coverings
1. Clean to remove dirt, grease, and oil from canvas and cotton.

L. Miscellaneous
1. Preparation for other materials not previously listed shall be as required by product manufacturer.

3.06 MATERIAL PREPARATION

A. Mix and prepare painting materials in accordance with the manufacturer's directions. Stir materials before application to produce a mixture of uniform density, and stir as required during the application of the materials. Do not stir surface film into the material. Remove the film and, if necessary, strain the material before using.

3.07 COLORS

A. For estimating purposes, bidder shall assume that each individual room shall have one wall color and a second color for trim and accents. Ceilings may be painted different color than walls.

B. Access doors shall be enameled to contrast adjacent wall surfaces. Steel door lintels shall be painted to match door frames.

C. Hollow metal work will generally be enameled same color, but different color than adjacent walls.

D. Exposed piping and ducts generally (except for identification banding) will be painted color and texture to match adjacent walls, or ceilings.

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E. Intermediate coats of paint shall be tinted slightly darker than each preceding coat unless otherwise directed. Undercoats shall be tinted slightly lighter than finish coats.

3.08 APPLICATION

A. Contractor and applicator shall ensure the proper Dry Film Thickness is achieved in all paint/coating applications to satisfy the specification requirements and manufacturers recommendations, and as per Best Industry Standards.

B. It is the responsibility of the contractor to have the necessary calibrated dry film thickness gauges and wet film thickness gauges to ensure proper application.

C. All surfaces to be painted or coated shall be a minimum temperature of 5 degrees F above the dew point (and rising prior) to application of any primers, paints or coatings. Follow instructions and recommendations provided on the manufacturer product data sheets regarding temperature, relative humidity and other environmental factors.

D. Brush or roll materials smoothly in solid, even colors without drops, runs, lumps, defective brushing, discoloration or clogging of lines and angles. Make edges of paint adjoining other materials or colors sharp and clean without overlapping by masking edges of paint adjoining other materials or colors to obtain sharp, clean division.

E. Follow Manufacturer Instructions provided on the Product Data Sheets regarding re-coat windows and cure times.

F. Where thinning is necessary, only the products of the manufacturer furnishing the paint, and for the particular purpose, will be allowed; thin paint in strict accordance with the manufacturer's instructions and only with the full knowledge and approval of the Engineer.

G. Do not apply finish coats until after other trades, whose operations would be detrimental to finish painting, have completed work in the areas to be painted, and the areas have been approved by the Engineer for painting.

H. Touch up suction spots or "hot spots" in masonry or concrete after application of first coat and before applying second coat, to produce even result in finish coat. If undercoats, stains or other conditions show through the final coat of paint, apply additional coats until the paint film is of uniform finish, color and appearance.

I. Woodwork and doors shall be finished on all edges, tops and bottoms in same manner as specified for faces.

J. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.

K. Paint surfaces behind permanently fixed equipment or furniture with prime coat only.

L. Exposed conduit, ductwork, and piping shall be painted to match background color, unless noted otherwise.

M. At completion, touch up and restore finish where damaged. Paint top and bottom edges of doors one coat.

3.09 FIELD QUALITY CONTROL

A. Inspection and Testing

1. Inspection by the Engineer does not limit the Contractor's responsibilities for quality control inspection and testing as specified herein or as required by the Manufacturer's instructions.

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2. Contractor shall maintain a Quality Control Plan which documents and records the following information. This information shall be collected on a form and maintained on the job site for each day of work performed by the Contractor.
    a. Record of the following environmental conditions a minimum of four (4) times daily, prior to commencing work, post morning break, post lunch break, and post afternoon break:
        1) General weather conditions
        2) Air temperature
        3) Surface temperature
        4) Dew point
        5) Relative humidity
    b. Area of work completed each day
    c. Product and manufacturer information, batch numbers, and quantities of all material used on site each day
    d. Date and time of initiation and completion of surface preparation
    e. Date and time that materials were mixed and applied
    f. Details on surface preparation equipment and coating equipment used each day
3. Contractor shall perform the quality control procedures listed below in conjunction with the requirements of this Section:
    a. Inspect all materials upon receipt to ensure that all are supplied by the approved Manufacturer.
    b. Provide specified storage conditions for the coating materials and applicable solvents.
    c. Inspect and record findings for the degree of cleanliness of substrates used.
    d. Inspect and record substrate profile.
    e. Measure and record ambient air temperature using a thermometer and measure and record substrate temperature using an infrared or other surface thermometer.
    f. Measure and record relative humidity and dew point temperature using a sling psychrometer in accordance with ASTM E337.
    g. Provide correct mixing of coating materials in accordance with the Manufacturer's instructions.
    h. Inspect and record that the "pot life" of coating materials is not exceeded during installation.
    i. Verify curing of the coating materials in accordance with the Manufacturer's instructions.
    j. Upon completion of the coating system, the area shall be cleaned and prepared to permit close visual inspection by the Engineer or the Engineer's representative. Any and all deficiencies or defective work (not in compliance with this section or related sections) will be marked for repair or removal/replacement by the Contractor at no additional cost to the Owner.

B. Acceptance Criteria
1. Acceptance Criteria for Surface Preparation Work:
    a. All surfaces shall be prepared in accordance with the specification and referenced standards therein.
2. Acceptance Criteria for Coating System Application Work:
    a. Acceptable coating work will be based upon the following:
        1) No pock-marks, depressions, waviness or ridges, pinholes or holidays in either size or frequency.
        2) No intercoat bond failures between lifts.
        3) Proper curing of coatings.
    b. The Engineer or Engineer's Representative shall, at their discretion, inspect the following:
        1) Profile and degree of cleanliness of substrate.
        2) Thickness of materials/coverage rate confirmation.
        3) Ambient temperature and humidity requirements and substrate temperature.
        4) Curing and recoat times.
        5) Proper curing of the resurfacing materials.
    c. Rework required on any holidays or any other inadequacies found by the Engineer or the Engineer's Representative in the quality of the coating work shall be marked. Such areas

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shall be re-cleaned and reworked by the Contractor according to these specifications and the Manufacturer recommendations at no additional cost to the Owner.

d. The Contractor is responsible for keeping the Engineer informed of all progress so that inspection for quality can be achieved.

e. The Contractor is ultimately responsible for the quality performance of the applied materials and workmanship. Inspections by the Engineer or the Engineer's Representative do not limit this responsibility.

C. Final Inspection

1. Perform a final inspection to determine whether the resurfacing system work meets the requirements of the specifications. The Engineer and the Engineer's Representative will conduct final inspection with the Contractor.

3.10 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damages by cleaning, repairing or replacing, and repainting, as directed by the Engineer. Provide “Wet Paint” signs as required to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

3.11 CLEAN-UP

A. During the progress of the work, remove from the project all discarded paint materials, rubbish, cans and rags. Upon completion of painting work, clean all window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

3.12 PAINTING SCHEDULE

A. Provide the following finish painting systems for the various substrates as shown on the contract drawings and/or schedules and as specified herein.

1. Submit Painting Schedule to Engineer for color selection by Owner (see following for schedules);
2. Apply paints to surfaces in accordance with the schedule;
3. If surfaces have been primed at the mill, factory or shop, omit the surfacer coat specified hereinafter, except for touch-up; for touch-up, use surfacer of the same composition as the mill, factory or shop surfacer.

B. Substrates of “New or Previously Unpainted Surfaces” shall be defined and coated by painting systems scheduled as follows:

Substrate	System
1. Concrete and Masonry (cementitious materials):	
a. Block Masonry, Interior	B
b. Concrete Ceilings, Interior	E
c. Poured Concrete, Exterior	F
2. Metals:	
a. Building Accessories, Interior	G
b. Building Accessories, Exterior	H
c. Galvanized Metals, Interior, Non-Immersion	I
d. Galvanized Metals, Exterior, Non-Immersion	J
e. Galvanized Metals, Exterior, Immersion	K
f. Ferrous Metals, Interior and Exterior, Immersion	L
g. Ferrous Metals, Interior, Non-Immersion	M
h. Ferrous Metals, Exterior, Non-Immersion	N
i. Mill, Factory Paint Piping, Equipment and Machinery, Interior and Exterior	O
j. Mill Finish Aluminum	P

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3. Gypsum Board: .....Q
4. Plumbing and Miscellaneous:
   a. Plumbing - Copper, PVC and HDPE.....R
   b. Piping Insulation .....T
5. Wood:
   a. Wood, Interior and Exterior .....U
6. Dissimilar Materials .....Z

3.13 PAINTING SYSTEMS

A. Where more than one manufacturer is listed, it is the contractor's option to select from the list. A single manufacturer shall be used for each item.

B. All products shall be installed per manufacturer printed instructions.

C. Where no thickness is listed for a coat, install to thickness recommended by manufacturer.

D. Each coat shall be applied to an even finish. Apply next coat per manufacturer instructions for recoating time.

E. System A: Block Masonry, Exterior
1. Surface Preparation: Clean and dry and joints cured. Remove excess mortar and mortar smears.
2. Surfacer: One (1) coat Block Filler Epoxy, applied by spray and back roll technique to fill voids for even, pinhole free final finish.
   a. Tnemec Series 69
   b. Sherwin Williams Heavy Duty Block Filler
3. Surfacer: One coat Acrylic Emulsion.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
   c. or equal
4. Finish: Apply one (1) or two (2) topcoat(s) to provide an even pinhole free finish.
   a. Tnemec Series 73
   b. Sherwin-Williams Acrolon 218

F. System B: Block Masonry, Interior
1. Surface Preparation: Clean and dry and joints cured.
2. Surfacer: One (1) coat Block Filler Epoxy, applied by spray and backroller application, to fill voids as needed to provide an even, pinhole free final finish.
   a. Tnemec Series 69
   b. Sherwin Williams Heavy Duty Block Filler
3. Intermediate: One (1) coat Polyamidoamine Epoxy, applied by spray and backroller application.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646
4. Finish: One (1) coat Polyamidoamine Epoxy, applied by spray and backroller application.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646

G. System C: Concrete Walls, Interior
1. Surface Preparation: Per the requirements of SSPC-SP13/NACE 6 and the surface profile requirements of ICRI Guideline 310.2 R and the manufacturer's instructions.
2. Surfacer: One (1) coat thinned by volume Polyamidoamine Epoxy, roller applied.
   a. Tnemec Series 69
   b. Sherwin Williams Heavy Duty Block Filler
3. Intermediate: One (1) coat Polyamidoamine Epoxy, roller applied, same color as surfacer, without added thinner.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646

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4. Finish: One (1) coat Polyamidoamine Epoxy, unthinned.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646

H. System D: Concrete Floors, Interior
1. Moisture Vapor Transmission: Perform testing per ASTM D4263 (Plastic Sheet Method) to determine if moisture vapor transmission (MVT) is occurring. If testing indicates MVT is present, perform additional testing per ASTM F1869 (Calcium Chloride Testing) or ASTM F2170 (Insitu RH Probes). Testing per ASTM F 1869 shall produce results of less than 3lbs/1000sq ft. /24 hours. Testing per ASTM F2170 shall produce results of less than 75% RH.
2. Surfacer: One (1) coat thinned by volume Polyamidoamine Epoxy, roller applied.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646
3. Intermediate: One (1) coat Polyamidoamine Epoxy, roller applied.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646
4. Finish: One (1) coat Polyamidoamine Epoxy.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646

I. System E: Concrete Ceilings, Interior
1. Surfacer: One (1) coat Block Filler Epoxy, applied by spray and backroller application, to fill voids as needed to provide an even, pinhole free final finish.
   a. Tnemec Series 69
   b. Sherwin Williams Heavy Duty Block Filler
2. Intermediate and Finish: Two (2) coats Polyamidoamine Epoxy, applied by spray and backroller application.
   a. Tnemec Series 69
   b. Sherwin Williams Macropoxy 646

J. System F: Poured Concrete, Exterior
1. Surface Preparation: Prepare surface per SSPC-SP13/NACE #6, to surface profile specified in ICRI Guideline 301.2R, and manufacturer's instructions.
2. Surfacer: One (1) coat Acrylic Emulsion, roller applied.
   a. Tnemec Series 180
   b. Sherwin Williams Conflex XL
3. Finish: One (1) coat Acrylic Emulsion, roller applied.
   a. Tnemec Series 180
   b. Sherwin Williams Conflex XL

K. System G: Metal Building Accessories, Interior
1. Surface Preparation: SSPC-SP6 Commercial-grade blast level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of not less than 4.0 mils. Primer to be shop applied for new materials; field applied for existing materials.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
3. Shop or Field Intermediate: One (1) coat Polyamidoamine Epoxy, to an average DFT of 3.0 to 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
4. Touch-up in Field:
   a. Spot surface prepare by degreasing nuts and bolts and sanding and wire brushing the erection damage
   b. Follow with a spot primer of Modified Polyamidoamine Epoxy primer, brush applied in two (2) coats to build a minimum of 5.0 mils over these areas.
   c. Apply a final finish coat by brush, roller or spray to these areas only to the extent of 3.0 mils DFT.

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5. Finish: One (1) coat Modified Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646

L. System H: Metal Building Accessories, Exterior
1. Surface Preparation: SSPC-SP6 Commercial-grade blast level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of not less than 4.0 mils. Primer to be shop applied for new materials; field applied for existing materials.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
3. Shop or Field Intermediate: One (1) coat Polyamidoamine Epoxy, to an average DFT of 3.0 to 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
4. Touch-up in Field:
   a. Spot surface prepare by degreasing nuts and bolts and sanding and wire brushing the erection damage
   b. Follow with a spot primer of Modified Polyamidoamine Epoxy primer, brush applied in two (2) coats to build a minimum of 5.0 mils over these areas.
   c. Apply a final finish coat by brush, roller or spray to these areas only to the extent of 3.0 mils DFT.
5. Finish: One (1) coat Acrylic Polyurethane, to an average DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 73
   b. Sherwin-Williams Acrolon 218

M. System I: Galvanized Metals, Interior, Non-Immersion
1. Surface Preparation: Sweep-blast to roughen new spangle on the galvanized surface. Follow this with solvent cleaning to the extent of an SSPC-SP-1 level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
3. Finish: One (1) coat Modified Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646

N. System J: Galvanized Metals, Exterior, Non-Immersion
1. Surface Preparation: Sweep-blast to roughen new spangle on the galvanized surface. Follow this with solvent cleaning to the extent of an SSPC-SP-1 level of cleanliness.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
3. Finish: One (1) coat Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
   a. Tnemec Series 73
   b. Sherwin-Williams Acrolon 218

O. System K: Galvanized Metals, Interior, Immersion
1. Surface Preparation: Blast to the extent of an SSPC-SP-10 near-white level of cleanliness and apply primer before any rust bloom reforms.
2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646
3. Finish: One (1) coat Polyamidoamine Epoxy, to a DFT of 6.0 to 8.0 mils.
   a. Tnemec Series 69
   b. Sherwin-Williams Macropoxy 646

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P. System L: Ferrous Metals, Interior and Exterior, Immersion
   1. Shop Surface Preparation: Blast to the extent of an SSPC-SP-10 near-white level of cleanliness and apply primer before any rust bloom reforms.
   2. Shop Primer: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Duraplate 235
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Duraplate 235
   4. Field Finish: One (1) coat Polyamidoamine Epoxy, spray applied to a minimum DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Duraplate 235

Q. System M: Ferrous Metals, Interior, Non-Immersion
   1. Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness and prime before any rust bloom reforms.
   2. Shop Primer: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Intermediate: One (1) coat Polyamidoamine Epoxy, spray applied to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   4. Finish: One (1) coat Modified Polyamidoamine Epoxy, to an average DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646

R. System N: Ferrous Metals, Exterior, Non-Immersion
   1. Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness and prime before any rust bloom reforms.
   2. Shop Primer: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Intermediate: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   4. Field Finish: One (1) coat Acrylic Polyurethane, to an average DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 73
      b. Sherwin-Williams Acrolon 218

S. System O: Mill, Factory Paint Piping, Equipment and Machinery, Interior and Exterior
   1. Shop Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness and prime before any rust bloom reforms.
   2. Shop Primer: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Intermediate: Spray apply one even coat of Manufacturer, Color, Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   4. Field Finish: Spray apply one field finish coat of Manufacturer, Color, Acrylic Polyurethane, to a minimum DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 73
      b. Sherwin-Williams Acrolon 218

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T. System P: Mill Finish Aluminum
   1. Surface Preparation: Sweep-blast to roughen new spangle on the mill surface. Follow this with solvent cleaning to the extent of an SSPC-SP-1 level of cleanliness.
   2. Surfacer: One (1) coat Polyamidoamine Epoxy, to a DFT of 5.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646
   3. Field Finish: One (1) coat Acrylic Polyurethane, to an average DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 73
      b. Sherwin-Williams Acrolon 218

U. System Q: Gypsum Board
   1. Surface Preparation: Clean and dry joints cured and sanded. Blow down or sweep thoroughly, with a soft bristled brush.
   2. Surfacer: One (1) coat Poly Vinyl Acrylic Sealer, roller applied.
      a. Tnemec Series 51-792
      b. Sherwin-Williams PrepRite ProBlock Interior-Exterior Latex Primer-Sealer
   3. Intermediate and Finish: Two (2) coats Polyamidoamine Epoxy, applied by spray and backroller application.
      a. Tnemec Series 69
      b. Sherwin Williams Macropoxy 646

V. System R: Plumbing – Copper, PVC and HDPE
   1. Surface Preparation: Hand sand to roughen and then solvent clean with mineral spirits to the extent of an SSPC-SP-1 level of cleanliness.
   2. Field Finish(es): Two (2) thin coats Polyamidoamine Epoxy, brush, roller, or spray apply to an average DFT of 2.0 to 3.0 mils.
      a. Tnemec Series 69
      b. Sherwin-Williams Macropoxy 646

W. System S: Equipment and Machinery Exhaust Piping
   1. Surface Preparation: Blast to the extent of an SSPC-SP-6 Commercial-Grade level of cleanliness.
   2. Field Finish(es): Brush, roller, spray apply two thin coats (2.0 to 3.0 mils DFT each) of Manufacturer, Color, Inorganic Zinc.

X. System T: Piping Insulation
   1. Surface Preparation: Clean and dry. Blow down or sweep thoroughly, with a soft bristled brush.
   2. Field Finish(es): Brush, roller, spray apply two thin coats (2.0 to 3.0 mils DFT each) of Manufacturer, Color, Manufacturer specified.
      a. Special per application, to be specified by manufacturer.

Y. System U: Wood, Interior and Exterior
   1. Surface Preparation: Sand as needed. Clean and dry. Blow down or sweep thoroughly, with a soft bristled brush.
   2. Field Primer: Brush apply one even coat of Alkyd Wood Primer to a dry film thickness as recommended by the manufacturer and allow to harden before topcoating.
   3. Acceptable Primer:
      a. Tnemec Series 36
      b. Sherwin-Williams PrepRite ProBlock Interior-Exterior Latex Primer-Sealer
   4. Field Finish: Brush apply two thin coats (2.0 mils DFT each) Acrylic Emulsion.
   5. Acceptable Finish:
      a. Tnemec Series 6
      b. Sherwin-Williams Pro Industrial Multi-Surface Acrylic (matte, eg-shel, gloss)

Z. System Z: Dissimilar Metal Protection
   1. Surface Preparation: Scarify the Surface, SP-1
   2. First Coat:
      a. Tnemec Series 46H-413 @ 20 mils DFT.

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b. Sherwin Williams HilMil Sher-Tar @20 mils DFT.

3.14 COLORS SCHEDULE

A. Colors for any components not specifically mentioned herein shall be selected by the Owner; submit Color Schedule to Engineer.

B. Paint for components listed shall be of the colors scheduled as follows:

COMPONENT	COLOR
1. Potable Water Piping	Blue
2. Non-Potable Water Piping	Blue with Red Bands
3. Compressed Air Piping	Green
4. Gas Piping, Natural	Orange
5. Chemical Piping	Selected by Engineer (each type of chemical will have a different color).
6. Equipment and Tanks	Match Attached Piping
7. Miscellaneous Metals	Selected by Engineer
8. Heat Ducts and Grilles	Match Background
9. Electrical Conduit	Match Background
10. Domestic Drainage/Vent	Dary Gray
11. Other Lines	Selected by Engineer

Note: Color coded bands will be placed every 30-inches along the axis of the piping. Bands shall be 4-inch to 6-inch in length.

PART 4 MEASUREMENT AND PAYMENT

4.01 HIGH PERFORMANCE COATINGS

A. General. High performance coatings shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. High Performance Coatings, Lump Sum. When so provided, payment for high performance coatings shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. High Performance Coatings, Inclusive. When no quantity is provided, high performance coatings shall be considered inclusive to payment for work associated with the related construction.

END OF SECTION

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SECTION 09 96 23
WEATHER/GRAFFITI-RESISTANT COATINGS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Weather seal and graffiti control coating to protect exterior masonry surfaces.

1.02 RELATED WORK

A. Section 04 20 00 – Unit Masonry.

B. Section 07 92 00 – Joint Sealers.

1.03 REFERENCES

A. ASTM International (ASTM):
1. C67/C67M- Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile. (2021)
2. C140/C140M- Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units. (2022b)
3. D2369- Standard Test Method for Volatile Content of Coatings. (2020)
4. D6490- Standard Test Method for Water Vapor Transmission of Non-Film Forming Treatments Used on Cementitious Panels. (1999 R2014)
5. D6532- Standard Test Method for Evaluation of the Effect of Clear Water Repellent Treatments on Water Absorption of Hydraulic Cement Mortar Specimens. (2000 R 2022)
6. D7089- Standard Practice for Determination of the Effectiveness of Anti-Graffiti Coating for Use on Concrete, Masonry and Natural Stone Surfaces by Pressure Washing. (2006 R2021)
7. E96- Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials. (2000)

1.04 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. Product Data: Submit manufacturer's product literature.

C. Manufacturer's Installation Instructions: Submit.

D. Maintenance Instructions: Submit manufacturer's product literature on graffiti removal procedures and products.

1.05 QUALITY ASSURANCE

A. Manufacturer: Company specializing in graffiti-resistant coatings with minimum three (3) years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three (3) years documented experience and approved by manufacturer.

1.06 MOCK-UP

A. Section 01 45 00 - Quality Control: Mockup provisions.

B. Apply protective treatment to each type of masonry on the mock-up wall constructed under Section 04 20 00. Let test area cure before inspection.

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1.07 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Material and Equipment: Product storage and handling provisions.

B. Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

1.08 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Material and Equipment: Environmental conditions affecting products on site.

B. Maintain ambient and surface temperatures above 40 degrees F and below 90 degrees F for 24 hours before application and continuously until protective treatment has cured.

C. Surfaces to receive coating shall be dry.

D. Apply sealants minimum 24 hours, or as required by sealant manufacturer, whichever is greater, prior to application of graffiti-resistant treatment.

PART 2 PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

A. Prosoco, Inc.

B. Approved equal prior to bidding. Substitution request shall be submitted at least seven (7) calendar days prior to bid date. Request shall include product data, manufacturer literature, and list of recent projects.

2.02 PROTECTIVE TREATMENT COATINGS

A. Use clear-drying, penetrating, water-based silicone emulsion for protecting substrate from graffiti attacks and weatherproofing masonry materials without altering their natural appearance.

B. Physical and Performance Properties:
   1. Total Solids per ASTM D 2369: 15 percent.
   2. Comply with VOC requirements of authorities having jurisdiction.
   3. Water Absorption Reduction per ASTM C67/C67M:
      a. Brick: Greater than 99 percent.
   4. Water Absorption Reduction per ASTM C140/C140M:
      a. CMU: Greater than 92 percent.
   5. Water Vapor Transmission (WVT) per ASTM D 6490: Minimum 97 percent retention.
   6. Cleanability: Level 2 per ASTM D7089.

C. Basis of Design: Prosoco Blok-Guard & Graffiti Control WB 15.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify surfaces are complete and ready to receive protective treatment.

B. Newly constructed surfaces shall cure for 28 days before application.

C. Sealant and caulking compounds shall be in place and cured before application.

D. Beginning of installation means acceptance of substrate.

E. Verify all windows, exterior intakes and air conditioning vents are covered and air handling equipment is shut down during application and until vapors have dissipated.

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3.02 PREPARATION

A. Prepare surfaces to receive protective treatment in strict accordance with manufacturer's instructions.

B. Protect people, vehicles, plants, painted surfaces, anodized metal, metal, glass, and all non-masonry surfaces from product, residue, splash, fumes and wind drift.

C. Allow new masonry surfaces to cure for a minimum of 28-days prior to application.

3.03 FIELD TESTING

A. Test surfaces and materials to be treated to ensure compatibility and desired graffiti-resistant treatment results.

B. Sample Area:
   1. Size: Use masonry mock-up wall, minimum 48 inches (1219 mm) by 48 inches (1219 mm) in size.
   2. Apply to substrate and allow to cure.
   3. Owner's representative will inspect the cured test panel for approval.
   4. Maintain approved sample for comparison during the Work.

C. Adjacent Material Testing:
   1. Test samples of adjacent materials for compatibility with the graffiti-resistant treatment.
   2. Owner's representative will inspect the samples for approval.

D. If any part of this work is found to be defective due to improper preparation of surfaces or application of treatment at any time before the final acceptance of the work, the Contractor shall, at their own expense, make good such defect to the satisfaction of the Owner and Design Professional.

3.04 APPLICATION

A. Do not dilute or alter product.

B. Apply protective coating in strict accordance with manufacturer's instructions.

C. Apply second coat when first coat is dry to the touch, or within manufacturer's time limit, to maximize the effectiveness of the second coat.

3.05 PROTECTION

A. Protect in accordance with manufacturer's instructions.

B. Protect from rain for at least 6 hours after application.

END OF SECTION

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SECTION 10 14 00
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Accessible Room Signs.

B. Accessible Exit Signs

C. Load capacity sign

D. Building Street Address Numbers

1.02 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Shop Drawings: Indicate letter and sign styles, lettering font, foreground and background colors, locations, and overall dimensions of each sign.

1.03 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three (3) years documented experience.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Store adhesive attachment tape at ambient room temperatures.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 - Product Requirements: Environmental provisions.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of signs.

D. Provide ventilation to disperse fumes during application of solvent-based adhesive.

PART 2 PRODUCTS

2.01 COMPONENTS

A. Accessible Room Signage: Photo Polymer signs, 0.125 inch thick etched plastic, ADA sign with raised text and pictogram with corresponding Grade 2 Braille, painted. Manufactured by InPro Corporation, Schwaab Inc. or equal.
   1. Unisex Toilet Room: 6” x 8”, “RESTROOM” text with symbol of accessibility.
   2. Exit Doors: 8” x 3”, “EXIT” text.
   3. Adhesive tape mounted.

B. Load Capacity Sign: One-piece constructed signs that provide raised characters (braille not required) with on high impact polystyrene injected molded plastic.
   1. Size:
      a. Lifting Devices: 8-inch by 3-inch with minimum 1/2-inch high text.

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b. Mezzanine: 8-inch by 8-inch with minimum 1/2-inch high text. First line “Equip Platform”.

2. Colors shall be selected by Architect from manufacturer’s standard colors.
3. Stainless steel screws, type appropriate for masonry.
4. See Contract Drawings for load capacity.

C. Building Exterior Letters: Cast aluminum letters
1. Manufacturer: Gemini Incorporated or equal
2. Size: 4-inch high.
3. Quantity: Assume three to four numbers
4. Font: Arial or Helvetica. As selected from manufacturer’s standard.
5. Finish: to be selected from manufacturer’s standard Anodized Finish: clear, champagne, light bronze, medium bronze, dark bronze, black.
6. Mounting: project jam nut mount or project spacer mount, type as appropriate for uneven wall surface.
7. Provide layout drawing, showing font, size, and layout, for review by Architect.
8. Fabricate installation template after layout has been approved.

D. Colors as selected by Architect from manufacturer’s standard colors.

2.02 ACCESSORIES

A. Mounting Hardware: As required for installation location and substrate, as provided by manufacturer.

B. Tape Adhesive: Double sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify that surfaces are ready to receive work.

C. Beginning of installation means acceptance of substrates.

3.02 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install letters and signs after substrate is finished, in locations indicated.

C. Mount accessible room signage with adhesive to wall adjacent to latch side of door. If not detailed on the drawings the room signs shall be mounted 9 inch minimum from edge of door to center of sign and 52 inches above finished floor to center of sign.

3.03 CLEANING

A. Section 01 70 00 - Execution and Closeout Requirements: Cleaning provisions.

B. Clean signs per manufacturer’s instructions.

END OF SECTION

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SECTION 10 14 69
WARNING SIGNS

PART 1 GENERAL

1.01 WORK INCLUDES

A. Informational and accident prevention signs.

1.02 RELATED WORK

A. Section 08 16 00 - Fiberglass Reinforced Polyester Door and Frame System: Mounting substrate.

B. Section 09 96 00 – High Performance Coatings: Field paint finish for door.

1.03 DESIGN REQUIREMENTS

A. General: Accident prevention signs shall conform as to design with OSHA Section 1910.145 of Subpart J, Part 1910, Chapter XVII, Title 29 of the Code of Federal Regulations.

1.04 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements: Product storage and handling provisions.

B. Store adhesive attachment tape at ambient room temperatures.

1.05 ENVIRONMENTAL REQUIREMENTS

A. Section 01 60 00 – Product Requirements: Environmental provisions.

B. Do not install signs when ambient temperature is lower than recommended by manufacturer.

C. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.01 GENERAL

A. Sign lettering shall be single stroke and shall contrast in color with the background. For those messages for which there are international symbols, the international symbols shall be used.

2.02 PRODUCTS

A. Material: Aluminum, fiberglass, or high-impact plastic, suitable for exterior surface mounting. Sign material and message shall be fade resistant.

B. Sign Size: 14-inch by 10-inch.

C. Sign Messages:
   1. Chemical Room: (white sign)
      a. First Line: DANGER or WARNING (white letters surrounded by red over black rectangle)
      b. Proceeding Lines: CHEMICAL STORAGE (black letters)

2.03 ACCESSORIES

A. Tape Adhesive: Permanent adhesive, designed for exterior installation.

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PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

B. Verify that surfaces are ready to receive work.

C. Beginning of installation means acceptance of substrates.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install signs after substrate is finished, in locations indicated.

3.03 CLEANING

A. Section 01 70 00 – Execution and Closeout Requirements: Cleaning provisions.

B. Clean signs per manufacturer’s instructions.

END OF SECTION

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SECTION 10 28 13
WASHROOM ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Toilet and washroom accessories.

B. Attachment hardware.

C. Installation of Owner provided paper towel dispensers, toilet paper dispenser, and soap dispensers.

1.02 RELATED SECTIONS

A. Section 04 20 00 - Unit Masonry: Mounting substrate.

1.03 REFERENCES

A. Americans with Disabilities Act (ADA) of 1990, Accessibilities Guidelines for Buildings and Facilities, 2017 edition.

B. American National Standards Institute (ANSI):
   1. ANSI A117.1 - 2010 - Accessible and Usable Buildings and Facilities.

C. American Society of Testing and Materials (ASTM):
   1. ASTM A269 - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
   2. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   3. ASTM C1036 - Standard Specification for Flat Glass.

D. Federal Specification Unit (FS):
   1. FS A-A-3002 - Mirrors, Glass.

E. International Code Council:
   1. IBC - International Building Code, 2021 edition, with all referenced standards and 2025 State of Wisconsin amendment.

1.04 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Submit product data on accessories describing size, finish, details of function, and attachment methods.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable code for installing work in conformance with ADA and ANSI.

1.06 COORDINATION

A. Section 01 30 00 - Administrative Requirements: Coordination provisions.

B. Coordinate the Work with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

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1.07 WARRANTY

A. Mirrors: Guarantee against loss of perfect reflection quality for 15 years.

PART 2 PRODUCTS

2.01 PRODUCTS

A. Manufacturers, for all but automatic towel and soap dispensers and rubber waste containers:
   1. American Specialties, Inc.
   2. Bobrick Washroom Accessories.
   3. Bradley Corp.
   4. General Accessories Manufacturing Corp. (Gamco).
   5. Substitutions: None.

2.02 COMPONENTS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
   1. Grind welded joints smooth.
   2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Fasteners, Screws, and Bolts: Hot dip galvanized.

2.03 ACCESSORIES

A. Mirrors, Glass with Channel Frame: 24-inch wide by 36-inch tall (for mounting above lavatory or counter), unless otherwise noted on the drawings.
   1. American Specialties 0620
   2. Bobrick B-165
   3. Bradley 781
   4. Gamco C-Series

B. Grab Bars, Concealed Mounting: Assembly shall be able to withstand 300-pound downward pull.
   1. American Specialties 3800 Series
   2. Bradley 812
   3. Bobrick B-6806
   4. Gamco 150-S Series

C. Cup Dispenser: Paper cup dispenser, round or square, surface mounted, 22-gauge type 304 stainless steel, refill viewer, bright or satin finish. Hold 100 3oz to 6 oz waxed paper cups. Furnish 100 non-insulated 6oz cups.
   1. American Specialties 002-ASM
   2. Bradley 9495
   3. Gamco CD-1

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.

B. Verify that site conditions are ready to receive work and dimensions are as indicated on shop drawings.

C. Beginning of installation means acceptance of substrates.

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3.02 PREPARATION

A. Verify exact location of accessories for installation.

3.03 INSTALLATION

A. Install fixtures, accessories, and items in accordance with manufacturers' instructions.

B. Install grab bars so that center of bar is 34-inch above finished floor.

C. Install other accessories so that bottom of item is at 40-inch above finished floor, unless noted otherwise.

D. All accessories shall be mounted so that all operable parts are no more than 48 inches above finished floor.

E. Mount mirror above lavatory or counter so that bottom of reflective surface is no more than 40-inch above the floor.

F. All accessories shall be mounted so as to comply with ADA and ANSI requirements.

G. Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

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SECTION 10 44 16
FIRE EXTINGUISHERS

PART 1 GENERAL

1.01 WORK INCLUDES

A. Fire extinguishers.

1.02 RELATED WORK

A. Section 04 20 00 - Unit Masonry: Mounting substrate.

1.03 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 10 - Standard for Portable Fire Extinguishers.
   2. NFPA 17 – Standard for Dry Chemical Extinguishing Systems.

B. Underwriter's Laboratories Inc. (UL):
   1. Fire Protection Equipment Directory.

1.04 PERFORMANCE REQUIREMENTS

A. Conform to NFPA 10 requirements for extinguishers.

B. Furnish extinguishers classified and labeled by Underwriters Laboratories Inc. for purpose specified and indicated.

PART 2 PRODUCTS

2.01 FIRE EXTINGUISHERS

A. Manufacturers:
   1. Amerex.
   2. Ansul.
   3. J.L. Industries (Activar).
   4. Larsens Manufacturing Company.
   5. Nystorm Products Company.
   6. Potter Roemer.

B. Ten pound Model MP10, Larsen's. UL Rating: 4A-80B:C.

C. Finish: Red enamel.

2.02 ACCESSORIES

A. Brackets, exposed: Support bottom of extinguisher, by manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Section 01 30 00 – Administrative Requirements: Coordination and project conditions.

B. Beginning of installation means acceptance of existing conditions.

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3.02 INSTALLATION

A. Install mounting bracket at each extinguisher location, so that top of extinguisher is 48 inches above the finished floor

B. Place extinguisher on wall bracket. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 11 16 20
KEY VAULTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Key vaults.

1.02 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal provisions.

B. Product Data: Provide component dimensions, describe component within assembly, anchorage and fasteners, and finish.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Knox Company, 1601 W. Deer Valley Road, Phoenix, AZ 85027, (800) 552-5669, www.knoxbox.com.

2.02 MATERIAL

A. Key Vault: Knox-Box Series 3200 (coordinate model number with local fire department), hinged door model, surface mount, finish to be selected by Architect.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify rough opening for unit is correctly sized and located.

B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

A. Verify final location with Owner and/or local fire department prior to installation.

B. Install plumb and level in wall openings or on surface 56 inches from finished floor to inside top of cabinet.

C. Secure rigidly in place in accordance with manufacturer's instructions.

END OF SECTION

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SECTION 21 05 00

FIRE SUPPRESSION REQUIREMENTS

PART 1 GENERAL PROVISIONS

1.01 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work under this Section.

B. This Section applies to all Division 21 sections of fire suppression.

C. The Contractor performing the work of this Section applies to the pipe fitter licensed and certified per the State of Wisconsin requirements.

1.02 APPLICABLE PUBLICATIONS

A. Publications, standards and listing requirements called out in the Sections of this Division of Labor shall form a part of these specifications as if contained herein.

B. The requirements of the Contract Documents, including the General Conditions, and Supplementary Conditions, and Division 01 - General Requirements, apply to this section except as modified herein.

1.03 DESCRIPTION OF WORK

A. Requirements of Instructions to Bidders Conditions of Contract and Division 1 - General Requirements apply to Work under this Division, which shall include:
1. Section 21 05 00 – Fire Suppression Requirements
2. Section 21 05 05 – Through-Penetration Firestopping
3. Section 21 10 00 – Automatic Water Base Sprinkler System

B. Work Included:
1. The work covered by this Division of the specifications includes the furnishing of all labor, materials, tools, equipment, permits, certificates and temporary connection necessary for or incidental to executing and completing the fire suppression work to make the system ready for normal and proper operation, including all work or materials not directly shown on the drawings or in the specifications, but necessary for the proper operation of the system.
2. All work shall be as specified and indicated on the drawings unless specifically excepted on the drawings or herein and in compliance with the State of Wisconsin Uniform Building Code, NFPA standards, Local Codes and Ordinances, Local Utility Regulations and OSHA.
3. All work shall be performed by individuals' license and certified per the State of Wisconsin requirements. Their work shall be performed to the satisfaction of the Architect / Engineer, and Owner.
4. Read all other Divisions of the Specifications which are applicable to this work, including the General Conditions section applicable to all bidders.
5. This section is a supplement to and not a replacement for the project General Condition's section.
6. In cases of conflict with information in the General Conditions, the more stringent of the contract requirements shall be considered applicable.
7. Prior to submitting bid, call to the attention of the Engineer any material or apparatus believed to be inadequate or any necessary items or work omitted.
8. Address any questions regarding the interpretation of the plans and/or specifications at least 12 days before the bid opening.
9. The Engineer reserves the right to interpret his own specifications and plans after bids are received, and to demand that the installation conform to his intent.

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10. All piping is to be concealed. If building construction does not permit the concealing of piping, locations and routing are to be approved by Architect / Engineer prior to installation. Route piping in structural webbing of floor/ceiling joist in areas where piping is exposed. It is the responsibility of the contractor to verify the routing of all piping, devices, fixtures and equipment with other trades.
11. No work shall be completed and no prefabrication started until Architect / Engineer has reviewed and approved shop drawings and coordinated pipe routing with other trades.

C. Examination of Plans, Specifications and Site:
1. Before submitting a bid, the bidder shall familiarize himself with all features of the building and site which may affect the execution of his work.
2. No extra payment will be allowed for the failure to obtain this information.
3. If there are omissions or errors in the plans or specifications, they shall be clarified with the architect prior to submitting bid.
4. Lack of information on existing conditions shall not be allowed for a valid cause for additional compensation.

D. Codes, Permits, and Inspection Fees
1. All work and materials shall conform in every respect to the current rules and requirements of the State of Wisconsin Uniform Building Code, NFPA standards, Local Codes and Ordinances, Local Utility Regulations and OSHA.
2. Give to the proper authorities all required notices relating to the project, obtain all official permits and licenses required, pay all fees incidental thereto, deliver upon completion of the work and without cost to the Owner all required certificates of inspection and approval.
3. Secure all local permits, utility fees and licenses applicable for the work under this Division and pay all fees, including posting all bonds incidental thereto. Plan review submittal to the State of Wisconsin Department of Safety and Professional Services or its designated municipality, shall be by the Contractor.

E. Scope of Work:
1. This specification for a fire protection system is a “Performance” specification. It is intended to establish the design criteria for the work. The Fire Protection Contractor shall assume full responsibility for the design and details to meet the requirements of the State of Wisconsin, local municipality, NFPA Codes, H.S.S. Code and Factory Mutual I.R.I. or Owners insurance service.
2. Furnish all labor, materials, equipment and performing all operations necessary to install the automatic fire sprinkler system, including piping, fittings, sprinkler heads, valves, controls, alarms, hangers, supports and any other supplemental items necessary to complete the system.

1.04 RELATED WORK ELSEWHERE

A. Thoroughly inspect the entire set of plans and specifications as to the class of building construction in general and specifically to the items of other divisions that affect the work of this Division.

B. Work of this Division also includes any fire protection work shown on the drawings and included in the specifications of other Divisions.

C. Drawings and specifications of the work under this Division are intended for a complete project. If trade jurisdiction requires portions of the work be done by other tradesmen, this Division’s contractor shall sublet those portions of the work to qualified contractors, however this Division’s contractor shall be held fully responsible for all such installations.

1.05 SHOP DRAWINGS

A. Submit shop drawings for all equipment and systems as indicated in the specification. 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.

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B. Submit electronic files with dimensions, capacities, and information as soon as available from the list of acceptable manufacturers.

C. Shop drawings shall include, but are not limited to, the following items:
   1. State Approved Fire Suppression Drawing, Specifications and Hydraulic Calculations.
   2. Sprinkler Heads
   3. Fire Department Connection
   4. Backflow Preventers.
   5. Flow Switch
   6. Pipe, Fittings, and Valves.
   7. Pipe Hangers / Support.
   8. Pipe Labels, and Valve Tags.
   9. Fire Hose Connection Cabinets
   10. Fire Hose cabinets

D. The Architect, Engineer or its representative shall review and comment on all items being submitted and items to be installed. The Architect, Engineer or its representative holds the right to request submitted items to be revised and resubmitted or to reject a submitted item if it does not meet the conformity with the design concept of the work as established in the Contract Documents.

E. All shop drawings, product data, and samples submittals shall illustrate details of the work, fixtures, equipment, materials, products, systems, designs or workmanship that this Division's contractor intends to use in order to comply with the design concept established in the Contract Documents. Review of these submittals by the Architect, Engineer or its representative is only for the limited purpose of checking for conformity with the design concept of the work as established in the Contract Documents, and is not intended to be for the purpose of determining the accuracy of other matters that may be contained in such submittals, including, but not limited to such matters as dimensions, quantities, performance of fixtures, equipment and systems design and installed, engineering and design, construction means, methods, techniques, sequences, procedures or safety precautions, the correctness of which as set forth in the Contract Documents or submittal shall be the sole responsibility of by this Division's contractor.

F. Any flagged deviations on the shop drawings from the specified item and any approval of the shop drawings will not be considered acceptance of the deviation unless it's been explicitly flagged.

G. Where any specific fixture, equipment, materials, process or method of construction is specified by name or by reference to the model number of a manufacturer, the specifications are to be used as a guide and are not intended to take precedence over the basic duty and performance specified or noted on the drawings.

1.06 OPERATION & MAINTENANCE MANUALS

A. Submit operation and maintenance manuals following Section specific shop drawing submittal guidelines.
   1. Upon the complete installation of the work under this Division, this Division's contractor shall provide the necessary qualified personnel for operating the systems as directed by and scheduled with the Architect, Engineer and the Owner. At this time, this Division's contractor shall instruct the Owner or his representative in the operation, adjustment and maintenance of all equipment furnished.
   2. Provide (1) electronic and three (3) paper copies of maintenance manuals shall be submitted, which shall present full details for the care, maintenance, and operation of all equipment and systems.
   3. Provide documentation in the operation and maintenance manual to required testing of the work under this Division.

B. Record Drawings:
   1. Record drawings shall be kept daily, noting all changes and available upon demand.
   2. Record drawings shall reflect any changes or pipe re-routing due to construction phasing or existing field conditions.

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3. Final record drawings shall be provided to Architect / Engineer and owner at the completion of the project. Final record drawing shall be submitted in electronic PDF form (not hand written mark-ups) or recorded in CAD / BIM format with the ability to extract an electric PDF.

1.07 QUALITY ASSURANCE

A. 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.

B. 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.

C. Provide all necessary accessories required for a complete and operable system.

1.08 WARRANTY

A. The Work of this Division shall be guaranteed, in writing, to be free from defects in materials and/or workmanship for one (1) year from the date of certificate of completion and acceptance of the work. Necessary instruction and/or emergency services to be performed as a result of defects in materials or workmanship shall be furnished for one (1) year at no extra cost for labor or materials. If default thereof, the Owner may have such work done and charge all applicable costs to the Contractor.

B. Furnish manufacturer's written warranties on all equipment to the Owner stating effective date of warranty.

C. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

PART 2 PRODUCTS

2.01 GENERAL

A. It is the intent of these specifications that all the necessary material, apparatus, and devices to complete the installation as specified herein, except such parts as are specifically accepted, shall be provided.

B. If an item is either shown on the drawings or called for in these specifications, shall be considered sufficient as an item part of this contract.

C. All materials, products, fixtures and equipment shall be an approved product per the State of Wisconsin Department of Safety and Professional Services.

D. All sizes given are as minimum.

E. Material and labor shall be first class and workmanlike and to the satisfaction of the Plumbing Engineer and shall be subject to inspection test and approval at all times from commencement until acceptance of completed work.

F. Manufacturers shall be responsible for providing material listed by U.L. or other approved agencies, and all governing codes and ordinances.

G. All material must bear U.L. and/or other approved labels where possible.

H. Items specified by catalog number or brand name and approval of shop drawings will not relieve the manufacturer of this responsibility.

2.02 HANGERS, ANCHORS AND INSERTS

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A. See Pipe Hangers, Supports and Insulation Detail.

B. All piping in the piping system shall be supported with hangers in accordance with the provisions of the Wisconsin Building Code.

C. The use of perforated strap hangers will not be acceptable.

D. Use approved malleable, wrought iron or steel pipe riser clamps for steel or cast iron pipes and copper plated clamps for copper pipes.

E. Provide all necessary inserts for supporting piping and equipment.

F. Piping shall be supported with clevis or adjustable band loop hangers at intervals recommended by the manufacturer.

G. Provide low compressive insulation protectors on all insulated piping supported by hangers or strut channel. Protective shield material shall be galvanized carbon steel with pre-insulated calcium silicate support blocks.

H. Manufacturers shall be as listed above, B-Line, Anvil, Fee & Mason, Elcen or an acceptable approved equal approved by the engineer. No private label wholesale products will be accepted.

2.03 SUPPORTS

A. See Pipe Hangers, Supports and Insulation Detail.

B. Provide all structural supports required for equipment included under this Division of the Work.

C. Structural supports that are required for the installation of the system specified shall be done and repaired by this Division's contractor in coordination with the general contractor and under the direction and to the satisfaction of the Architect and Engineer.

D. Manufacturers shall be as listed above, B-Line, Anvil, Fee & Mason, Elcen or an acceptable approved equal approved by the engineer. No private label wholesale products will be accepted.

2.04 ESCUTCHEONS

A. See Pipe Penetration Detail.

B. Provide on all pipes passing through finished floors, walls and ceilings with outside diameter sufficient to cover sleeve opening and inside diameter to fit snugly around pipe.

C. Escutcheon plates shall be chrome plated brass.

D. Manufacturers shall be as listed above, BrassCraft, Dearborn, Keeney, McGuire or an acceptable approved equal approved by the engineer. No private label wholesale products will be accepted.

2.05 ACCESS PANELS

A. Provide access panels with a key locking device and sized as required for the access to all valves, etc.

B. Panels shall be installed by Fire Protection Contractor in openings provided by the General Contractor as located and supervised by this Division.

C. Manufacturers shall be as listed above, KARP and Associates, Milcor, Titus or an acceptable approved equal approved by the engineer. No private label wholesale products will be accepted.

2.06 IDENTIFICATION

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A. All equipment, pipe and valves, etc., shall be identified as listed below.

B. All piping in this Division of the Work exposed, in access spaces or above ceilings shall be identified at minimum of 25' intervals and at least once in every room with, pipe marking labels, 2¼" color as required by A.N.S.I. standards.

C. Sprayed on pipe stencils letterings are not allowed.

D. Valve tags shall be 1 1/8" round brass tags with black numerals. Fasten tags to body of valves with copper or brass chain. Numerals on tags shall correspond to the record drawings.

E. Equipment and starters shall be identified with neat, clear, permanent labels.

F. Valve Charts:
   1. Furnish three (3) charts listing all valves, giving their location in the building and describing the valve number, service, function, normal position, etc. One (1) chart encased in plastic to be mounted in the building maintenance office and the other two (2) charts delivered to the Architect for transmittal to the Owner.
   2. Furnish one (1) overall floor plan showing the location of all valves and the corresponding number from the valve chart.

G. Manufacturers shall be W.H. Brady Co., Seton, or an acceptable approved equal approved by the engineer. No private label wholesale products will be accepted.

2.07 PIPE SLEEVES AND PENETRATIONS

A. See Pipe Penetration Detail.

B. Pipe sleeves and penetrations passing through fire walls, barriers, floors or ceilings shall be sealed with fire barrier caulking. 3-M Fire Barrier CP-25 caulk and 303 putty synthetic elastomers, U.L. rated.

C. Provide sleeves for pipes passing through masonry or concrete tunnels, basins equipment, walls and floors, seal all openings between pipe and sleeve with vinyl acrylic plastic.

D. Pipe sleeves passing through floors outside of chases shall be constructed of schedule 40 galvanized steel pipe ½" larger than pipe or pipe insulation and shall extend ½" above finished floors.

E. Pipe sleeves passing through walls, partitions, etc., for piping exposed to view shall be constructed of 20 gauge galvanized iron sleeves 1" larger than pipe or pipe insulation and shall extend ½" from the finished surfaces.

F. Pipe penetrations passing through masonry or concrete that are cored and below grade or subjected to water or ground water shall have its opening 1" larger than the outside diameter of the penetrating pipe and sealed with a mechanical link-seal. Locations shall include, but not limited to, tunnels, equipment basins, walls and floors.

G. Manufacturers for fire barriers shall be U.L. listed 3-M Fire Barrier CP-25 caulk, 303 putty synthetic elastomers or an acceptable approved equal approved by the engineer.

H. Manufacturers for mechanical link-seals shall be Garlock, Trumbul, or an acceptable approved equal approved by the engineer.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify fixtures and equipment are in compliance with approved submittal drawings.

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3.02 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base on drawings.

B. Identify conflicts with the work of other trades prior to installation of work.

C. Adjust system to satisfy field requirements.

3.03 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.04 INSTALLATION

A. General:
1. The complete installation of the work under this Division shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies, fixtures and equipment in per the manufacturer's recommendations and requirements. Consult manufacturer as required for missing information and technical advice of that product.
3. All equipment, tools, pipe, fittings and valves required for construction, phases of construction, and the "means and methods" of construction shall be provided this Division's contractor.
4. Exposed piping is to be painted by Painting Contractor. This Division Contractor shall protect sprinkler heads and equipment from painting in exposed areas.

B. Electrical Coordination
1. Electrical Contractor will furnished and install all power wiring to control panels, valves, aquastats, low voltage transformer box, fixtures, equipment and other devices furnished by this Division's contractor that is required for the operation of the piping system.
2. Provide manufacturer's wiring diagrams to Electrical Contractor for all equipment and devices furnished by this Division's contractor and as indicated to be wired by the Electrical Contractor.

C. Piping:
1. All installation to be installed per the local and state of Wisconsin Building code and NFPA standards.
2. All water meters shall be installed per the local utility installation requirements. Provide water meter test connection s as required.
3. Verify existing and proposed pipe connection elevations and locations in the field and notify the Architect and Engineer, in writing, of any variances prior to the start of any work.
4. Underground piping shall be laid on 4" of bedding sand or pea gravel to support pipe evenly and avoid hubs supporting piping. All installations shall be constructed in an approved manner to the complete satisfaction of the Architect and Engineer.
5. Avoid locating any piping over electrical equipment or in elevator equipment rooms.
6. Conceal all piping whenever possible. Install all piping so that it can be drained, and provide a brass drain plug at low points and at the bottom of risers.
7. All pressure gauges shall be located so they can be viewed from the floor and in the upright position.
8. All installation to be installed per the local and state codes.
9. All piping shall be installed in parallel with the building's structure.
10. All horizontal piping shall be installed level.
11. All vertical piping shall be installed plumb.
12. All valves and valve handles shall be installed in an accessible location. Valve handles shall operate so that pulling down will close the valve. Provide adequate spacing between piping for proper operation of valves and for service and maintenance.

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13. Conceal all piping whenever possible. Bring stub extensions as close to fixtures as possible. Install all piping so that it can be drained, and provide a brass drain plug at low points and at the bottom of risers.
14. Plastic Piping:
    a. N/A.
    b. Installation of plastic piping through fire rated walls and ceilings must comply with the standards of the Wisconsin Administrative Code. Plastic piping may not be installed in fire rated walls or ceiling plenums except as noted in below paragraphs.
    c. Tremco Brand Fire Barrier Penetration Sealing Systems may be used where plastic piping penetrates fire rated walls and floors. Sealants shall be installed per manufacturer's recommendations and by trade's people familiar with the products. Approval of the local authorities must be obtained before any installation of this product is accepted.

D. Excavation:
1. Excavating and backfill as defined in Section [31 23 00] takes precedence over statements made in this section should any conflicts occur.
2. Contact public utilities and the building's maintenance personnel to determine locations of their underground installations and avoid confliction therewith. Underpin and support all lines. Cut off service connections encountered which are to be removed at the limits of fire excavation and cap. In the event relocation of the utility services is necessary to avoid this conflict, the Architect and Engineer shall be consulted.
3. Make all necessary excavations for the utility services, system piping and equipment. 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.
4. At no time place excavated materials where it will impede surface drainage unless such drainage is being safely rerouted away from the excavation or work of other trades.
5. Underground piping shall be laid on 4" of bedding sand or pea gravel to support pipe evenly and avoid hubs supporting piping. All installations shall be constructed in an approved manner to the complete satisfaction of the Engineer.
6. Underground plastic pipe and tubing shall be installed in accordance with ASTM D2774.
7. Excavate whatever materials are encountered as required to place at the elevations as shown on drawings. Remove debris and rubbish from excavations before placing bedding and backfill material.
8. Provide and maintain all fencing, barricades, signs, warning lights, and/or other equipment as required around all excavation areas at all times. No excavation shall be left unattended without adequate protection.
9. Elevations shown on the plans are subject to such revisions as may be required to fit field conditions.
10. Install piping passing under foundations with minimum of 1 ½" clearance to concrete and insure there is no disturbance of bearing soil. Care must be taken in excavation that the walls and footings will not be disturbed in any way.
11. Excavated materials from areas under building construction shall be removed from the site unless otherwise noted.
12. Bedding:
    a. Bedding material shall be thoroughly compacted sand, peal gravel or 3/8" crushed stone chips.
    b. Bedding material depth shall be a minimum of 4" from the bottom of excavated trench to bottom of pipe.
    c. Bedding material shall extend up from the bottom of the pipe to the pipe's centers spring-line.
    d. Verify will pipe manufacturer's recommendation and requirements.
    e. See ASTM D2321 Standard Practice for underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications for more information.
13. Backfill:
    a. Initial backfill material shall be thoroughly compacted sand, peal gravel or 3/8" crushed stone chips.
    b. Initial backfill material depth shall be a minimum from the pipe's centers spring-line to 8" above the top of the pipe.

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c. Final Backfill shall be clean crushed bank run sand or peal gravel, gravel or soil / dirt is acceptable above the initial backfill requirements. Place final backfill in layers not more than 8" in loose depth, compacting each layer to required maximum density. Do not place final backfill material on surfaces that are muddy, frozen, or contain ice or frost. All final backfill materials shall be vibrator compacted.

d. Place and compact acceptable final backfill materials in layers to required elevations. Final backfill materials shall be free of clay, rock debris, vegetable matter, waste and frozen materials. Use sub-base material where indicated under piping or conduit; shape to fit bottom 90 degrees of cylinder.

e. Verify will pipe manufacturer's recommendation and requirements.

f. See ASTM D2321 Standard Practice for underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications for more information.

14. Compaction:

a. Compact each layer of backfill to 90% maximum density for cohesive soils and 95% relative density for cohesion less soils; at lawns or unpaved areas, 85 maximum density for cohesive soils and 90% relative density for cohesion less soils or requirements of Section 31 23 00 which takes -precedence if requirements are stricter.

b. Perform and pay costs of field density tests in accordance with Section 31 23 00 of the specifications.

15. Surface Restoration:

a. Completely restore the surface of all disturbed areas to a like condition of the surface prior to the work. Level off 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. Replacement of all existing areas removed to install piping by Fire Protection Contractor must be replaced to match existing.

16. Sheeting, Shoring and Bracing:

a. Provide shoring, sheet piling and bracing in conformance with the Wisconsin Administrative Code to prevent earth from caving or washing into the excavated earth. 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.

17. Dewatering:

a. 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.

18. Rock Excavation:

a. Remove rock encountered in the excavation to a minimum density of six (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 contented 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 2 cubic yard or more in volume.

b. Rock excavation will be computed on the basis of the depth of rock removed and a trench width two (2) feet larger than the outside diameter of the pipe where one (1) pipe is laid in the trench and three (3) feet larger than the combined outside diameter where two (2) 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.

E. Diagrams, Measurements, Final Layout Drawings:

1. Drawings show the layout in general and approximate locations of piping, major equipment, etc., and shall be followed as closely as the actual construction of the building, work of other trades, and the locations of equipment will permit.

2. All changes from the drawings necessary to make the work under this Division conform to the building as constructed and to fit the work of other trades shall be made without extra cost.

3. Drawings for the work under this Division shall not be scaled for exact dimensions. Consult the architectural and structural drawings and details for all dimensions and location of the work under this Division.

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F. Protection of Finished Work and Materials:
1. Protect all materials and work performed under this Division from damage or injury that may be caused by other workmen and from the action of the elements.
2. Protect the materials and work performed by other Divisions, and the Owner's property from damage or injury arising from work under this Division.
3. Keep all piping and equipment capped, plugged, drained, or otherwise protected including protection from freezing and by stoppage from building materials, sand or dirt, mortar, concrete, etc.

G. Painting
1. Exposed piping is to be painted by Painting Contractor. This Division Contractor shall protect sprinkler heads and equipment from painting in exposed areas.

H. Cleaning and Finishing:
1. After all work under this Division have been made and the system pronounced as satisfactory, this Division's contractor shall go over all his work and clean equipment, fixtures, piping, etc. and leave clean and in complete working order at final completion of the building.
2. The putting of new work, or any part thereof, into use, even though with the Owner's consent, shall not be construed to be an acceptance of the work on the part of the Owner, nor shall it be construed to obligate him, in any way, to accept improper work or defective material.

I. Cooperation with Other Divisions and the Owner:
1. Give full cooperation to other trades and furnish any information necessary to permit the work of all trades to be installed satisfactorily and with least possible interference or delay.
2. The Work of this Division must be coordinated with the work of other Divisions and the Owner to prevent interference. Any necessary changes to be made because of the lack of proper coordination shall be performed without extra charge.
3. Where the work of this Division will be installed in close proximity to the work of other trades, or where there is evidence that the work of this Division's contractor will interfere with work of other trades, they shall assist in working out space conditions to make a satisfactory adjustment.
4. Coordinate work of this Division so the installation of the piping and supports do not conflict with electrical code required clearances or in elevator hoist ways or equipment rooms. Piping systems are shown to be approximate on plans. Exact locations of equipment must be coordinated by this Division's contractor with other trades prior to installation.
5. Provide manufacturer's wiring diagrams to Electrical Contractor for all equipment and devices furnished by this Division's contractor and as indicated to be wired by the Electrical Contractor.
6. Furnish and install the tamper switches and flow switch.
7. Furnish the interior and exterior alarm bells, the strobe lights, and alarm control panel as required for the piping system and provide to the Electrical Contractor, who shall install and wire these items.
8. Electrical Contractor will furnish and install all power wiring to control panels, valves, fixtures, equipment and other devices furnished by this Division's contractor that is required for the operation of the piping system.
9. If this Division's contractor installs their work before coordinating it with other trades, they shall make necessary changes in their work to correct the condition without extra charge.
10. Provide all service connections under the jurisdiction of the work under this Division to Owner's equipment or equipment furnished by other Divisions as required for a complete and operating installation.

J. Cutting and Patching
1. All concrete floor / wall cutting and material removal that is required for the installation of the system specified shall be done and repaired by this Division's contractor in coordination with the general contractor and under the direction and to the satisfaction of the Architect and Engineer. No cutting of structural work shall be done without the written consent of the Architect and Engineer, and all such work shall be done in accordance with their directions and supervision.
2. Holes cut through precast concrete floors / walls shall be rotary or core drilled per the manufacturer's recommendations.

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3. All concrete floor / wall patching and refinishing that is required for the installation of the system specified shall be done by this Division's contractor in coordination with the general contractor and under the direction and to the satisfaction of the Architect and Engineer.
4. Replacement of all areas removed to install piping by this Division's contractor must be replaced to match the surrounding surface.

K. Supervision:
1. Provide the services of an experienced superintendent who shall be constantly in charge of all the work included in or related to this Division.

L. Substitutions:
1. All costs, as a result of submitted substituted items by the Contractor and with the approval by the Architect or Engineer, including costs required under other Contracts, shall be the responsibility of the Contractor requesting the substitution. None of the extra costs resulting from such approval shall evolve upon the Owner, the Architect, other Consultants, or other Contractors.

3.05 OWNER TRAINING

A. Provide as outlined in each specification section requiring owner training.

3.06 SPARE EQUIPMENT (NONE)

END OF SECTION

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SECTION 21 10 00
AUTOMATIC WATER BASE SPRINKLER SYSTEM

PART 1 GENERAL PROVISIONS

1.01 APPLICABLE PROVISIONS

A. Drawings and general provisions of contract, including general and supplemental conditions and Division 01 specification sections, apply to work under this Section.

1.02 DESCRIPTION OF WORK

A. Furnish and install a complete and operable system as indicated on the drawings and as specified herein.

B. Materials:
   1. Materials shall conform to the standard prescribed in the Wisconsin building and fire Codes and be approved for use by the Department of Safety and Professional Services, Division of Technical Services. When required, Fire Protection Contractor shall obtain approval prior to installation.
   2. All materials and equipment required for the work shall be new, of first-class quality and shall be furnished, delivered, erected, connected and finished in every detail and shall be so selected and arranged as to fit into the building spaces.

C. Materials Not Included:
   1. N/A.

1.03 SHOP DRAWINGS

A. Submit electronic files with dimensions, capacities, and information as soon as available from manufacturers.

1.04 QUALITY ASSURANCE

A. All materials and parts shall be new and unused of current manufacture.

B. Provide all necessary accessories required for a complete and operable system.

1.05 WARRANTY

A. Materials and workmanship shall be warranted for a period of not less than (1) year from the date of commissioning against defects in material and workmanship.

B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 AUTOMATIC WATER BASE SPRINKLER SYSTEM PIPING

A. Above ground mains and main branches pipes and fittings within the building shall be as follows:
   1. Steel Pipe: Black steel pipe welded and seamless, Grade A, ASTM A53; black welded and seamless steel pipe for fire protection use, ASTM A795; electric resistance welded steel pipe, Grade A, ASTM A135.
      a. Schedule 10 pipe 1-1/4” and smaller for welded and mechanical grooved fittings joint.
      b. Schedule 10 pipe 1-1/2” and larger for welded and mechanical grooved fittings joint.

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2. Fittings: Cast iron threaded fittings, Class 125 or 250, ASTM A126/ANSI B16.4. Malleable and ductile iron threaded fittings, Class 150 or 300, ASTM A197/ANSI B16.3. Standard weight seamless carbon steel weld fittings, ASTM A234 grade, ANSI B16.9. Mechanical grooved fittings with EPDM gaskets, ASTM A536 ductile iron, ASTM A47 malleable iron or ASTM A53 fabricated steel.
    a. Fittings 1-1/4" and smaller shall be threaded fitting joints.
    b. Fittings 1-1/2" and larger shall be welded and mechanical grooved fittings joint.
    c. Mechanical tee fittings with full iron back equal to Grinnell Figure 730 will be allowed only as needed for connection to existing systems.
    d. Mechanical tees fittings with U-bolt back or other fastening means are not allowed.
3. Plastic Pipe: Chlorinated polyvinyl chloride (CPVC) pipe, seamless conforming to ASTM F-442 standards. Pipe shall be UL Listed/FM Approved for a rated working pressure of 175 psi at 150°F for sprinkler service. Pipe shall be Spears FlameGuard or BlazeMaster.
    a. Schedule 40 and Schedule 80 dimensions for 1" through 1-1/4", Schedule 80 for 1-1/2" through 2".
4. Plastic Fittings: Schedule 40, Schedule 80 conforming to ASTM-437, ASTM-438 and ASTM-439 standards. Fittings shall be UL Listed/FM Approved for a rated working pressure of 175 psi at 150°F for sprinkler service. Fittings shall be Spears FlameGuard or BlazeMaster.
    a. Schedule 40 and Schedule 80 dimensions for 1" through 1-1/4", Schedule 80 for 1-1/2" through 2".

B. Above ground branches pipes and fittings within the building shall be as follows:
1. Steel Pipe: Black steel pipe welded and seamless, Grade A, ASTM A53; black welded and seamless steel pipe for fire protection use, ASTM A795; electric resistance welded steel pipe, Grade A, ASTM A135.
    a. Schedule 40 pipe 1-1/4" and smaller for welded, mechanical grooved and threaded fitting joints.
    b. Schedule 10 pipe 1-1/2" and larger for welded and mechanical grooved fittings joint.
2. Fittings: Cast iron threaded fittings, Class 125 or 250, ASTM A126/ANSI B16.4. Malleable and ductile iron threaded fittings, Class 150 or 300, ASTM A197/ANSI B16.3. Standard weight seamless carbon steel weld fittings, ASTM A234 grade, ANSI B16.9. Mechanical grooved fittings with EPDM gaskets, ASTM A536 ductile iron, ASTM A47 malleable iron or ASTM A53 fabricated steel.
    a. Fittings 1-1/4" and smaller shall be threaded fitting joints.
    b. Fittings 1-1/2" and larger shall be welded and mechanical grooved fittings joint.
    c. Mechanical tee fittings with full iron back equal to Grinnell Figure 730 will be allowed only as needed for connection to existing systems.
    d. Mechanical tees fittings with U-bolt back or other fastening means are not allowed.
3. Plastic Pipe (Corrosive Areas): Chlorinated polyvinyl chloride (CPVC) pipe, seamless conforming to ASTM F-442 standards. Pipe shall be UL Listed/FM Approved for a rated working pressure of 175 psi at 150°F for sprinkler service. Pipe shall be Spears FlameGuard or BlazeMaster.
    a. Schedule 40 and Schedule 80 dimensions for 1" through 1-1/4", Schedule 80 for 1-1/2" through 2".
4. Plastic Fittings (Corrosive Areas): Schedule 40, Schedule 80 conforming to ASTM-437, ASTM-438 and ASTM-439 standards. Fittings shall be UL Listed/FM Approved for a rated working pressure of 175 psi at 150°F for sprinkler service. Fittings shall be Spears FlameGuard or BlazeMaster.
    a. Schedule 40 and Schedule 80 dimensions for 1" through 1-1/4", Schedule 80 for 1-1/2" through 2".

2.02 UNIONS AND FLANGES

A. Unions, flanges and gasket materials to have a pressure rating of not less than 175 psig.

B. 2" and Smaller Steel: 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.

C. 2" and Smaller Copper: ANSI B16.18 cast bronze union coupling or ANSI B15.24 Class 150 cast bronze flanges.

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D. 2½" and Larger: ASTM A181 or A105, Class 150, grade 1 hot forged steel flanges of threaded, welding neck, or slip-on pattern on black steel and threaded only on galvanized steel. ANSI B16.1 or ANSI B16.5, Class 150 cast iron threaded flanges. Use raised face flanges ANSI B16.5 for mating with other raised face flanges or equipment with flat ring or full face gaskets. Use ANSI B16.1 flat face flanges with full face gaskets for mating with other flat face flanges on equipment.

2.03 MECHANICAL GROOVED PIPE CONNECTIONS

A. Mechanical grooved pipe couplings and fittings, as manufactured by Viking, Victaulic, ITT Grinnell, Stockham or Gustin-Bacon may be used with cut steel pipe. Couplings and fittings to be malleable iron, ASTM A47, or ductile iron A536.

B. All mechanical grooved pipe material including gaskets, couplings, fittings, and flange adapters to be from the same manufacturer.

C. Gaskets shall be EPDM, ASTM D2000. Heat treated carbon steel oval neck track bolts and nuts, ASTM A-183, with zinc electroplated finish.

D. Couplings: Standard flexible couplings, Style 77, or lightweight couplings, Style 75. Reducing couplings are not acceptable.

E. Flanges: Flange adapter Style 741, except at lug type butterfly valves where standard threaded flanges shall be used.

F. Fittings: Malleable or ductile iron elbows and tees of the manufacturer's standard line may be used in all sizes, except bullhead tees will not be accepted.

2.04 PIPE HANGERS AND SUPPORTS

A. Pipe hangers and supports shall be as manufactured by B-Line, Fee and Mason. Grinnell, Pate Roof Products & Systems, Unistrut or approved equal.

B. Pipe and fittings shall be anchored, clamped and rodded as required by the Architect, Engineer, and NFPA Codes.

C. Provide all supporting steel required for the installation of mechanical equipment and materials, including angles, channels, beams, etc. to suspended or floor supported equipment. All of this steel may be specifically indicated on the drawings.

D. Hangers for pipe sizes ½" through 2" shall be carbon steel, adjustable swivel, split ring or clevis.

E. Multiple or trapeze hangers shall be steel channels with welded spacers and hanger rods.

F. Wall support for pipe sizes through 3" shall be cast iron hook and for sizes 4" and over shall be welded steel bracket and wrought steel clamp.

G. Vertical support shall be steel riser clamp.

H. Floor support shall be painted steel pipe saddle, stand and bolted floor flange.

I. Provide threaded rods complete with adjusting and lock nuts.

J. Beam clamps shall be malleable black iron clamp for attachment to beam flange to 0.62 inches thick with a retaining ring and threaded rod of 3/8, 1/2 and 5/8 inch diameter. Furnish with a hardened steel cup point set screw or forged steel jaw type clamp with a tie rod to lock clamp in place, suitable for rod sizes to 1½ inch diameter.

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K. Riser clamps shall be black carbon steel filled clamp in two section that are bolted together around the pipe. Plastic or copper coat the clamps when used on copper pipe.

L. Anchors: Use welding steel shapes, plates and bars to secure piping to the structure.

M. Equipment Stands: Use structural steel members supported by pipe supports. All steel exposed to the weather to be galvanized or stainless. All other steel to receive prime and finish coat of rust inhibiting paint.

2.05 SLEEVES

A. Sleeves. Pipe sleeves to be Schedule 40 steel pipe flush with wall and ceiling surfaces.

B. Seal all openings between pipe and sleeves with fiberglass and vinyl acrylic plastic. For piping passing through fire walls, floors or ceilings, use 3-M Fire Barrier CP-25 caulk and 303 putty synthetic elastomers, U.L. rated.

2.06 BACKFLOW PREVENTER

A. Detector check valves for fire service 3" through 12" in size shall be Underwriters' approved as manufactures.

B. Double check valves shall be manufactured by Beeco, Cla-Vat, Febco, Watts or Wilkinson shall be ASSE 1015 double check backflow preventer with two independent spring loaded check valves, two isolation ball or gate valves, four valved test ports. Size for maximum pressure drop of 11 psig at 250 GPM. Construct of bronze or epoxy coated cast iron body with bronze and plastic internal parts, stainless steel springs, silicone rubber valve discs, bronze seats and rated for 175 psig.

2.07 VALVES

A. Valves shall be as manufactured by Kennedy, Milwaukee, Nibco, Stockham, Viking, Victaulic, ITT Grinnell, or equal, and must be approved and listed by UL or FM if applicable.

B. Gate valves 2" and smaller shall be outside screw and yoke, 175 psig, bronze body, bronze mounted, screwed bonnet, rising stem, solid wedge, with tamper switch. Gate valves 2½" and larger shall be outside screw and yoke, 175 psig, cast iron body, bronze mounted, bolted bonnet, rising stem, solid wedge, with tamper switch.

C. Butterfly valves 2" shall be bronze body butterfly, 175 psig, geared operator, visible position indicator, tamper switch, Buna or Viton seat, stainless steel disc and stem. Butterfly valves 2½" and larger shall be cast or ductile iron body butterfly, lug style, 175 psig, geared operator, visible position indicator, tamper switch, EPDM resilient seat, EPDM seals, nickel plated ductile iron disc. Valve assembly to be bubble tight to 175 psig with no downstream flange/pipe attached. Use cap screws for removal of downstream piping while using the valve for system shutoff.

D. Check valves 2" and smaller shall be bronze body, threaded end, Y-pattern, regrindable bronze seat, renewable bronze disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward. Check valves 2 ½" and larger shall be cast or ductile iron body, flanged or grooved ends, bronze trim, bolted cap, renewable bronze seat and disc, 175 psig, suitable for installation in a horizontal or vertical line with flow upward.

E. Spring loaded check valves 2" and smaller shall be bronze body, threaded ends, bronze trim, stainless steel spring, stainless steel center guide pin, 175 psig, teflon seat unless only bronze available. Spring loaded check valves 2½" and larger shall be cast or ductile iron body, wafer or globe type, bronze trim, bronze or EPDM seat, stainless steel spring, stainless steel stem if stem is required, 175 psig.

F. Drain valves shall be ½" two or three piece bronze body ball valve: threaded ends, chrome plated bronze ball; glass filled teflon seat; teflon packing and threaded packing nut; blowout-proof stem; 400 psig WOG, with hose thread outlet and cap.

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G. All valves controlling the water supply for automatic sprinkler systems and water flow switches on all sprinkler systems shall be electrically supervised. Alarm, supervisory and trouble signals shall be automatically transmitted to an approved supervising station per NFPA 72.

H. Supervisory/tamper switches, for OS&Y valve or butterfly valve installations, UL/FM listed/approved, to monitor position of valve, tamper resistant cover screws, single or double SPDT switch contacts, corrosion resistant, for indoor or outdoor use, NEMA 4 & 6P enclosures.

2.08 FLOW SWITCHES

A. Vane type UL approved waterflow switch with metal enclosure, adjustable pneumatic retard and electrical characteristics compatible with alarm system.

B. Pressure Switches: Pressure actuated UL approved switch with field adjustable settings, metal enclosure and electrical characteristics compatible with alarm system.

C. Pressure gauges shall be as manufactured by Ametek/U.S. Gauge Division, Ashcroft, Marsh, H.O. Trerice or equal. Select pressure range for twice the system working pressure but not less than 200 psig. Include bronze pressure snubber and ball valve gauge cock.

D. Automatic sprinkler systems shall be monitored by an approved supervising station. The automatic fire sprinkler system shall be tied into the building fire alarm control panel per NFPA 72, or a fire alarm panel shall be provided to supervise and monitor the fire sprinkler system. The fire alarm panel shall be protected in accordance with NFPA 72 and have at least one manual pull box for testing purposes.

2.09 ALARM BELL / HORN

A. Provide a weather tight external alarm bell / horn, read painted with metal housing on the exterior of the building above the FDC location or as determined by the AHJ / fire marshal.

B. Alarm bell shall be equal to Potter PBA-AC & MBA-DC.

C. Alarm bell shall be activated by the sprinkler flow switch.

2.10 STROBE LIGHT

A. Provide a weather tight external strobe light on the exterior of the building above the FDC location or as determined by the AHJ / fire marshal.

B. Strobe lights shall be equal to Potter SH-120 Series.

C. Strobe lights shall be activated by the sprinkler flow switch.

2.11 FIRE DEPARTMENT CONNECTION

A. Manufacturer: Elkhart Brass, Potter-Roemer, W.D. Allen or equal.

B. Confirm Fire Department Connection type with Fire Department.
   1. Furnish and install a 5” Storz polished brass Fire Department Connection with 30 degree downturn elbow similar to #5799 as manufactured by Potter-Roemer, Inc. or equal. Provide brass caps with chain and label as required.
   2. Furnish and install a 2½” x 2½” x 4” polished brass Fire Department Connection similar to #5751-B as manufactured by Potter-Roemer, Inc. or equal. Provide brass caps with chain and label as required.

C. Provide 24” automatic drip drain valve on inlet of Fire Department Connection.

2.12 SPRINKLERS

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A. Sprinklers shall be as manufactured by TYCO, Grinnell, Reliable, Viking or Victaulic,

B. Fusible link or glass bulb, cast brass or bronze construction. Provide heads with nominal ½" discharge orifice except where greater than normal density requires large orifice.

C. Provide ordinary-temperature sprinklers except where maximum ceiling temperatures exceed 100°F such as at skylights, sealed display windows, unventilated attics and roof spaces, over cooking equipment, adjacent to diffusers, unit heaters, uninsulated heating pipes or ducts, boiler rooms, or where otherwise indicated. Where maximum ceiling temperatures exceed 100°F, provide sprinklers with temperature ratings in accordance with NFPA 13 standards.

D. See drawings schedules sheet(s) for more information of specified sprinkler head types, colors and finishes.

2.13 SPRINKLER HEAD COVERS

A. Sprinklers shall be as manufactured by TYCO, Grinnell, Reliable, Viking or Victaulic,

B. See drawings fire sprinkler head and design hazard schedule for more information of specified heads, colors and finishes.

2.14 SPRINKLER HEAD GUARDS

A. Sprinklers shall be as manufactured by SprinkGuard, TYCO, Grinnell, Reliable, Viking or Victaulic,

B. See drawings fire sprinkler head and design hazard schedule for more information of specified heads.

2.15 SPRINKLER HEAD CONNECTORS / DROPS

A. Sprinkler head connectors / drops shall flexible and be equal to Victaulic series AQB braided Aquaflex stainless steel sprinkler fitting with 1-BEE bracket for connection to ceiling grid system. Minimum size shall be 1".

2.16 IDENTIFICATION

A. Valve Tags: Identify each valve in the system with valve tags in conformity with the Fire Underwriters and State of Wisconsin requirements. Round brass tags with ½ inch numbers, ¼ inch system identification abbreviation, 1 ¼ inch minimum diameter with brass jack chains or brass "S" hooks around the valve stem, available from EMED Co., Seton Name Plate Company or W.H. Brady.

B. Chart: Furnish three (3) charts, listing all valves, giving them locations in the building and their function in the system. One (1) chart with glass cover and neat frame; two (2) charts without frames to be delivered to the Architect.

C. All piping and equipment in this Division of the Work shall be identified as required by NFPA Codes and local Fire Department Standards with not less than 1 inch high letters/numbers for marking pipe and equipment.

D. 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., on equal, by W.H. Brady.

PART 3 EXECUTION

3.01 ERECTION

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A. 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 fire protection 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, ceiling grid layout, light fixtures, and grilles before installing piping.

B. Install piping so that system can be drained. Where possible, slope to main drain valve. Slope dry pipe or pre-action systems subject to freezing at minimum ¼"/10' on mains and ½"/10' on branches. Where piping is susceptible to freezing and cannot be fully drained, install nipple and cap for drainage of less than 5 gallons or valve/nipple/cap for drainage over 5 gallons. Pipe drain valves to grade or to air gap sewer receptor.

3.02 JOINTS AND CONNECTIONS

A. Threaded Pipe Joints: Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking will be allowed.

B. Mechanical Grooved Pipe Connections: Use pipe factory grooved in accordance with the coupling manufacturer's specifications or field grooved pipe in accordance with the same specifications using specially designed tools available for the application. Lubricate pipe and coupling gasket, align pipe, and secure joint in accordance with the coupling manufacturer's applications.

3.03 HANGERS AND SUPPORTS

A. 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.

3.04 SPRINKLER HEADS

A. Locate sprinkler heads as indicated on fire protection plan and reflected ceiling plan maintaining minimum clearances from obstructions, ceilings, and walls. Install sprinkler heads level in location not subject to spray pattern interference. Center sprinkler heads in ceiling panels.

B. Sprinkler heads with concealed covers shall match the adjacent ceiling with color. Sprinkler heads with concealed covers shall have its color matched / painted by the manufacturer.

3.05 SWITCHES

A. Locate flow and pressure switches where indicated and where required to obtain specified zoning to isolate floors and major areas of floors. Provide valved test connection for flow switch adjacent to flow switch. Pipe to floor drain. Test flow switch to verify proper operation.

3.06 GAUGES

A. Provide a valved pressure gauge in main fire sprinkler zone riser.

3.07 VALVES

A. Properly align piping before installation of valves. Do not support weight of piping system on valve ends. Mount valves in locations which allow access for operation, servicing, and replacement. Install all valves with the stem in the upright or horizontal position. Valves installed with the stems down will not be accepted. Provide a riser shutoff valve and a capped hose thread drain valve at the bottom of each riser. Provide capped hose thread drain valves to allow draining of each portion of piping.

3.08 IDENTIFICATION

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A. All equipment, pipe and valves, etc., shall be identified as listed below.

B. All piping in this Division of the Work exposed, in access spaces or above ceilings shall be identified at minimum of 25' intervals and at least once in every room with W.H. Brady Co., Seton, or equal, pipe marking labels, 2¼" color as required by A.N.S.I. standards.

C. Sprayed on pipe stencils letterings are not allowed.

D. Valve tags shall be 1 1/8" round brass tags with black numerals. Fasten tags to body of valves with copper or brass chain. Numerals on tags shall correspond to the record drawings.

E. Charts:
1. Furnish three (3) charts listing all valves, giving their location in the building and describing the valve number, service, function, normal position, etc. One (1) chart encased in plastic to be mounted in the building maintenance office and the other two (2) charts delivered to the Architect for transmittal to the Owner.
2. Furnish one (1) overall floor plan showing the location of all valves and the corresponding number from the valve chart.
3. Provide hydraulic design information sign of permanently marked weatherproof metal or engraved nameplate material Secure to alarm valve with brass chain. Information to include location of the design areas, discharge densities, required flow and residual pressure at the base of riser, hose stream demand and sprinkler demand.

3.09 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base on contract drawings.

B. Identify conflicts with the work of other trades prior to installation of work.

C. Adjust system to satisfy field requirements.

3.10 DELIVERY, STORAGE AND HANDLING

A. Receive, sign for and store all equipment in this section.

B. Maintain original quality and condition of equipment while it is in storage.

3.11 INSTALLATION

A. General
1. The complete installation shall be done in a neat, workmanlike manner in accordance with all applicable codes and the manufacturer's recommendations.
2. Install all materials, assemblies, fixtures and equipment in strict accordance with manufacturer's recommendations and instructions. Consult manufacturer for all diagrams, schematics, sizes, outlets, etc. before installing.

B. Painting
1. Exposed piping is to be painted by Painting Contractor. This Division Contractor shall protect sprinkler heads and equipment from painting in exposed areas.

C. General
1. See specifications section 21 05 00 – Fire Suppression Requirements for more information.

D. Testing
1. All testing that is required for the installation of the system specified shall be done by this Division's contractor prior to painting, backfilling, installation of pipe covering, or concealment within the building construction.

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2. All tests shall be conducted in the presence of and to the satisfaction of the inspector having jurisdiction.
3. Testing shall be conducted in accordance with the Wisconsin Building Code and NFPA standards or as hereinafter specified.
4. Repair any leaks that occur during testing, and retested until no leaks occur for the installation of the system specified shall be done by this Division's contractor.
5. The system specified shall be tested and proved watertight under a water pressure not less than 200 PSI for a period of two hours. Where system design is in excess of 150 psig, test at a pressure 50 psig above system design pressure.
6. All pressure tests are to be documented on NFPA Contractor's Material and Test Certificate forms.

3.12 OWNER TRAINING

A. Instruct Owner's personnel in the proper operation, maintenance and testing of systems and equipment provided as part of this project.

3.13 SPARE EQUIPMENT

A. Provide quantity of spare heads as noted below and 1 wrench for each type of head and each temperature range installed. Provide 6 spare heads per 300 or less installed heads, 12 per 1000 or less and 24 for more than 1000. Provide steel cabinet for storage of heads and wrenches.

END OF SECTION

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SECTION 22 00 00
PLUMBING

PART 1 GENERAL

1.01 WORK INCLUDED

A. Plumbing where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Domestic hot, cold, and tempered water piping systems and water service.
   2. Waste and vent systems and waste service.
   3. Gas piping and service.
   4. Plumbing fixtures and trim as shown on the Drawings.
   5. Plumbing equipment.
   6. Water heating system.
   7. Pipe and pipe fittings. Pipe hangers and supports. Valves. Piping specialties, drainage specialties, and supply specialties.
   8. Mechanical Identification. Sleeves.
   9. Piping and equipment insulation, jackets, and accessories.
   10. Caulking of penetrations, openings, and fixtures.

B. Coordinate services, with required meters, with local utilities. Verify water and gas service pressure at connection.

C. Water Meter: Furnished by Owner. Installed under this Section.

D. Use of American Iron and Steel.

1.02 WORK OF OTHER SECTIONS

A. Openings for work in walls, floor, roof, ceiling, etc., required by this section shall be provided under other sections. Locations and size of these openings shall be the responsibility of this Contractor.

B. Division 03 - Concrete.

C. Division 04 - Masonry.

D. Division 06 - Woods, Plastics, and Composites.

E. Division 07 - Thermal and Moisture Protection.

F. Section 07 92 00 - Joint Sealants: Sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters exposed after finished installation.

G. Division 09 - Finishes.

H. Section 09 96 00 - High Performance Coating: Painting of piping, insulation, etc.

I. Section 23 00 00 - Heating, Ventilating, and Air Conditioning: Fuel-fired heating equipment.

J. Division 26 - Electrical: Electrical line voltage wiring (100 volts and greater) connections.

K. Section 33 10 00 – Water Utilities: Water service.

L. Section 33 31 13 – Public Sanitary Utility Sewerage Pipe: Sanitary sewer service.

1.03 BUILD AMERICA, BUY AMERICA (BABA) ACT COMPLIANCE

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A. All Iron and Steel Products, Manufactured Products, and Construction Materials installed for this project by any and all contractors and Manufacturers MUST comply with the Build America, Buy America (BABA) Act requirements under Title IX of the Infrastructure Investment and Jobs Act (IIJA), Pub. L. 117-58, §§ 70901-70953 or are the subject of a waiver approved by the Funding Agency or designee.

1.04 RELATED SECTIONS

A. Documents affecting work of this section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 01 of these specifications.

B. Section 07 92 00 - Joint Sealants: Requirements for sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters.

C. Section 07 92 00 - Joint Sealers: Requirements for sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters concealed after finished installation.

D. Division 26 - Electrical: Requirements for electric connections specified by this section.

E. Division 31 – Earthwork: Requirements for trenching and backfilling.

1.05 GENERAL PROVISIONS

A. Everything essential for the completion of the work implied to be covered by these Specifications to make the System ready for normal and proper operation must be furnished and installed by the Contractor. Accordingly, any omission from either the plans or the Specifications, or both, of details necessary for the proper installation and operation of the system shall not relieve the Contractor from furnishing such detail in full and proper manner.

B. The plans show various details indicating the general arrangement of the plumbing work, sizes and locations of piping, equipment, etc. The said plans with figures, lettering, etc., shall be considered a part of these Specifications and no charge or alternation shall be made in either case unless ordered by the Engineer.

C. In addition to the plumbing plans, see General Plans of the building, all plumbing work appearing on the latter plans will be part of this contract unless especially specified to be done by other contractors, as well as, said work detailed on the plumbing plans.

D. “Chemical Area” indicated on the Drawing shall define materials to be used in the area designated as described herein or on the Drawings. Miscellaneous materials not specifically scheduled or specified and used in this space shall be resistant to corrosion from the chemical contained in the room under non-immersion, non-splash, or non-spray service.

1.06 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Control: Quality provisions.

B. Perform work in accordance with State of Wisconsin and industry standards.

C. Qualification of Installer:
1. Company specializing in performing the work of this section with minimum three (3) years documented experience.
2. In acceptance or rejection of installed work, the Architect or Engineer shall make no allowances for lack of skill on part of the installers.
3. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
4. All work shall be installed in a first-class manner by State of Wisconsin licensed plumbers.

D. Qualification of Manufacturer:

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1. Company specializing in manufacturing products specified in this section with a minimum of 10 years experience. Manufacturer shall conform to the ratings and certifications indicated.
2. Equal products shall be of similar quality, be functionally similar, and have the controls specified. Where more than one type of product is specified in a particular section, the listed acceptable manufacturers may not have an equal product for every type of product specified.

E. Codes and regulations:
1. All plumbing installation shall meet the requirements of the State of Wisconsin Board of Health.
2. In addition to complying with the specified requirements, comply with pertinent regulations of governmental agencies having jurisdiction.
3. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern when so directed by the Engineer.

F. The following standards, referred hereafter by basic designation only, are imposed, as applicable to work in each instance, and form a part of this specification to the extent indicated by the reference thereto:
1. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.
2. ANSI - American National Standards Institute
   a. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
3. ASME - American Society of Mechanical Engineers
4. ASTM - American Society for Testing and Materials
5. AWWA - American Water Works Association
6. DSPS - Department of Safety & Professional Services, Division of Industry, Wisconsin Administrative Code
   a. Plumbing, Current Edition
   b. 2018 Wisconsin Commercial Building Code
7. International Code Council (ICC):
   a. IECC - International Energy Conservation Code, 2015 edition, and all referenced standards
8. National Fire Protection Association (NFPA):
   a. NFPA 70 - National Electric Code (NEC), 2014 edition.
9. SDWA – Federal Safe Drinking Water Act
   a. Reduction in Lead Drinking Water Act

G. All materials used in the drinking water system, including plumbing pipes, fittings, and fixtures, shall meet the requirements of the federal definition of “lead-free.” The definition requires that no more than 8-percent lead content means “not more than a weighted average of 0.25-percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fixtures, and fixtures.” Solder and flux are not to exceed 0.2-percent lead.
1. Exemptions include:
   a. Applications that are exclusively used for non-potable systems; which includes pipes, pipe fittings, plumbing fixtures, and back-flow preventers in non-potable systems or uses where the water is not used for human consumption.
   b. Toilets, bidets, urinals, fill valves, flushometer valves, tub fillers, shower valves, service saddles, or water distribution main gate valves 2-inches in diameter or larger.
2. Lead-free products shall bear a certified mark by a nationally accredited certification body such as UL, NSF, IAPMO R&T, CSA, ICC-ES, WQA, Truesdail, or ETL that includes texts consisting of NSF-60-G, NSF pw-G, NSF-372, or low lead content.

1.07 PERMITS

A. The Contractor shall obtain and pay for all construction permits required for Work of this section.

B. One (1) copy of all permits shall be provided to Owner.

C. One (1) copy of all permits shall be maintained on site.

1.08 COORDINATION

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A. Section 01 31 13 – Project Coordination: Coordination provisions.

B. Cooperate and coordinate with other trades to assure that all systems in the plumbing work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

C. Arrange work in neat, well organized manner with piping and similar services running parallel with primary lines of building construction and with minimum 7 foot overhead clearance. Provide maximum clearances wherever possible.

D. Locate equipment properly to provide easy access, and arrange entire plumbing work with adequate access for operation and maintenance.

E. Give right-of-way to piping which must slope for drainage.

1.09 SUBMITTALS

A. Section 01 33 00 - Submittals: Submittal provisions.

B. The Contractor shall be responsible for correction of work deemed necessary by the Engineer due to proceeding with the work without shop drawings that have the Engineers final approval.

C. This Contractor will be responsible for all figures and dimensions shown on the shop drawings. Approval of shop drawings describing equipment that cannot fit in the space allotted does not relieve this Contractor from providing equipment that will meet the space requirements.

D. Shop drawings: include data on physical dimensions, gauges, materials of construction, and capacities.
1. Plumbing Fixtures and Equipment: Manufacturer's literature, include capacities, equipment performance, and electrical characteristics.
2. Mechanical Identification, including listing of wording, symbols, letter size and color coding; valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

E. Product Data:
1. Valves: Submit manufacturers catalog information with valve data and ratings for each service.
2. Plumbing Piping Specialties: Submit manufacturers catalog information with sizes, capacities, sizes, and finishes.
3. Plumbing Drainage Specialties: Submit manufacturers catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.
4. Plumbing Supply Specialties: Submit manufacturers catalog information with sizes, capacities, rough-in requirements, service sizes, and finishes.
5. Mechanical Insulation and Jackets: Product description, list of materials, and thickness for each service or equipment scheduled and locations.
6. Mechanical Identification: Submit manufacturer's catalog literature for each product.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 – Material and Equipment: Product storage and handling provisions.

B. Accept equipment on site in factory packaging. Inspect for damage.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation and related products when ambient temperatures and conditions do not meet manufacturer's requirements.

B. Maintain temperature before, during, and after installation for minimum period of 24 hours.

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1.12 CLOSEOUT SUBMITTALS

A. Section 01 70 00 – Project Closeout: Closeout provisions.

B. Project Record Documents and As-Builts: Record actual location of equipment and fixtures including items remotely within walls or above ceilings, etc.

C. Operation and Maintenance Data and Instructions:
   1. Submit manufacturer's descriptive literature, operating instructions, service instructions, installation instructions, maintenance and repair data, parts listing, warranties, and wiring diagrams.
   2. Assemble two (2) complete sets. Prepare in bound copies complete with index tabs.
   3. Submit bound copies to Engineer for disbursement.

D. Test Results:
   1. Submit the Certificate of Performance on the domestic water service, include results of laboratory analysis of water sample.
   2. Submit all records and certifications approving testing requirements and a complete record of all testing that has been approved on the piping systems.

E. Warranties.

1.13 WARRANTY

A. Section 01 77 00 - Closeout Procedures: Warranty provisions.

B. Pumps: Furnish five (5) year manufacturer warranty.

C. Mechanical Faucets: Furnish five (5) year manufacturer warranty on faucet and cartridge. Furnish one (1) year manufacturer warranty on finish.

D. Emergency Fixture Thermostatic Mixing Valve: Furnish 10-year manufacturer warranty on thermostat.

E. Commercial Water Heater: Furnish three (3) year manufacturer's warranty against tank leaks.

1.14 SPECIAL PROJECT CONDITIONS

A. Allowances:
   1. Section 01 21 00 – Allowances.
   2. The allowance amount shown is the invoice amount from the utility.
   3. The plumbing contract will be adjusted up or down by change order by the amount listed for the allowance, less the actual cost of the utility fee. No additional compensation for mark-ups or handling will be allowed by the contractor. Any such costs shall be included in the bid.

B. Utility Coordination:
   1. Be responsible for utility coordination on behalf of the Owner. Contact the Owner to determine requirements, and from that, organize a meeting with the various system serving utilities, so that the installation of the service can be done to coordinate with building construction.
   2. Gas Utility: Company name. Contact name, phone number.

PART 2 PRODUCTS

2.01 PIPES AND TUBES

A. Sanitary Sewer Piping and Vent Piping:
   1. Buried below the building and outside within 5 feet of the building:
   2. Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, ASTM D3034 (SDR of 26 or less), or ASTM F891 (schedule 40 only) with PVC fittings and solvent weld joints complying to ASTM D2855.

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Primer shall conform to ASTM F656. Solvent shall conform to ASTM D2564 and be handled in accordance with ASTM F402.

3. Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, ASTM D3034 (SDR of 26 or less), or ASTM F891 (schedule 40 only) with PVC fittings and mechanical push-on joints complying to ASTM D3212. Mechanical joints shall be installed in accordance with manufacturer's instructions.
4. All piping within 50-feet of a well shall be pressure class rated.

B. Above ground inside the building:
1. Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, or ASTM F891 (schedule 40 only) with PVC fittings and solvent weld joints complying to ASTM D2855. Install in accordance with ASTM D2321. Primer shall conform to ASTM F656. Solvent shall conform to ASTM D2564 and be handled in accordance with ASTM F402.
2. Polyvinyl Chloride (PVC) Pipe: ASTM D1785, ASTM D2665, or ASTM F891 (schedule 40 only) with PVC fittings and mechanical push-on joints complying to ASTM D3212. Install in accordance with ASTM D2321. Mechanical joints shall be installed in accordance with manufacturer's instructions.
3. All exposed piping inside the building, within 7 feet of the floor, shall be Schedule 80 PVC.

C. Water Piping:
1. General:
   a. All materials in contact with water shall be suitable for use with potable water.
   b. All pipes, fittings, and other materials for water supply lines shall be made of a material that is "lead-free".
   c. A water supply system shall be resistive to corrosive action and degrading action from the water being conveyed.
   d. Plastic pipe shall be certified for potable water contact by nationally recognized listing agency.
   e. Water distribution pipe shall have a minimum working pressure of 100 psig at 180 degrees F; except underground cold water distribution pipe shall have a minimum working pressure of 150 psig at 73.4 degrees F.
   f. Joints between different materials shall be made with mechanical compression joints.
2. Buried below the building and outside within 5 feet of the building:
   a. Copper Tubing: ASTM B42, annealed without fittings. Type K.
3. Above ground inside the building:
   a. Copper Tubing: ASTM B88, Type L, hard drawn, with cast brass or wrought copper fittings and Grade 95TA soldered joints. Joint surfaces shall be made in accordance with ASTM B828. Solder shall conform to ASTM B32. Flux shall be approved by NSF.
   b. Copper Tubing: ASTM B88, Type L, hard drawn, with wrought copper fittings and mechanical joints. Mechanical joints shall be installed in accordance with manufacturer's instructions. Mechanical push-on joints and mechanical compression type joints which use flexible elastomeric seals shall be suitable for potable water.
   c. Chlorinated Poly Vinyl Chloride (CPVC) Pipe (SDR11 piping for water temperatures up to 180OF): ASTM D2846 with CPVC fittings and solvent weld joints. Mechanical joints shall be installed in accordance with manufacturer's instructions. Mechanical push-on type joints with use flexible elastomeric seals shall conform to ASTM D3139. Solvent cemented joints shall be made in accordance with ASTM D2846 or ASTM F493. Solvent cement shall conform to ASTM F493 and handled in accordance with ASTM F402.
   d. All piping exposed, not installed within wall, floor, or ceiling construction, in Chemical areas shall be plastic.
   e. All piping, exposed or concealed in all areas, except Chemical areas, shall be copper.

D. Natural Gas Piping:
1. Piping and tubing shall have a minimum working pressure of 150 psig.
2. Buried below the building and outside within 5 feet of building:
   a. By gas utility.
   b. Polyethylene Pipe: ASTM D2513, SDR 11.5, with socket type fittings and fusion welded joints.
      1) Materials and installation shall conform to AWWA C203 requirements.
3. Above ground inside the building:

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a. Steel Pipe: ASTM A53, Schedule 40 black, with malleable iron or forged steel fittings, screwed or welded. Threaded joints shall comply with ASME B1.20.1.

b. Equipment Connections:

1) Steel tubing: ASTM A254 or ASTM A539.

2) Corrugated stainless steel tubing: Tested and listed in compliance with the construction, installation, and performance requirements of ANSI/AGA LC 1.

3) Tubing joints: Shall be made with approved gas tubing fittings or brazed with a material having a melting point in excess of 1,000o F. Brazing alloys shall not contain more than 0.05% phosphorus.

2.02 VALVES

A. Valves must be trademarked on body with manufacturer's name or trademark and pressure rating.

B. Minimum design pressure of 200 psig and certified for water-oil-gas (WOG) operation.

C. Valves installed in CPVC pipe shall be of CPVC construction.

D. Valves installed in pipes with insulation shall be provided with extensions for the handles.

E. Gas shut-off valves:

1. Ball valve: bronze body, threaded ends, stainless steel ball, full or conventional port, Teflon seat, blow-proof stem, two-piece construction.
2. UL listed for use as a gas shut-off.
3. Exterior valves shall have square lug.
4. Acceptable Manufacturers: American Valve, Red-White Valve Corp., or equal.

F. Gas Cocks:

1. Sizes 1/2 inch to 4 inches: DeZurik Fig. 425 gas valve, cast iron body, screwed or flanged ends, bronze bearings, bronze plug and resilient seal ring for bubble-tight shut-off to 175 psig working pressure.
2. UL approved for natural gas.
3. Acceptable manufacturers: Crane, DeZurik, Jenkins, Milwaukee, Nibco, and Walworth.

G. Ball Valves:

1. Up to 2 inches: Bronze or stainless steel one-piece body, chrome plated brass ball, Teflon seats and stuffing box ring, lever handle, solder or threaded ends.
2. Acceptable Manufacturers: American Valve, Crane, FMC Crosby Valve, Red-White Valve Corp., or equal.

H. Thermoplastic Ball Valves

1. Thermoplastic ball valves, 6 inch and smaller, shall have full port, PVC SCH 80 body, ball and stem.
2. Valves shall be end entry, double union design with solvent weld socket in accordance with ANSI B1.20.1 or flanged end connections.
3. Seats shall be PTFE and seals shall be Viton o-ring stem seals.
4. Provide hand lever operator with stops at the full open and full closed positions.
5. Valves shall be rated for the greater of 150 psi or 150 percent of working pressure.

I. Relief Valves:

1. Bronze body, Teflon seat, stainless steel stem and springs, automatic, direct pressure actuated capacities ASME certified and labeled.
2. Gas service: Stainless steel seat and disc.
3. Acceptable Manufacturers: Aquatrol, Kunkle Valve, or equal.

2.03 PIPING SPECIALTIES

A. Flanges, Unions, and Couplings:

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1. Pipe Size 2 inches and Under: Malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
2. Pipe Size Over 2 inches: Forged steel flanges for ferrous piping; bronze flanges for copper piping; preformed neoprene gaskets.
3. Grooved and Shouldered Pipe End Couplings: Malleable iron housing, C-shape elastomer composition sealing gasket, steel bolts, nuts, and washers.
4. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

B. Flexible Connectors:
1. Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9-inches long with copper tube ends; for maximum working pressure 300 psig.

C. Water Pressure Gages:
1. Gage: ASME B40.100, with bourdon tube, rotary brass movement, brass socket, front calibration adjustment, black scale on white background.
   a. Case: Cast aluminum or stainless steel.
   b. Bourdon Tube: Type 316 stainless steel.
   c. Dial Size: 4-1/2 inch diameter. Readable to person standing on floor.
   d. Mid-Scale Accuracy: two percent.
   e. Scale: Psi.
   f. Graduation: 0 to 5 psig, in inch of water increments.
2. Acceptable manufacturers: Kunkle, Taylor, Trerice, or equal.

D. Thermometers:
1. Stem Type Thermometer: ASTM E1, adjustable angle, red appearing mercury, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.
   a. Size: 9 inch scale.
   b. Window: Clear glass.
   c. Stem: Brass, 3/4 inch NPT, 3-1/2 inch long.
   d. Accuracy: 2-percent.
   e. Calibration: Both degrees F and degrees C.

E. Pressure Reducing Valve:
1. Designed for plumbing system, serviceable in line, bypass feature for thermal expansion pressure. Cast bronze body, stainless steel fasteners, stainless steel seat.
2. ASSE Listed 1003, IAMPO Listed, CSA Certified.
3. Maximum Working Pressure: 300 psi.
4. Adjustable Outlet Pressure: 75-125 psi.
5. Wilkins Model 500-510.
6. Acceptable Manufacturers: Watts, Bell & Gosset, Wilkins, or equal.

F. All specialties exposed in Corrosion or Chemical areas shall be type 316 stainless steel or chemical-resistant.

2.04 DRAINAGE SPECIALTIES

A. Refer to project plumbing schedules for floor drains, cleanouts, hub drains, and all applicable drainage specialties.
1. Acceptable Manufacturers: Josam, Smith, Zurn, or equal.

B. Traps: For all lavatories and sinks, except service sinks, Los Angeles pattern cast brass traps with brass nuts.

2.05 SUPPLY SPECIALTIES

A. Water Meter: Furnished by local Water Utility. 100% lead free.

B. Backflow Preventers:

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1. Hose Bibb: ASSE 1011; hose connection type anti-siphon vacuum breaker; meet the requirements of ANSI A112.1.3.
    a. Acceptable Manufacturers: Watts, Woodford, or equal.
    b. Refer to project plumbing schedules for additional information.

C. Water Hammer Arrestors:
1. Water hammer arrestors shall be tested and certified in accordance with the Plumbing Drainage Institute Standard PDI WH-201.
2. Stainless steel construction bellows type, pre-charged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psi working pressure, permanently sealed.
    a. Acceptable manufacturers: Josam 75000 series Smith 5000 series, Wade 4480, or Watts SS series.
3. Provide at each fixture or branch of fixtures and where called for elsewhere on the drawings.

D. Thermostatic Mixing Valves:
1. Emergency Station: Designed specifically for emergency fixtures with drench shower and/or eye/face wash.
    a. Flow capacity of 3 to 44 gallons per minute (GPM).
    b. Capable of delivering 20 gpm with no more than a 10 psi drop in pressure across valve.
    c. Dial thermometer on outlet.
    d. Mixing valve shall have bimetallic thermostat that senses incoming water temperature and automatically blend water to adjustable outlet set point temperature.
    e. Built-in cold water by-pass, assuring cold water in event of loss of or interruption of the hot water supply or thermostat failure.
    f. Positive shut-off of hot water supply when cold water supply is lost.
    g. Vandal resistant temperature adjustment.
    h. High temperature limit stop at 90° F.
    i. Temperature range: 65°F to 90° F.
    j. Maximum operating supply pressure: 125 psi.
    k. Maximum inlet temperature: 180°F.
    l. Warranty: Manufacturer's 1-year.
2. Acceptable Manufacturers: Bradley, Guardian, or equal.
3. Provide thermometers on hot and cold water inlets.
4. Provide pressure gage on mixed water outlet.

E. Hose Bibbs/Hydrants:
1. Interior Hose Bibbs, Potable Systems:
    a. Brass or cast brass, replaceable hexagonal disc, hose thread spout, chrome plated with vacuum breaker.
    b. Acceptable Manufacturers: Watts, Woodford, or equal.
2. Sample Taps:
    a. Bronze or brass, replaceable hexagonal disc, smooth end spout, chrome plated.
    b. Acceptable Manufacturers: T&S Brass B-0703, Kohler K-7870-C or equal.

2.06 PIPE INSULATION

A. EPDM-Rubber: ASTM C534 Type I and II, ASTM D1056, flexible, closed-cell EPDM-rubber based elastomeric, tube and sheet, UV resistant, indoor/outdoor, mold and fungal growth resistant, paintable. Self-sealing acrylic adhesive closure and exterior (cellular fusion adhesive) tape shall be provided at all longitudinal joints; exterior tape shall be applied at butt joints.
1. Physical Properties:
    a. k Value: 0.245 at 75 degrees F (ASTM C518/C117)
    b. Density: 3 to 6 psf
    c. Service Temperature (continuous): -297^{O}F to 257^{O}F
    d. Water Vapor Permeability: 0.03 perm (ASTM E96)
    e. Water Absorption (weight %): 0.2% (ASTM C209)
    f. Flame Spread/Smoked Developed Ratings (through 2" thickness): 25/50 (ASTM E84), self-extinguishing (ASTM D635)

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2. Acceptable Products:
   a. Aerocel Stay-Seal with Protape (SSPT) by Aeroflex, 423-337-2493, www.aeroflexusa.com. Provide manufacturer's rigid pipe supports (Aerofix), fabricated fitting covers (AeroFit), tape (Protape), and adhesive.

B. Finished Jackets:
1. PVC Plastic: One-piece molded type fitting covers and sheet material.
   a. Thickness: 20 mil.
   b. Tensile Strength and Modulus: 6,000 psi, 470,000 psi
   c. Flexural Strength and Modulus: 11,600 psi, 460,000 psi
   d. Surface Burning Characteristics: Flame spread - 25 or less, smoke development - 50 or less.
   e. Connections: Brush on adhesive, or pressure sensitive color matching vinyl tape, or solvent welding adhesive.
   f. Installation Locations: Indoor or outdoor.
   g. Color: Blue for water pipe, off-white for other applications.

C. Composite piping insulation (insulation, jackets, coverings, sealers, mastics, and adhesives) shall have ratings not exceeding flame spread index rating of 25 and a smoke developed index rating of 150 (test method ASTM E-84).

D. All exposed insulation without finished jacket shall have paintable surface finish.

E. Schedule:
1. Domestic Hot, Cold, and Tempered Water:
   a. Insulation: EPDM Rubber
      1) Schedule: Exposed and concealed:
         i. Hot Water

Pipe Size	Thickness
1/2 inch to 2 inches	1 inch

         ii. Cold and Tempered Water

Pipe Size	Thickness
1/2 inch to 1 inch	1/2 inch
1 1/4 inch to 2 inches	3/4 inch

   b. Finished Jacket, exposed areas: PVC

2.07 SLEEVES AND SEALS

A. Sleeves for pipes through walls, footings, and potentially wet floors: Schedule 40 PVC.

B. Sleeves shall be of sufficient length to pass through entire floor or wall construction. Sleeves through floors shall extend 1 inch above finished floor level.

C. All sleeves shall be of sufficient diameter such that the bare or insulated pipe, as applicable, with unbroken pipe covering or wrapping, where specified, can pass through and allow for expansion and contraction in all directions.
1. Uninsulated: Sleeve shall be two pipe sizes larger than the pipe passing through; or provide a minimum of 1/2 inch clearance between inside of sleeve and outside of the pipe.
2. Insulated: Sleeve shall be of adequate size to accommodate the full thickness of pipe covering, with clearance for packing and caulking.

2.08 ESCUTCHEONS

A. 1 inch wide or of sufficient size to cover the sleeved opening and an inside diameter to fit snugly around pipe.

B. Finish shall be stainless steel; except at Chemical Areas provide plastic or fiberglass.

2.09 PIPE HANGERS AND SUPPORTS

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A. Plumbing Piping - Drain, waste, vent, and domestic water:
   1. Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Carbon steel, adjustable swivel, split ring.
   2. Hangers for Pipe Sizes 2 inches and Over: Carbon steel, adjustable, clevis.
   3. iron roll, double hanger.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3 inches: Cast iron hook. For insulated pipe, bracket shall allow for insulation to run continuous through bracket or have a single offset penetration so that insulation is continuous around bracket.
   6. Wall Support for Pipe Sizes 4 inches and Over: Welded steel bracket and wrought steel clamp. For non-insulated pipe only.
   7. Vertical Support: Steel riser clamp.
   8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.

B. With supporting stands, struts, rods, plates, brackets, and attachments as necessary.

C. Standard or heavy-duty grade.

D. All items in Chemical areas shall be plastic, fiberglass, or equal chemical resistance.

E. Insulation shall be continuous through all hangers and supports, except vertical supports which shall provide thermal break at pipe connection and a single penetration through the insulation. Hangers and supports shall provide adequate offset from structure to allow the insulation and finished jacket to run through continuous.

F. Acceptable manufacturers: Cooper B-Line, Fee and Mason, Michigan Hanger Co., or equal.

G. Pipe Hanger Spacing:

Pipe size:	max. hanger spacing	hanger rod diameter
1/2 to 1-1/4	6’	3/8”
1-1/2 to 2	10’	3/8”
2-1/2 to 3	10’	1/2”
4 to 6	10’	5/8”
8 to 12	14’	7/8”
14 and over	20’	1”
PVC (All Sizes)	6’	3/8”

2.10 FIXTURES

A. See Plumbing Fixture and Equipment Schedule on Drawings for additional requirements.

B. Emergency (Safety) Station:
   1. Drench Shower with Eye/Face Wash – Chemical Resistant:
      a. Construction: All PVC or PVC-coated components.
      b. Shower head: 10-inch diameter plastic.
      c. Shower valve: 1-inch chrome plated stay-open ball valve. Valve shall be chrome plated brass ball with Teflon seals. Flow shall be 20 gallons per minute. Stainless steel actuating arm and 29-inch stainless steel pull rod.
      d. Spray head assembly: Four (4) spray heads with flip top dust cover, internal flow control and filter.
      e. Eye/Face Wash bowl: 11½-inch diameter ABS plastic.
      f. Eye/Face Wash Valve: 1/2-inch IPS chrome plated brass stay-open ball valve with flag handle. Valve shall be chrome plated brass ball with Teflon seals.
      g. Mounting: PVC floor flange.
      h. Pipe and Fittings: Schedule 80 PVC.
      i. Supply: 2-inch IPS weld top female inlet.
      j. Waste: 2-inch IPS socket weld female outlet.
      k. Sign: ANSI-compliant identification sign for wall mounting.
      l. Warranty: Manufacturer’s 2-year

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2. Acceptable Manufacturers: Bradley, Guardian, or equal.

C. Provide all necessary accessories and ancillary devices for a complete and operable system.

2.11 EQUIPMENT

A. See Plumbing Fixture and Equipment Schedule on Drawings for additional requirements.

B. Demand (Tankless) Gas Water Heaters:
1. Automatic, natural gas fired, direct power vent, separated combustion, tankless water heater with electronic ignition, condensing, modulating gas valve.
   a. Power input: 19,000-199,000 BTU/hr.
   b. Minimum flow to activate: 0.65 to 0.80 gpm.
   c. Maximum working pressure: 150 psi.
   d. Warranty: 12 year warranty on heat exchanger, 2 year warranty on parts.
   e. Acceptable Manufacturers: Bosch, State, or equal.

C. Provide all necessary accessories and ancillary devices for a complete and operable system.

2.12 MECHANICAL IDENTIFICATION

A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have a minimum sheet size with stainless steel spring fastener. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Conform to ASME A13.1 and State of Wisconsin Plumbing Code.
1. Acceptable Manufacturer: Seton Nameplate Corporation, Kolbi Pipe Markers Co., or equal.

C. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service, detectable.

D. Valve Tags: minimum 1 1/2 inches diameter, lettering shall be a minimum of 1/2 inch in height.
1. Material:
   a. Plastic: Laminated three-layer plastic with engraved black letters on light background color.

2. Shape:
   a. Gas Service: Square/diamond shape.
   b. Potable Water Service: Circle shape.

E. Framed, typewritten directory under glass for all valves.

F. All items in Chemical Area shall be plastic, fiberglass, or equal chemical resistance.

2.13 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

B. Formed channels:
1. Stainless steel 12 gage with holes 1 1/2 inches on center.
2. Manufacturers: Allied Tube & Conduit Corp., B-Line Systems, Midland Ross Corp., Unistrut Corp., or equal.

C. Provide all supporting steel and related materials not indicated on structural drawings as required for the installation of equipment and materials, including angles, channels, and hangers.

D. Prime coat paint all supports.

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E. All items in Chemical area shall be plastic, fiberglass, or equal chemical resistance.

PART 3 EXECUTION

3.01 JOB CONDITIONS

A. Section 01 31 13 - Project Coordination: Coordination and project conditions.

B. Surface Conditions: Examine the areas and conditions under which work will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

C. Cooperate as necessary with other trades in order that all work be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum access to each system. Coordinate openings and placement of sleeves and inserts in building construction.

D. Measurements:
   1. Field measuring existing conditions.
   2. Lay out work, properly locate all apparatus, pipe, fittings, fixtures, sleeves, etc. Adjust work, as necessary, to insure that work shall fit into the spaces that have been allotted for such work. Due regard shall be taken for the work of other trades.

E. Proceed as rapidly as the building construction will permit.

3.02 ELECTRICAL PROVISIONS

A. Contractor shall furnish complete list and location of equipment requiring electrical connections and necessary wiring diagrams to Division 26.

B. Division 26: All line voltage electrical wiring connections.

3.03 SYSTEM LAYOUT

A. Lay out the plumbing system in careful coordination with the Drawings; determine proper elevations for all components of the system and using only the minimum number of bends to produce a satisfactorily functioning system.

B. Follow the general layout shown on the Drawings in all cases, except where other work may interfere.

C. Lay out pipes to fall within partition, wall, or roof cavities and to not require furring other that as shown on the Drawings, unless noted otherwise on drawings.

D. Schematics are shown for size requirements and arrangement only. Field conditions shall determine actual routes.

3.04 TRENCHING AND BACKFILLING

A. Perform trenching and backfilling associated with the work of this Section in strict accordance with the provisions of Division 31 of these Specifications.

B. The Contractor shall notify all affected utility companies at least three consecutive working days preceding the construction to coordinate work regarding other utilities and to determine the location of gas, water, light, etc., conduit or service connection or any other subsurface structure that crosses or passes through the space occupied by the proposed work. Contractor shall make advance arrangements with the utility companies for any relocation or interfering utilities so as to not delay construction.

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C. Interruptions of utility services which become necessary due to the work shall be coordinated with the Owner. If down time is limited by the Owner as to duration and time (weekend, nights, holidays), the Contractor shall perform the work during the designated period at no additional cost.

D. Excavation:
1. During excavation, material suitable for backfill shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted. Grading shall be done as necessary to prevent surface water from flowing into trenches and any water accumulated shall be removed by pumping or other approved method.
2. Sheeting and shoring shall be placed as necessary for the protection of the work and for the safety of personnel. Excavation shall be open cut.

E. Trench excavation: Trenches shall be of the necessary width for the proper laying of pipe and conform to State of Wisconsin regulations. The banks shall conform to OSHA requirements and the Contractor is responsible for all safety and requirements of said codes.
1. Care shall be taken not to over-excavate. The bottom of the trench shall be accurately graded to provide uniform bearing and support for each section of pipe. Depressions for joints shall be dug after the trench bottom has been graded, and be only of such length, depth, and width as required for properly making of the joint. Stones shall be removed to avoid point bearing.
2. Except as specified for wet or other unstable material, over-depths shall be backfilled as and with materials specified for backfilling the lower portions of trenches. Wet or unstable materials incapable of properly supporting the pipe shall be over-excavated to a depth to allow for the construction of stable pipe bedding at the proper grade.
3. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not be less than 6-inches nor exceed 8-inches on either side of the pipe. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.

F. Backfill: Debris, frozen material, organic matter, unstable material, or stones greater than 8-inches in diameter shall not be suitable for backfill. Large clods and stones not exceeding 8-inches in diameter, when allowed for use as backfill, shall not be placed within 2-feet of the top of the pipe. Backfill shall be of the following types:
1. Insitu Backfill Material:
a. Previously excavated soil free of organic debris, clay balls, and aggregate larger than 1-1/2 inches.
2. Imported (Trucked) Granular Backfill Material:
a. Sand, conforming to State of Wisconsin, Department of Transportation, Standard Specifications Subsection 209.2.2, Grade No. 1 Granular Backfill or well-graded sand and gravel conforming to Subsection 305.2.2.1 of said State Standard Specification 1-1/4 inch dense graded base with not more than 8-percent by weight passing a No. 200 sieve.

G. Bedding and backfilling:
1. Install piping promptly after trenching. Keep trenches open as short a time as practicable.
2. Under the building, install pipes on a 6 inch bed of damp sand. Backfill to bottom of slab with damp sand.
3. Outside the building, install underground piping on a 6 inch bed of damp sand. Backfill to within 12 inches of finish grade with damp sand. Backfill remainder with native soil.
4. Do not backfill until installation has been approved and until Project Record Documents have been properly annotated.

3.05 FLOOR, WALL, ROOF, AND CEILING OPENINGS

A. All openings for work of this section shall be provided under other sections. Openings shall be made as necessary in ceiling, floors, walls, roof, etc., as required to permit the installation of Work specified or shown on the Drawings. Openings shall be made with care to avoid damage which cannot be concealed when work is completed.

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B. Provisions for openings and holes and clearances through walls, floors, and ceilings to be made in advance of construction of such parts of the building. The Contractor is responsible for the correct size and location of these openings.

3.06 SERVICE CONNECTIONS

A. Install sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and verify proper slope for drainage and proper cover to avoid freezing.

B. Install water service complete with water meter with by-pass valves. Floor- Install sleeve around service main to 6 inch above floor and 4 feet minimum below grade. Install pressure gauge after water meter. Before commencing work check invert elevations required for water service connections and verify proper cover to avoid freezing. Verify water pressure at building service connection; if pressure exceeds 80 PSI, install water pressure reducing valve.

C. Install gas service complete with gas meter and regulators. Verify gas utility pressure at building service connection. Install regulators on each line serving gravity type appliances, sized in accordance with equipment. For pressures above 7 inch wg, use pressure regulators at system service entrance or at each piece of equipment.

3.07 INSTALLATION – PENETRATIONS AND SLEEVES

A. Provide and install sleeves wherever piping passes through floors, walls, partitions, ceilings, etc.

B. Sleeves shall be set and maintained in place during the progress of the work. Set sleeves in position in forms. Set sleeves in place before concrete is placed. Provide reinforcing around sleeves.

C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.

D. Sleeves shall be securely fastened in place.

E. Extend sleeves through floors 1 inch above finished floor level, unless otherwise noted.

F. Exterior watertight entries:
   1. Below-grade: Sleeve pipe.
   2. Above-grade: Sleeve pipe and seal with caulk.

G. Where piping penetrates floor, ceiling, wall, etc., close off space between pipe and adjacent work with stuffing insulation, for penetrations through non-rated assemblies, and firestopping, for penetrations through rated assemblies, insulation to within 1/2 inch of surface face.

H. Caulk the space between the sleeve and pipe or pipe covering for all sleeves and penetrations not visible after finished installation or hidden behind covers.

I. Section 07 92 00: Caulking of all sleeves and penetrations visible after finished installation.

J. Provide close fitting metal collar, escutcheon covers, or plates wherever piping or hanger rods are exposed to view and pass through floor, wall, ceiling, partitions, and similar locations. Hold escutcheons in place with set screw. Escutcheon not required around openings for insulated pipe if opening is not visible after insulation installation.

3.08 INSTALLATION - PIPE

A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.

B. Remove scale and dirt, on inside and outside piping before assembly.

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C. Prepare piping connections to equipment with flanges or unions.

3.09 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping whenever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Thoroughly clean items before installation.

G. Bolt all equipment, isolators, hangers, and similar items securely in place.

H. Cut pipe accurately, and work into place without springing or forcing properly clearing window, doors, and other openings. Excessive cutting or other weakening of the building will not be permitted.

I. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

J. Sleeve pipe passing through partitions, walls and floors.

K. Install piping system allowing clearance for installation of insulation and access to valves and fittings.

L. Install piping, equipment, valves, and other items to permit access for maintenance. Relocate items as necessary to provide such access, and without additional cost to the Owner.

M. Provide access doors where valves, clean outs, and fixtures or equipment requiring access for maintenance are located in wall or chases or above ceilings. Coordinate location of access doors with other trades as required.

N. Install identification on piping systems, including underground piping.

O. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

P. Make changes in directions with fittings; make changes in main sizes with eccentric reducing fittings.

Q. Provide sufficient swing joint, ball joints, expansion loops, and devices necessary for a flexible piping system, whether or not shown on the Drawings.

R. Support piping independently at pumps, coils, tanks, and similar locations so that weight of pipe will not be supported by the equipment.

S. Pipe Joints:
   1. Copper Tubing:
      a. Cut square, remove burrs, and clean inside of female filling to a bright finish.
         1) Apply solder flux with brush to tubing.
         2) Remove internal parts of solder-end valves prior to soldering.
      b. Provide dielectric unions at points of connection of copper tubing to ferrous piping and equipment.
      c. For joining copper tubing, use the following:
         1) Water piping 3 inches and smaller: 95-5 solder;

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2) Water piping larger than 3 inches: “Sil-fos” brazing;
3) Underground: “Si1-fos” brazing.

2. Screwed Piping:
   a. Deburr cuts.
      1) Do not ream exceeding internal diameter of the pipe.
      2) Thread to requirements of ANSI B2.1.
   b. Use Teflon tape on male thread prior to joining other services.
   c. Use litharge and glycerin on joint prior to cleaning for air and oil piping.
3. Leaky Joints:
   a. Remake with new material.
   b. Remove leaking section and/or fitting as directed.
   c. Do not use thread cement or sealant to tighten joint.

3.10 INSTALLATION - VALVES

A. Install valves in water system so as to give complete regulation of apparatus, equipment, and fixtures.

B. Furnish and install where necessary for the proper control of piping flow and equipment operation control valving required; as gate, angle, globe, and check valves.

C. Provide valves in at least the following locations:
1. In branches and/or headers of water piping serving a group of fixtures.
2. At each fixture.
3. On both sides of apparatus and equipment.
4. For shutoff of risers and branch mains.
5. For flushing and sterilizing the system.
6. Where shown on the Drawings.
7. As specified herein.

D. Install valves with stems upright or horizontal, not inverted.

E. Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

F. Install 3/4-inch gate or ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment.

G. Extend valve handles to above insulation surface.

3.11 INSTALLATION - PIPING SPECIALTIES

A. Install pressure gages with pulsation dampers. Provide needle valve or ball valve to isolate each gage. [Install siphon on gages in steam systems.] Extend nipples [and siphons] to allow clearance from insulation.

B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inches for installation of thermometer sockets. Allow clearance from insulation.

C. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.

D. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.

E. Install pressure gauges at water and gas service inlet inside building.

F. Install thermometer on inlet(s) and outlet pipe for water heaters and mixing valves.

G. Install pressure gauge on inlet pipe at emergency stations.

3.12 INSTALLATION – SUPPLY PIPING AND SPECIALTIES

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A. Install water piping in accordance with ASME B31.9.

B. Establish elevations of buried piping outside the building to obtain not less than six (6) feet of cover.

C. Water service installed under the building slab and foundation shall be continuous, without joints or fittings.

D. Provide support for utility meters in accordance with requirements of utility companies.

E. Coordinate installation of water meter by utility.

F. Slope water piping upwards adequately in direction of flow and arrange to drain at low points, for complete drainage of system.

G. Install piping with straight side of eccentric fittings at top of pipe, unless noted otherwise.

H. Install piping from relief valves, back-flow preventers, air vents, and other drains to nearest floor drain, open sight drain, or other acceptable discharge point. Terminate with a plain and unthreaded pipe 6 inches above the drain.

I. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to sinks.
   1. Install in upright position at the following locations:
      a. all quick closing valves
      b. isolated plumbing fixtures
      c. supply headers at plumbing fixture groups
   2. Locate and size as specified, locate in accordance with Plumbing and Drainage Institute Standard "P.D.I. WH-201."
   3. Install water hammer arrestors behind access panels where installed within wall construction.

J. Provide water service complete with approved water meter with by-pass valve station, and pressure reducing valve.

3.13 INSTALLATION - DRAINAGE PIPING AND SPECIALITIES

A. Install bell and spigot pipe with bell end upstream.

B. Establish elevations of buried piping outside building to provide not less than four (4) feet of cover. Where appropriate depth of cover is not possible, insulate as required by the plumbing code.

C. Establish invert elevations, slopes for drainage to 1/4 inch per foot minimum, unless noted otherwise. Maintain gradients.

D. Floor drains and hub drains shall be installed prior to placement of concrete slab. Install top of drain at elevation shown on the drawings; if top of drain elevation is not noted on drawings, floor drain shall be installed so that adjacent areas slope toward the drain at a maximum slope of 1 inch in 50 inches; unless noted otherwise.

E. Floor drains shall be so constructed with a P-trap and shall be provided with removable strainers, unless otherwise noted on drawings.

F. Drain lines shall be so constructed so that they may be cleaned and so that the drain inlet is accessible.

G. Cleanouts:
   1. Secure the Architect's approval of locations for cleanouts in finished areas prior to installation.
   2. Make all cleanouts accessible. Install with clearance at cleanout for rodding of drainage system.
   3. Extend cleanouts to finished floor or wall surface.
   4. Encase exterior cleanouts in concrete flush with grade.
   5. Install floor cleanouts at elevation to accommodate finished floor.

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6. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil after pressure tests are made and approved.

H. All vents must rise. No vent-to-vent connection allowed below floor, except for loop-vent construction.

I. Pipe the drains from drip pans and other similar locations to nearest floor drain, open sight drain, or other acceptable discharge point. Terminate with a plain and unthreaded pipe 6 inches above the drain.

3.14 INSTALLATION - FUEL PIPING

A. Install natural gas piping in accordance with NFPA 54.

B. Provide clearance for installation of insulation and access to valves and fittings.

C. Establish elevations of buried piping outside building to provide not less than one (1) foot of cover.

D. Provide support for utility meters in accordance with requirements of utility company.

E. Pipe vents from gas pressure reducing valves, regulators, and relief vents to outdoors and terminate in weatherproof hood with bug screen.

F. Underfloor piping shall be installed within Schedule 40 PVC conduit at least two pipe sizes larger than gas piping. Conduit shall extend 1 inch above floor.

G. Coordinate relocation of existing gas service and reconnection to existing facility gas piping to avoid interruption of Owners operations.

3.15 INSTALLATION - GAS VENTS

A. Install concentric vent kit, as required by manufacturer and as indicated on drawings, as close to the exterior wall as practical.

B. Install vent pipes continuously from appliance to exterior of building.

C. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories for complete installation.

D. Install exterior hood per manufacturer's written instructions. Maintain minimum clearances to doors, windows, and intake louvers, and to roof overhang. Maintain minimum distance above roof surface.

3.16 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Insulation and vapor retarder jacket shall run continuous through supports, hangers, and brackets. Provide rigid supports or shields as necessary.

B. Support horizontal piping as scheduled.

C. Pipe hangers shall be installed according to recommendations of the pipe manufacturer and hanger manufacturer.

D. Space hangers and supports according to the schedule, unless shorter distances are required by other standards or standard industry practice and to prevent excessive pipe movement during normal operations.

E. Arrange supports to prevent excessive deflection and to avoid excessive bending stress.

F. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

G. Insulation shall be continuous through hangers. Protect insulation with galvanized steel shields.

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H. Place hangers within 12 inches of each horizontal elbow.

I. Use hangers with 1-1/2 inch minimum vertical adjustment.

J. Horizontal hubless pipe:
   1. Support pipe adjacent to each hub, on both sides and within 6 inches of, so that coupling will bear no weight.
   2. Do not provide hangers on couplings.
   3. 5 feet maximum spacing between hangers.
   4. Provide hangers adequate to maintain alignment and to prevent sagging of the pipe.
   5. Make adequate provision to prevent shearing and twisting of pipe and joint.

K. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub. Supports shall be secured to the piping and resting on the building structure. Provide at each floor, unless noted otherwise.

L. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

M. Support each pipe independently. Do not use wire for hanging or strapping pipes.

N. Support riser piping independently of connected horizontal piping.

O. Design hangers for pipe movement without disengagement of supported pipe.

P. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

Q. Provide sway bracing on hangers longer than 18 inches.

R. Piping can be surface mounted to walls and ceilings, unless noted otherwise.

3.17 INSTALLATION – PIPING INSULATION AND FINISHED JACKETS

A. Insulate complete system of pipes for the following: hot, cold, and tempered domestic water piping and storm piping located in interior space of building, including all piping located inside walls, unless noted otherwise.

B. Continue insulation vapor barrier through penetrations and hangers, brackets, and supports. Provide rigid supports or blocking or exterior shields as necessary to prevent crushing of insulation.

C. Locate insulation and cover seams in least visible locations.

D. Neatly finish insulation at supports, protrusions, and interruptions.

E. Install insert between support shield and piping on piping 2 inches diameter or larger. Fabricate of cork or other high density insulating material suitable for temperature, not less than 6 inches long.

F. For exposed insulated pipe, finish with PVC jacket and fitting covers.

3.18 INSTALLATION - FIXTURES

A. Show no tool marks or threads on exposed plated, polished, or enameled connections from fixtures. Tape all finished surfaces to prevent damage during construction.

B. Set fixtures in proper alignment with respect to walls and floors.

C. Provide supplies in proper alignment with fixtures and with each other.

D. Grout wall and floor mounted fixtures watertight where the fixtures are in contact with walls and floors.

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E. Install each fixture with chrome plated rigid or flexible supplies with screwdriver stops, reducers, and escutcheons.

F. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

G. Install sealant required for plumbing installation, which is concealed once fixture is in place.

H. Install piping penetrations in exterior horizontal areas to maintain integrity of water-proofing assembly. All piping penetrating these areas shall be flashed water-tight.

I. Section 07 92 00: All caulking exposed after finished installation for deck-mounted trim, self-rimming sinks installed in casework, wall mounted fixtures, etc.

3.19 INSTALLATION – EQUIPMENT

A. Show no tool marks or threads on exposed connections.

B. Set equipment in proper alignment with respect to walls and floors.

C. Provide supplies in proper alignment with equipment and with each other.

D. Install water heaters in accordance to AGA, NSF, NFPA, and UL requirements. Coordinate with plumbing piping and related fuel piping, gas venting, and electrical work to achieve operating system.

E. On water heater, install drain at water inlet and outlet, thermometer with range of 40 to 200 degrees F, and ASME pressure relief valve suitable for maximum working pressure.

F. Install sealant required for plumbing installation.

G. Install piping penetrations in exterior horizontal areas to maintain integrity of water-proofing assembly. All piping penetrating these areas shall be flashed water-tight.

3.20 INSTALLATION - MECHANICAL IDENTIFICATION

A. Install adequate marking of exposed accessible piping, per ANSI A13.1.

B. Install plastic nameplates with adhesive when mounting to metal equipment cabinets and screws when mounting to building materials.

C. Install plastic and metal tags with corrosion resistant metal chain.

D. Valves:
   1. Tag all valves, except potable water fixture stop valves, with tags.
   2. Install valve directory where directed.

E. Pipes:
   1. Install plastic pipe markers on all pipes. Where plastic tape pipe markers are used, plastic tape direction arrow pipe markers shall be installed around the entire pipe at each end of the pipe marker. Do not install until after pipe has been painted.
   2. Install per State of Wisconsin Plumbing Code and as follows: Space no more than 25 feet apart, with a minimum of one marker on each straight section of pipe, and at each side where the piping passes through a wall, floor, or roof.
   3. Color of bands shall comply with State of Wisconsin Plumbing Code:
      a. Potable Water Pipe: green
      b. Gas Pipe: Red

3.21 PAINTING

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A. Section 09 96 00: Painting of piping, valves, and specialties, all exposed insulated and non-insulated piping and equipment, without factory finish or finished cover, shall be painted.

B. Touch-up all factory finishes damaged during construction.

3.22 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

A. Perform disinfection under the Engineer's observation. Notify the Engineer at least 48 hours prior to start of the disinfection process.

B. Disinfecting of Domestic Water Systems:
1. Prior to starting, verify system is complete, flushed and clean.
2. Verify pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
3. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain residual from 50 to 80 mg/L.
4. Bleed water from outlets to obtain distribution and test for disinfectant residual at minimum 15 percent of outlets.
5. Maintain disinfectant in system for 24 hours.
6. When final disinfectant residual tests less than 25 mg/L, repeat treatment.
7. Flush disinfectant from system until residual concentration is equal to incoming water or 1.0 mg/L.
8. Take samples no sooner than 24 hours after flushing, from 10-percent of outlets and from water entry, and analyze in accordance with AWWA C651.

C. Upon completion of disinfecting, secure and submit the Certificate of Performance, stating system capacity, disinfectant used, time and rate of disinfectant applied, and resultant residuals in ppm at completion.

D. When disinfection operation is completed, and after final flushing, secure an analysis by a laboratory approved by the Engineer, based on water samples from the system, showing test negative for coli-aerogene organisms. Provide a total plate count of less than 100 bacteria per cc, or equal to the control sample.

E. If analysis results are not satisfactory, repeat the disinfection procedures and retest until specified standards are achieved.

3.23 TESTING AND ADJUSTING

A. Section 01 77 00 - Closeout Procedures: Testing and adjusting provisions.

B. Contractor shall notify any inspectors required to observe test, when test is ready to be performed. Contractor shall advise A/E field representative that notification has been given.

C. All equipment required for testing, including fittings for additional openings, shall be provided by Contractor. Provide all openings inside and outside the building as required. Contractor shall provide all personnel required for testing. Contractor shall pay the cost of all required tests and retests and inspections if required.

D. Tests shall be witnessed and approved by Owner's representatives and A/E field representative. Contractor shall certify in writing the time, date, name, and title of person approving test. This shall also include the description and what portion of the system has been approved. Person approving test shall sign certification.

E. A complete record shall be maintained of all testing that has been approved, and shall be made available at the job site to all authorities concerned.

F. Upon completion of the work, all records and certifications approving testing requirements shall be submitted to the A/E Field Representative before final payment is made.

G. Test drainage piping in accordance with local code requirements.

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H. Water test entire drainage system (sanitary and vent system) by sections if necessary, with a minimum of 10 foot head for two hours without loss of water. If weather makes water test impractical, use air test with 10 inches of mercury column pressure and no loss of pressure for at least 15 minutes.

I. Test supply piping in accordance with local code requirements.

J. Water test entire domestic water systems, by sections if necessary, before connecting fixtures, with hydrostatic pressure of 100 PSI without loss of pressure for at least two hours.

K. Test natural gas piping in accordance with NFPA 54.

L. Notify A/E in advance regarding time and date of all tests.

M. Defective work or material shall be replaced or repaired, as necessary, and the inspection and test repeated. Repairs shall be made with new materials. Caulking of screwed joints or holes will not be acceptable.

N. Adjust the system to optimum standards of operation.

3.24 CLOSEOUT OPERATIONS

A. Section 01 77 00 - Closeout Procedures: Closeout provisions.

B. Closeout Equipment/System Operations: Sequence operations properly so that work of the project will not be damaged or endangered. Coordinate with seasonal requirements.
   1. Adjust and correct operations as required for proper performance.
   2. Clean each system: After all equipment and fixtures have been proven operational, carefully clean all accessible parts, thoroughly removing all traces of dirt, oil, grease, and foreign substances.

C. Instruction: Upon completion of the installation, but before final acceptance of the system, the Contractor shall instruct the Owner (Owner's personnel) on the proper operation and maintenance of all parts of the system.

D. Record Drawings.

3.25 SCHEDULE OF MECHANICAL IDENTIFICATION

A. Piping:
   1. Sanitary Sewer: "Sanitary Drain" or "Drain" or "Sanitary Sewer" or "Sanitary Waste" or "Waste"
   2. Sanitary Vent: "Plumbing Vent" or "Sanitary Vent" or "Vent"
   3. Potable Water, Cold: "Domestic Cold Water" or "Potable Water" or "City Water" or "Cold Water"
   4. Potable Water, Hot: "Domestic Hot Water" or "Hot Water"
   5. Potable Water, Tempered: "Tempered Water"
   6. Natural Gas: "Natural Gas" or "Gas"

B. Equipment:
   1. Water Heater: "35-WH-1"

END OF SECTION

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SECTION 23 00 00

HEATING, VENTILATING AND AIR CONDITIONING (HVAC)

PART 1 GENERAL

1.01 WORK INCLUDED

A. Provide system where shown on the Drawings, as specified herein, and as needed for a complete and proper installation including, but not necessarily limited to:
   1. Exhaust fans, motors.
   2. Unit heaters, vent pipes, hoods, brackets.
   3. De-stratification (circulation) fans, guards.
   4. Air conditioning split ductless system: indoor unit with blower, condensing unit, refrigerant piping and appurtenances.
   5. Controls: Low-voltage wiring, conduit, relays, time clocks, thermostats, dampers, damper operators, switches, etc.
   6. Air Distribution: Ductwork, insulation, duct accessories, louvers, diffusers, registers, grilles, etc.
   7. Gas piping
   8. Refrigeration piping, specialties, valves.
   9. Related accessories.
   10. Sealing of ductwork.
   11. Testing, adjusting, and balancing.
   12. Firestopping of penetrations and openings through fire-rated assemblies.
   13. Caulking of penetrations and openings.

1.02 WORK OF OTHER SECTIONS

A. Openings for work in walls, floor, roof, ceiling, etc., required by this section shall be provided under other sections. Location and size of these openings shall be the responsibility of this Contractor.

B. Division 03 - Concrete.

C. Division 04 - Masonry.

D. Division 06 - Woods, Plastics, and Composites.

E. Division 07 - Thermal and Moisture Protection.

F. Section 07 84 00 - Firestopping: Sealing of fire-rated construction penetrations.

G. Section 07 92 00 - Joint Sealants: Sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters exposed after finished installation.

H. Division 09 - Finishes.

I. Section 09 91 00 - Painting [09 96 00 - High Performance Coatings]: Painting of conduit, insulation, ductwork, accessories, etc.

J. Section 40 23 23 - Process Piping, Valves and Specialties (for Wellhouses).

K. Section 22 00 00 - Plumbing: Gas piping and final connections for fuel-fired equipment.

L. Division 26 - Electrical: Electrical line voltage wiring (100 volts and greater) connections. Equipment starters and disconnects not provided under this Section.

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1.03 RELATED SECTIONS

A. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions and Sections in Division 0l of these Specifications.

B. Division 05 - Metals: Equipment structural supports, anchors, etc.

C. Section 07 84 00 – Fire Stopping: Requirements for firestopping openings in and penetrations through fire-rated assemblies.

D. Section 07 92 00 - Joint Sealers: Sealing of exterior and interior floor, wall, ceiling, and roof penetrations and fixture perimeters.

E. Section 07 92 00 - Joint Sealants: Requirements for sealing of exterior and interior floor, wall, ceiling, and roof penetrations concealed after finished installation.

F. Division 26 - Electrical: Execution requirements for electric connections specified by this section.

G. Division 26 – Electrical: Requirements for low voltage (under 100 volts) wiring, conduit, etc. Requirements for equipment starters and disconnects provided under this Section.

1.04 GENERAL PROVISIONS

A. Everything essential for the completion of the work implied to be covered by these Specifications to make the system ready for normal and proper operation must be furnished and installed by the Contractor. Accordingly, any omission from either the plans or the Specifications, or both, of details necessary for the proper installation and operation of the System shall not relieve the Contractor from furnishing such detail in full and proper manner.

B. The Drawings show various details indicating the general arrangement of the heating and ventilating work, sizes, locations of units, etc., the said plans with figures, lettering, etc., shall be considered a part of these Specifications and no charge or alternation shall be made in either case, unless ordered by the Engineer.

C. In addition to the heating and ventilating plans, see General Plans of the building, heating and ventilating work appearing on the latter plans will be part of this contract unless especially specified to be done by other contractors, as well as, the said work detailed on the heating and ventilating plans.

D. “Chemical Area” indicated on the Drawing shall define materials to be used in the area designated as described herein or on the Drawings. Miscellaneous materials not specifically scheduled or specified and used in this space shall be resistant to corrosion from the chemical contained in the room under non-immersion, non-splash, or non-spray service.

E. “Corrosion Area” indicated on the Drawing shall define materials to be used in the area designated as described herein or on the Drawings. Miscellaneous materials not specifically scheduled or specified and used in this space shall be resistant to corrosion from direct exposed to water or condensation due to the moist environment.

F. “Hazardous Area” indicated on the Drawing shall define materials to be used in the area designated as described herein or on the Drawings. Miscellaneous materials not specifically scheduled or specified and used in this space shall be resistant to corrosion from direct exposed to water or highly acidic condensation or air vapor.

1.05 QUALITY ASSURANCE

A. Section 01 40 00 - Quality Requirements [01 45 00 - Quality Control]: Quality provisions.

B. Perform work in accordance with State of Wisconsin and industry standards.

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C. Qualification of Installer:
   1. Company specializing in performing the work of this section with minimum three (3) years documented experience.
   2. For the actual fabrication, installation, and testing, adjusting, and balancing of heating and ventilating work, use only thoroughly trained and experience workers completely familiar with the items required and manufacturer's is current recommended methods of installation.
   3. In acceptance or rejection of installed work, the Architect or Engineer shall make no allowance for lack of skill on part of the workers.

D. Qualification of Manufacturer:
   1. Company specializing in manufacturing the products specified in this section with minimum 10 years documented experience.
   2. Equal products shall be of similar quality, be functionally similar, and have the controls specified. Where more than one type of product is specified in a particular section, the listed acceptable manufacturers may not have an equal product for every type of product specified.

E. Codes and Regulations:
   1. In addition to complying with the specified requirements, comply with pertinent regulations of State or local governmental agencies having jurisdiction, including building codes and local ordinances.
   2. In the event of conflict between or among specified requirements and pertinent regulations, the more stringent requirement will govern when so directed by the Engineer.

F. Report Forms: Testing, adjusting, and balancing - AABC MN-1 National Standards for Total System Balance forms, forms prepared following ASHRAE 111, or NEBB forms.

G. The following standards, referred hereafter by basic designation only, are imposed, as applicable to work in each instance, and form a part of this specification to the extent indicated by the reference thereto:
   1. AABC - Associated Air Balance Council
   2. Americans with Disabilities Act (ADA) of 1990, Accessibility Guidelines for Buildings and Facilities, 2010 edition.
   3. ARI - Air Conditioning and Refrigeration Institute
   4. AMCA - Air Movement and Control Association International, Inc.
      a. AMCA 500-D – Laboratory Methods for Testing Dampers for Ratings
      b. AMCA 511 – Certified Ratings Program for Air Control Devices
   5. ANSI - American National Standards Institute
      a. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
      a. ASHRAE Standard 62 – Ventilation for Acceptable Indoor Air Quality
   7. ASME - American Society of Mechanical Engineers
   8. ASTM - American Society of Testing and Materials
      a. ASTM C1363-97 – Thermal performance test in accordance with Architectural Testing Laboratories (ATI)
   9. DSPS - Department of Safety & Professional Services, Division of Industry Services, Wisconsin Administrative Code, 2018 Wisconsin Commercial Building Code
   10. International Code Council:
      a. IBC - International Building Code, 2015 edition, and all referenced standards (Wisconsin)
      b. IECC - International Energy Conservation Code, 2015 edition, and all referenced standards (Wisconsin)
      c. IMC - International Mechanical Code, 2015 edition, and all referenced standards (Wisconsin)
      d. IBC - International Building Code, 2015 edition, and all referenced standards (Iowa)
      e. IECC - International Energy Conservation Code, 2012 edition, and all referenced standards (Iowa)
      f. IMC – International Mechanical Code, 2021 edition, and all referenced standards (Iowa)
   11. Iowa Department of Public Safety, Building Code Bureau: (Iowa)
      a. State Building Code: 661-201 and 661-301 Iowa Administrative Rules, effective 2016.
      b. State Electrical Code: 661-504 Iowa Administrative Rules, effective 2021.
      c. State Energy Conservation Code: 661-303 Iowa Administrative Rules, effective 2014.
      d. State Mechanical Code: 641-61 Iowa Administrative Rules, effective 2021.

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12. MCA - Mechanical Contractors Association
13. MSS - Manufacturers Standardized Society
14. NEC - National Electric Code
    a. NFPA 70 - National Electric Code (NEC), 2020 edition. (Iowa)
15. NEMA - National Electrical Manufacturers Association
16. NFPA - National Fire Protection Association
17. SMACNA - Sheet Metal and Air Conditioning Contractors National Association

1.06 PERMITS

A. The Contractor shall obtain and pay for all construction permits required for Work of this section.

B. One (1) copy of all permits shall be provided to Owner.

C. One (1) copy of all permits shall be maintained on site.

1.07 GUARANTEE

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Guarantee provisions.

B. All material and workmanship must be new and first class in every respect; the heating, ventilating and air conditioning equipment must be turned over to the owner in complete working order and free from mechanical defects.

C. The system must be guaranteed to operate noiselessly and to the satisfaction of the Owner and to supply and exhaust quantities of air shown on plans.

D. Before final acceptance of the work, the Contractor shall have the entire apparatus and system in complete and satisfactory operation and shall maintain same in satisfactory and continuous operation for a period of ten (10) days prior to the date of acceptance; fuel to be furnished by Owner.

E. The Contractor shall submit to the Engineer in triplicate, at the completion of his work, a certified statement, signed by a principal of the firm, stating that the system has been fully installed and is operating within the intent of the plans and specifications and that all system components have been tested and adjusted. This statement shall be submitted before the system is presented the Owner for final inspection.

1.08 COORDINATION

A. Section 01 30 00 - Administrative Requirements [01 31 13 - Project Coordination]: Coordination provisions.

B. Cooperate and coordinate with other trades to assure that all systems in the work of this section may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum of access to each system.

C. Arrange heating and ventilating work in neat, well organized manner with piping and similar services running parallel with primary lines of building construction, and with minimum 7 foot overhead clearance. Provide maximum clearances wherever possible.

D. Locate operating and control equipment properly to provide easy access, and arrange entire heating and ventilating work with adequate access for operation and maintenance.

E. Give right-of-way to piping that must slope for drainage.

1.09 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures [Submittals]: Submittal provisions.

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B. Contractor shall be responsible for correction of work deemed necessary by the Engineer due to proceeding with the work without shop drawings that have the Engineer's final approval.

C. Contractor will be responsible for all figures and dimensions. Approval of shop drawings describing equipment that cannot fit in the space allotted does not relieve the Contractor from providing equipment that will meet the space requirements.

D. Shop Drawings: Include data on physical dimensions, gauges, materials of construction and capacities.
   1. Hangers and Supports: Design data, indicate sizes and load carrying capacity.
   2. Refrigerant Condensing Units: Indicate piping system layout.
   3. Controls: Indicate operating data, system drawings, piping and wiring diagrams, and written detailed operational description of system.
      a. List connected data points, including connected control unit and input device.
      b. Label with settings, adjustable range of control and limits. Include written description of control sequence.
      c. Include description and sequence of operation of operating, user, and application software.
   4. Mechanical Identification: Submit schedule of labels.
   5. Incomplete drawings will not be approved.

E. Product Data:
   1. Hangers and Supports: Manufacturer's catalog data including load carrying capacity.
   2. Valves: Manufacturer's catalog information with valve data and ratings for each service.
   3. Louvers, diffusers, grilles, registers: Manufacturer's catalog information with sizes, capacities, rough-in requirements, and finishes.
   4. Piping Specialties: Product description, model, dimensions, component sizes, rough-in requirements, service sizes, and finishes. Submit schedule indicating manufacturer, model number, size, location, rated capacity, load served, and features for each specialty.
   5. Pipe Expansion Products: Indicate maximum temperature and pressure rating, and maximum expansion compensation.
   6. HVAC Equipment: Submit dimensions, connections, arrangement, accessories, capacities, and finishes.
   7. Refrigerant Condensing Units: Submit capacities, schematic layout of system, piping and electrical connections, sound data, and controls.
   8. Air Distribution: Submit sizes, capacities, materials, and connections to other work. Submit catalog performance ratings, construction, electric and duct connections, flashing and dimensions for fans and exhausters.
   9. Controls: Submit description and engineering data for each control system component. Submit data for each system component and software module.
   10. PVC Coated Ductwork: Submit manufacturer's catalog information.
   11. Mechanical Insulation and Finished Jackets: Product description, list of materials, and thickness for each service or equipment scheduled and locations.
   12. Mechanical Identification: Submit description, dimensions, and materials.

F. Manufacturer Installation Instructions: Submit for all material and equipment.

G. Controls: Submit diagram and sequence. Include description of components and their operation.

H. Wiring Diagrams: Submit for all equipment.

I. Samples:
   1. Mechanical Identification: Two (2) tags, 1 1/2 inch in size.

J. Draft Reports: Testing, adjusting, and balancing - submit for review prior to final acceptance.

K. Test Reports: Testing, adjusting, and balancing - submit prior to final acceptance and for inclusion in operating and maintenance manuals. Assemble in soft cover, letter size, 3-ring binder, with table of contents page and tabs, and cover identification. Include reduced scale drawings with air outlets and equipment identified with data sheets, and indicating thermostat locations.

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1.10 DELIVERY, STORAGE, AND HANDLING

A. Section 01 60 00 - Product Requirements [Material and Equipment]: Product storage and handling provisions.

B. Accept equipment on site in factory packaging. Inspect for damage.

1.11 ENVIRONMENTAL REQUIREMENTS

A. Do not install insulation and related products when ambient temperatures and conditions are not meeting manufacturer's requirements.

B. Maintain temperature before, during, and after installation for a minimum period of 24 hours.

1.12 HOUSEKEEPING AND CLEANUP

A. Periodically as work progresses and/or as directed by the Engineer, the Contractor shall remove waste materials from the building and leave the area of the work broom clean. Upon completion of work, remove all tools, scaffolding, broken and waste materials, etc., from the site.

1.13 EXTRA MATERIALS

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Spare parts and maintenance provisions.

B. Provide two (2) sets of extra filters for each filter section.

C. Provide one (1) extra belt for each belt driven motor.

1.14 MAINTENANCE SERVICE

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Maintenance service provisions.

B. Furnish service and maintenance of equipment, accessories, and controls for one (1) year from Date of Substantial Completion.

C. Provide two (2) service calls within the first year, one (1) at the end of heating season prior to commencement of cooling season and one (1) prior commencement of heating season. Coordinate service calls dates with Owner, set preliminary dates at Date of Substantial Completion.

D. Include systemic examination, adjustment, and lubrication of unit, including controls checkout and adjustments. Repair or replace parts in accordance with manufacturer's operating and maintenance data. Use parts produced by manufacturer of original equipment.

E. Perform work without removing units from service during building normal occupied hours.

F. Provide emergency call back service during working hours for this maintenance period.

G. Maintain locally, near place of the work, adequate stock of parts for replacement or emergency purposes. Have personnel available to ensure fulfillment of this maintenance service, without unreasonable loss of time.

H. Perform maintenance work using competent and qualified personnel under supervision [and direct employ] of manufacturer or original installer.

I. Do not assign or transfer maintenance service to agent or subcontractor without prior written consent of Owner.

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1.15 WARRANTY

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Warranty provisions.

B. Heat Exchangers and Refrigeration Compressors: Furnish five (5) year warranty.

C. Infra-Red Tube Heaters: Furnish three (3) year warranty on stainless steel burner; two (2) year warrant on combustion and radiant emitter tubes; and one (1) year warranty for all components utilized in heater control assembly.

D. Destratification Fans: Furnish five (5) year warranty.

E. Split Ductless Air-Conditioning System: Furnish five (5) year warranty on parts and defects and seven (7) years parts on the compressor.

F. Kynar/Hylar (70% PVFD) Finish on Fans, Louvers, and Accessories: Furnish manufacturer's 10-year paint warranty.

1.16 CLOSEOUT SUBMITTALS

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Submittal provisions.

B. Project Record Documents and As-Builts: Record actual location of equipment, ductwork, and controls including thermostats remotely located from equipment in pipes, ducts, and walls.

C. Operation and Maintenance Data and Instructions:
   1. Assembly two (2) complete sets. Prepare in bound copies complete with index tabs.
   2. Submit bound copies to Engineer for distribution.
   3. Controls:
      a. Systems descriptions, set points, and controls settings and adjustments.
      b. Inspection period, cleaning methods, recommended cleaning materials, and calibration tolerances.
      c. Interconnection wiring diagrams complete field installed systems with identified and numbered system components and devices.
   4. Equipment: Submit for each piece of equipment. Submit manufacturer's descriptive literature, operating instructions, service instructions, installation instructions, maintenance and repair data, parts listing, warranties, and piping and wiring diagrams.

D. Warranties.

PART 2 PRODUCTS

2.01 ELECTRICAL PROVISIONS

A. Contractor shall consult with the Division 26 before ordering electrical motors, to ascertain correct electrical current characteristics.

B. Motors: Comply with applicable provisions of the National Electrical Code, NEMA Standards, and Division 26 of these Specifications, and as follows, unless otherwise indicated.
   1. Phases and Current: up to 1/3 HP, capacitor-start, 120 volt, 60 cycle single-phase; 1/2 HP and larger, squirrel-cage induction NEMA rated 460 volt, three phase, 60 cycle. Provide 2 separate windings on 2 speed three-phase motors. Coordinate with actual current characteristics; refer to Division 26.
   2. High Efficiency Motors: All motors 1 HP and larger shall be high efficiency motors meeting or exceeding values test in accordance with IEEE Standards 112, Method B procedures as stated in NEMA MG 1-12.53a.

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3. Integral Thermal Overload: on all motors less than 1/2 HP.
4. Service Factor: 1.15 for three-phase; 1.35 for single-phase.
5. Construction: General purpose, continuous duty.
6. Frames: NEMA Standard for horsepower specified.
7. Overload Protection: Built-in thermal, with internal sensing device for stopping motor, and for signaling where indicated.
8. Type: Motors in airstream shall be totally enclosed; all others shall be open drip-proof; unless noted otherwise.

C. Starters:
1. Where starters are indicated to be an integral part of equipment provided by this Section, they shall meet requirements of Division 26 and shall be connected under Division 26.
2. Where an MCC is provided under Division 26, all starters not provided integral with equipment shall be furnished and installed under Division 26.
3. Where an MCC is NOT provided under Division 26 OR an MCC without motor starters is shown as being provided under Division 26, all starters not provided integral with equipment shall be furnished and installed under this Section, they shall meet requirements of Division 26 and shall be connected under Division 26.

D. Disconnects:
1. Where disconnects are provided as an integral part of equipment provided by this Section or where they are furnished standard for field installation for equipment provided by this Section, they shall meet requirements of Division 26 and shall be connected under Division 26.
2. All disconnects not integral with equipment shall be furnished and installed under Division 26.
3. All disconnects not integral with equipment shall be furnished and installed under this Section, they shall meet requirements of Division 26 and shall be connected under Division 26.

E. General Wiring: Comply with applicable provisions of Division 26 Section.

2.02 SLEEVES

A. Sleeves for pipes through non-fire rated floors: 18 gage thick galvanized steel.

B. Sleeves for pipes through non-fire rated beams, walls, footings, and potentially wet floors: Steel pipe or 18 gage thick galvanized steel.

C. Sleeves shall be of sufficient length to pass through entire floor or wall construction, including plaster, finished floor, etc., as applicable. Sleeves through floors shall extend 1 inch above finished floor level.

D. All sleeves shall be of sufficient diameter such that the bare or insulated duct or pipe, as applicable, with unbroken covering, where specified, can pass through and allow for expansion and contraction in all directions.
1. Uninsulated: Provide sleeves two inches larger than the duct or two pipe sizes larger than the pipe passing through; or provide a minimum of 1/2 inch clearance between inside of sleeve and outside of the duct or pipe.
2. Insulated: Provide sleeves of adequate size to accommodate the full thickness of covering, with clearance for packing and caulking.

E. Mechanical sleeve seals:
1. Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.
2. Manufacturers: Thunderline Link-Seal, Inc., NMP Corp., or equal.

2.03 ESCUTCHEONS

A. 1 inch wide or of sufficient size to cover the sleeved opening and an inside diameter to fit snugly around pipe.

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B. 1-1/2-inch wide and an inside dimension to fit snugly around duct.

C. Finish shall be chrome-plated steel.

2.04 FANS

A. Furnish fans in the size, capacity, and type as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. Fans shall be quiet operating and vibration free.

C. Fans shall be UL Listed and CSA approved.

D. The fan shall bear the AMCA Certified Ratings Seal for both sound and air performance.

E. Fan shall bear a permanently affixed manufacturer's engraved metal nameplate containing the model number and individual serial number for future identification.

F. Fan shall comply with OSHA guideline 1926.300 – General Requirements for Machine Guarding.

G. A general duty, internal wiring pigtail (flexible metal conduit) shall be provided by the fan manufacturer.

H. Direct Drive Motors option, where scheduled:
1. Motor to be an electronic commutation (EC) motor specifically designed for fan applications. AC induction type motors are not acceptable. Examples of unacceptable motors are: Shaded Pole, Permanent Split Capacitor (PSC), Split Phase, Capacitor Start and 3 phase induction type motors. Motors shall be permanently lubricated with heavy-duty ball bearings to match the fan load and prewired to the specific voltage and phase. Internal motor circuitry shall convert AC power supplied to the fan to DC power to operate the motor. Motor shall be speed controllable down to 20% of full speed (80% turndown). Speed shall be controlled by either a potentiometer dial mounted on the motor or by a 0-10 VDC signal. Motor shall be a minimum of 85% efficient at all speeds.
2. Greenheck VG or as approved by manufacturer of fan.

I. Centrifugal Inline Fan:
1. Duct mounted supply or exhaust fan shall be of the centrifugal direct driven in-line type.
2. The fan housing shall be of the square design constructed of heavy gauge galvanized steel and shall include square duct mounting collars.
3. Fan construction shall include two removable access panels located perpendicular to the motor mounting panel. The access panels must be of sufficient size to permit easy access to all interior components.
4. The fan wheel shall be centrifugal backward inclined, constructed of aluminum and shall include a wheel cone carefully matched to the inlet cone for precise running tolerances. Wheels shall be statically and dynamically balanced.
5. Motors shall be readily accessible for maintenance.
6. Direct Drive:
   a. Motors shall be permanently lubricated and carefully matched to the fan loads.
   b. A NEMA 1 disconnect switch shall be provided as standard, except with explosion resistant motors, where disconnects are optional. Factory wiring shall be provided from motor to the handy box.
   c. Greenheck SQ.

J. Ceiling Exhaust Fan:
1. Ceiling mounted exhaust fan shall be of the centrifugal direct drive type.
2. Wheel: Forward curved centrifugal wheel. Constructed of galvanized steel or calcium carbonate filled polypropylene. Statically and dynamically balanced.
3. Motors:
   a. Motor enclosures shall be open driproof (ODP), opening in the frame body and or end brackets.

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b. Motors shall be permanently lubricated sleeve bearing type to match with the fan load and furnished at the specific voltage and phase.
c. Motor shall be mounted on vibration isolators and be accessible for maintenance.
d. Thermal overload protection.

4. Housing:
   a. Shall be constructed of heavy gauge galvanized steel.
   b. Interior shall be lined with 0.5 inches of acoustical insulation.
5. Outlet:
   a. Round or square. Field rotatable from horizontal to vertical position.
   b. Duct collar shall include an aluminum spring loaded backdraft damper.
6. Grille: Designer, constructed of high impact polystyrene.
7. The access wiring shall be external. The motor disconnect shall be internal and of the plug-in type.
8. Mounting brackets shall be fully adjustable for multiple installation conditions.
9. Greenheck Model SP-A.
10. Accessories:
    a. Disconnect switch. Wired from fan motor to junction box installed within motor compartment.
    b. Motion detector. Grille mounted. Infra-red motion detection. Adjustable time delay shutoff setting from 1 to 20 minutes.
    c. Speed control. For airflow balancing.
11. Hooded soffit vent:
    a. Steel construction with black enamel finish.
    b. Built-in birdscreen and back-draft damper.
    c. Greenheck WC (square/rectangular connection).

2.05 HIGH VOLUME LOW SPEED FANS

A. Furnish fans in the size, capacity, and type as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. Fans shall be quiet operating and vibration free.

C. Ceiling Mounted Destratification Fans:
1. Extra heavy-duty industrial fan.
2. All metal construction. No plastic.
3. Energy efficient, 0.71 amps or less.
4. Sealed thermo-protected motor.
5. Permanent, sealed chrome ball bearings.
6. Secondary support cable.
7. Guard: Heavy-duty, non-sagging, 10 gauge steel wire - bright zinc plated, 1 1/2 inch maximum spacing, with secondary support cable.
8. Controls: 2 fan control, speed control.
9.

D. Acceptable Manufacturers: Greenheck HVLS, Big Ass Fans, or equal.

2.06 ELECTRIC HEATERS

A. Furnish unit in the size and capacity as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. All electrical components shall carry UL, ETL, or CSA listing.

C. Unit Heater:
1. Airflow shall be capable of being directed horizontally, vertically, or any position in between.
2. Multiple wattage heat selector switch.
3. Remote thermostat.
4. Ceiling/wall bracket.

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5. Heavy gauge die-formed steel housing.
6. Completely enclosed fan motor.
7. Aluminum-finned, copper clad steel sheath heating element.
8. Automatic reset linear thermal cutout, capillary type.
9. Q'Mark Model MUH.

D.

2.07 GAS-FIRED UNIT HEATERS

A. Furnish unit in the size and capacity as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. All electrical components shall carry UL, ETL, or CSA listing.

C. CSA certified as having 80% thermal efficiency.

D. Conform to the latest ANSI Standards for safe operation.

E. Factory assembled, piped, wired and tested.

F. Separated Combustion Tubular Unit Heater:
1. Cabinetry and casework shall be 20-gauge material with baked enamel finish.
2. Heat exchanger shall consist of 20-gauge aluminized steel tubes.
3. Burners shall be "inshot" design. 321 stainless steel burner box.
4. Direct spark ignition with integrated control and combination gas valve.
5. Flame rectification shall be independent of the spark igniter.
6. Efficiency: 81%
7. Direct spark ignition. Single stage gas valve. High limit switch. Air pressure switch.
8. Warranty: Manufacturer's standard 10-year warranty on heat exchanger, flue collector, and burners to be free from defects in materials and workmanship.
9. Concentric vent kit appropriate for installation location by unit manufacturer.
10. Hoods.
11. Sterling Model GG or Modine HDS.

G. Acceptable manufacturers: Modine, Reznor, Sterling, or equal.

2.08 SPLIT DUCTLESS AIR CONDITIONING SYSTEM

A. Wall-mounted, air conditioning only, split system.
1. Unit shall be tested by a Nationally Recognized Laboratory (NRTL) and bear the ELT label.
2. All wiring shall be in accordance with the National Electric Code (NEC).
3. The unit shall be rated in accordance with the Air-Conditioning Refrigeration Institute's (ARI) Standard 210/240 and bear the ARI Certification label.
4. The unit shall be manufactured in a facility registered to ISO 9001 set of standards.
5. System efficiency shall meet or exceed 13.0 SEER.
6. Indoor Unit:
   a. A dry air holding charge shall be provided in the indoor unit.
   b. General:
      1) The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, internal piping, control circuit board and fan motor.
      2) The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, and a test run switch.
   c. Cabinet:
      1) The casing shall have a white finish.
      2) Multi-directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining.

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3) There shall be a separate installation plate which secures the unit firmly to the wall.

d. Fan:
1) The indoor fan shall be assembled with a line-flow fan direct driven by a single motor.
2) The fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
3) A manual adjustable vertical guide vane shall be provided with the ability to change the airflow form side to side.
4) An integral, motorized air sweep flow louver shall provide an automatic change in airflow by directing the air up and down to provide for uniform air distribution.
5) The indoor unit fan motor shall operate in three (3) selectable speeds (high-medium-low).

e. Filter:
1) Return air shall be filtered by means of easily removed air filter.

f. Coil:
1) The indoor unit (evaporator) coil shall be of nonferrous construction with smooth, pre-coated aluminum fins on copper tubing.
2) Tubing shall have inner grooves for high efficiency heat exchange.
3) All tube joints shall be brazed with PhosCopper or silver alloy.
4) The coil shall be pressure tested at the factory.
5) A sloped condensate pan and drain with extension hose shall be provided under the coil.

g. Electrical:
1) The system shall be equipped with a system allowing the indoor unit to be powered directly from the outdoor unit using a minimum of 14 gauge, 3-wire polarity sensitive connection plus ground wire to provide both power and control signal between the indoor and outdoor units.
2) The indoor unit shall not have any supplemental electrical heat elements.

h. Control:
1) This system shall have a wireless remote controller to perform input functions necessary to operate the system. The controller shall consist of a Power On/Off switch, Mode Selector, Temperature Setting, Timer Control, Fan Speed Select and Auto Vane Selector.
2) Temperature changes shall be by 1°F increments with a range of 65°F to 87°F.
3) There shall be a 24 hour On/Off timer.
4) The unit shall have an emergency operation mode to allow operation without the remote controller.
5) The microprocessor located in the indoor unit shall have the capability of sensing return air temperature and indoor coil temperature, receiving and processing commands from the wireless remote controller, providing emergency operation and controlling the outdoor unit.
6) The control voltage between the indoor unit and the outdoor unit shall be115 volts, AC.
7) The system shall be capable of automatic restart when power is restored after power interruption.
8) The control system shall control the operation of the air sweep louvers, as well as provide on/off and system/mode function switching.

7. Outdoor Unit:
a. Vertical with side discharge.
b. Refrigerant: R410A.
c. General:
1) The outdoor unit shall be specifically designed for use with the indoor unit.
2) The outdoor unit shall be completely factory assembled, internally piped and wired.
3) Each unit shall be run tested at the factory.

d. Cabinet:
1) The casing shall be fabricated from zinc coated steel, bonderized with acrylic or polyester power coating for corrosion protection.

e. Fan:

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1) The unit shall be furnished with a direct drive propeller type fan, statically and dynamically balanced for smooth and quiet operation.
2) The fan motor shall have inherent protection, be equipped with permanently lubricated bearings. The fan motor shall be mounted and isolated for quiet operation.
3) The fan shall be provided with a raised guard to prevent contact with moving parts.
4) The outdoor unit shall have horizontal discharge airflow.

f. Coil:
1) The condenser coil shall be of nonferrous construction with pre-coated aluminum strake fins on copper tubing.
2) The coil shall be protected with an integral metal guard.
3) Refrigerant flow from the condenser shall be controlled by means of a metering orifice.

g. Compressor:
1) The compressor shall be a high performance, hermetic, rolling piston, rotary type.
2) Compressor shall be mounted using rubber isolating bushings to avoid the transmission of vibration.
3) Compressor shall be protected by an automatic over current relay and a thermal overload switch.

h. Operation:
1) The outdoor unit shall have an accumulator.
2) The outdoor unit must have the ability to operate with a maximum height difference of 35 feet between indoor and outdoor units.
3) The unit shall have a maximum refrigerant tubing length of 65 feet between indoor and outdoor units without the need for line size changes, traps or additional oil.
4) The unit shall be pre-charged for a maximum of 25 feet of refrigerant tubing.

i. Electrical:
1) The outdoor unit shall be controlled by the microprocessor located in the indoor unit. The control voltage between the indoor unit and the outdoor unit shall be 115 volts, AC.

8. Electrical:
a. The electrical power of the system shall be 115 volts, 1 phase, 60 hertz. The unit shall be capable of satisfactory operation within voltage limits of 103 volts to 127 volts.
b. The electrical power of the system shall be 230/208 volts, 1 phase, 60 hertz. The unit shall be capable of satisfactory operation within stated voltage limits.

9. Low ambient cooling, to 14 degrees F outside temperature.
10. Mitsubishi M-Series air conditioning only system.

B. Acceptable Manufacturers: Carrier, Friedrich, Mitsubishi Electric, Panasonic, or equal.

C.

2.09 GAS VENTS

A. Type: Type B double wall gas vent or as required by manufacturer or code.

B. Fabrication: Inner pipe of sheet aluminum [stainless steel], and outer pipe of galvanized sheet steel [stainless steel], tested in compliance with UL 441.

C. Vent Dampers: Electrically actuated, same size as draft hood collar, constructed of stainless steel or galvanized steel, with corrosion-resistant components, in compliance with ANSI Z21.66.

2.10 DUCTWORK

A. Materials:
1. Galvanized Steel Sheet: ASTM A653 Galvanized steel sheet of lock-forming quality. Galvanized coating tube 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90.

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2. Polyvinylchloride Coated Steel Sheet: Hot-dipped galvanized steel sheet with prime coat and a polyvinyl chloride film on both sides. Thickness of coating to be a minimum of 4 mils on each side.
   a. Where any duct surface is scratched, marred, or otherwise damaged, paint with PVC aerosol spray.
   b. Couplings shall be slip-join construction with a minimum 2 inches insertion length. Seal all couplings with sealant as specified.
3. Aluminum Ducts: Aluminum sheet, alloy 3003-H14.
4. Sealant (Mastic): Non-hardening, water-based, water resistant, fire resistive, used alone or with tape. UL 181A-M listed / UL 181B-M listed. Suitable for field painting.
5. Duct Joint Sealing Tape: Pressure sensitive duct joint sealer, UL-181B-FX listed, 2.0-mil annealed aluminum foil coated tape, for flexible and sheet metal ducts. Suitable for field painting.
6. Ductwork located in Corrosion and Chemical areas or exposed to air from Corrosion or Chemical areas shall be PVC coated..

B. Metal Ductwork:
1. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible; except as indicated on Drawings.
2. Construct T's, bends, and elbows with radius of 1 1/2 times the width of the duct on centerline. Where not possible, furnish turning vanes.
3. Increase duct sizes gradually, not exceeding 30 degrees divergence and 45 degrees convergence.

C. Duct Accessories:
1. Volume Control Dampers:
   a. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
   b. Fabricate splitter dampers of material duct gauge to 24 inches size in each direction, and two gages heavier for larger sizes. Secure with continuous hinge or rod. Operate with minimum 1/4 inch diameter rod.
   c. Fabricate single blade dampers for duct sizes to 12 inches by 30 inches.
   d. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes of 8 inches by 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
   e. Except in round ductwork 12 inches and smaller, furnish end bearings.
   f. Furnish locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches, furnish regulator at both ends.
2. Turning Devices and Extractors:
   a. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
   b. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.
3. Flexible Duct Connections:
   a. UL listed fire-retardant neoprene coated woven glass fiber to NFPA 90A, approximately 3 inches wide, crimped into metal edging strip.
4. Duct Access Doors:
   a. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
   b. Access doors smaller than 12 inches square secured with sash locks. Access doors with sheet metal screw fasteners are not acceptable.

2.11 AIR INLETS AND OUTLETS

A. Furnish inlets and outlets in the type, size, thickness, free area, and static pressure as scheduled on the drawings. See Schedule on Drawings for additional requirements.

B. Exterior Louver:
1. Furnish louver in the size, thickness, free area, and type as scheduled on the drawings.

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2. Factory-assembled louver section shall be designed to withstand wind loadings of 25 PSI (100 MPH wind equivalent). Louver frames, mullions, and section joints shall be adequately supported from the building structure to withstand this same wind loading.
3. Louver performance data shall be licensed under the AMCA Certified Ratings Program and shall bear the AMCA Certified Ratings Seal. This certified performance data shall include airflow pressure loss and water penetration.
4. Stationary Non-Drainable Louver with J-Style Blades, 4-inch deep:
    a. Design shall incorporate stationary horizontal blades, sloped sill, and high free area.
    b. Louvers shall be fabricated from 6063-T5 aluminum extrusions of 0.081 in nominal wall thickness.
    c. Blades shall be positioned at 37° and 45° angles on approximate 4-inch centers.
    d. Greenheck Model ESJ-401.
5. Screen: Flattened expanded aluminum in removable rear-mounted (inside) frame.
    a. Intake Service, no filter: Insect screen.
6. Extended sill.
7. Finish: Kynar 500/Hylar 5000 (70% PVDF), unless noted otherwise. Color shall be selected by Architect from manufacturer's standard colors, minimum of 12 [mill].
8. Options – see Schedules on Drawings:
    a. Clip angles
    b. Flanged frame
    c. Glazing adaptor
9. Acceptable manufacturers: Aerolite, Arrow United, Carnes, Cesco, Greenheck, Pottorff, Ruskin, United Enertech, or equal.

C. Gravity Ventilator:
1. Ventilator:
    a. Spun aluminum ventilator designed as intake.
    b. Finish: Kynar 500/Hylar 5000 (70% PVDF) finish, unless noted otherwise. Color shall be selected by Architect from manufacturer's standard colors, minimum of 12.
    c. Greenheck Model GRS.
2. Roof Curb:
    a. Designed for insulated roof decks.
    b. Type appropriate for pitched roof installation.
    c. Galvanized 18 gage steel, welded construction, with 1 inch, 3 pound density, insulation.
    d. Finish: Kynar 500/Hylar 5000 (70% PVDF) finish, unless noted otherwise. Color shall be selected by Architect from manufacturer's standard colors, minimum of 12.
    e. Greenheck Model GPFP.
3. Acceptable manufacturers: Carnes, Cesco, Greenheck, Ruskin, or equal.

D. Supply, Return, Intake, and Exhaust
1. Wall and duct mounted louvered registers:
    a. Frame: Surface mount border with countersunk screw holes.
    b. Finish: Baked enamel - white.
    c. Damper: Match grille construction.
    d. Return:
        1) Construction:
            a) 1/2 inch blade spacing. Blades parallel to floor.
            b) Steel. Price 530 Series.
            c) Aluminum. Price 630 Series.
2. Acceptable Manufacturers: Carnes, Krueger, Metal Aire, Nailor Industries, Price, Titus, or equal.

2.12 ACTUATED DAMPERS

A. Furnish damper in size, thickness, static pressure, and type as scheduled on drawings. See Schedule on Drawings for additional requirements.

B. All dampers shall be of low leakage design with linkages out of the airstream.

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C. Thermally Broken, Insulated Type:
   1. Ratings:
      a. Dampers to be designed for operation in temperatures ranging between –70 degrees F and 200 degrees F.
      b. Air leakage through a 48 inch by 48 inch damper shall not exceed 3-cfm per square foot against 1-inch water gauge or 8-cfm per square foot against 4-inches water gauge differential static pressure at standard air. Standard air leakage data shall be certified under the AMCA certified ratings program and the IECC requirements.
      c. Pressure drop of a fully open 48 inch by 48 inch damper shall not exceed 0.03 inch water gauge at 1000 fpm.
      d. Damper shall have a maximum velocity rating of 4000-fpm.
      e. Damper shall bear the AMCA Certified Ratings Seal for air leakage performance.
   2. Frame: Extruded aluminum (6063T5)
      a. Quick connection damper frame shall be aluminum formed into a 4-inch by 1-inch structural hat channel with 0.125-inch minimum wall thickness. (ICD-45).
      b. Optional frame types:
         1) Channel frame (ICD-45): aluminum formed 5-inch by 1¼-inch structural hat channel.
   3. Blades: Extruded aluminum (6063T5) profiles, internally insulated with non-CFC, expanded polyurethane foam and thermally broken. Complete blade shall have an insulating factor of R-2.29 and a temperature index of 55.
      a. Damper blades shall be heavy gauge extruded aluminum airfoil shape with metal blade to blade overlap. Each blade shall be symmetrical relative to its axle pivot point, presenting identical performance characteristics with air flowing in either direction through the damper.
      b. Blade orientation shall be horizontal, and operation shall be parallel or opposed.
      c. Polyurethane foam shall fill the airfoil blade cavity. Ends of blade shall have a thermal break to isolate the transfer of heat/cold through the aluminum material from one side of the blade to the other.
   4. Blade Stops: Each blade stop (at top and bottom of damper frame) shall occupy no more than ½-inch of the damper opening area to allow for maximum free area and to minimize pressure loss across the damper.
   5. Seals:
      a. Blade Edge: Silicone blade seals shall be mechanically fastened to each blade.
      b. Jamb Seal:
         1) ICD-45: Silicone.

   6. Linkage:
      a. Concealed in frame out of the airstream, plated steel material. Optional stainless steel.
   7. Axles: Minimum 1/2-inch diameter plated steel. Optional stainless steel. Removable control shaft shall extend 6-inches beyond the damper frame.
   8. Bearings: Dual bearing with acetal inner sleeve, flanged outer bearing resulting in no metal-to-metal or metal-to-plastic contact.
   9. Finish: Anodized corrosion resistant coating.
   10. Mounting: Either vertical or horizontal.
   11. Options: Low leakage, thermal insulation shall be provided from the factory upon request.
   12. Factory Tests: factory cycle damper and actuator assembly to assure proper operation.
   13. Greenheck Greenheck ICD-45 (thermally broken blades and frame).
   14. Acceptable Manufacturers: AlumaVent, Arrow, Greenheck, Ruskin, Tamco, United Enertech, or Ventex. No substitutions.

D. Frames: Control dampers shall be flanged to duct type wherever feasible and as required to reduce velocity and static pressure drop across damper.

E. Coating: Corrosion resistant coating on dampers in Corrosion areas or exposed to air exhausted from Corrosion areas.

F. Coating: Chemical resistant coating on dampers in Chemical areas or exposed to air exhausted from Chemical areas.

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2.13 LIFE SAFETY DAMPERS

A. Dynamic Fire Dampers:
1. Dampers shall meet requirements for fire dampers in accordance with NFPA 80, NFPA 90A, and NFPA 101 and applicable building code.
2. Dampers shall be tested, rated, and labeled in accordance with UL 555.
3. 3 hour rated. Vertical mounting. Curtain blade profile. Fusible link, 165 degree-F closure temperature. Type B section, with blade out of the airstream.
4. Type 304 stainless steel construction.
5. Greenheck SSDFD-350

B. Acceptable Manufacturers: Carnes, Greenheck, Louvers & Dampers, Metal-Fab, Ruskin, United Enertech, or equal.

2.14 BRICK VENT

A. Intake, :
1. Frame4-inch deep 6063 Extruded Aluminum.
2. Blades:1" deep 6063 Extruded Aluminum
3. Options:
a. Aluminum mesh insect screen.
b. Opposed blade backdraft damper.
c. Kynar 500 corrosion resistant finish.
4. Nailor 16BVE series, or equal.

2.15 PIPE INSULATION

A. Flexible closed cell type as recommended and/or provided unit manufacturer. May be provided as kit with refrigerant piping.

B. Finished Jackets:
1. Fabricated Line Set Cover: PVC. Standard professional grade, durable and UV and weather-resistant; indoor and outdoor. Minimum 3-inch wide, designed to cover line set, wiring, and drainage lines for split air-conditioning systems. Material shall be easily cut for custom configuration and proper fit.
a. Wall cover, coupler, elbow, end cap, mounting hardware, etc.
b. Color: White or brown, paintable. Satin finish.
c. Hide-A-Line Tubing by Breezzone, Fortress by Rectorseal, Cover Guard, or equal.

C. Acceptable Manufacturers: Johns Manville, Owens Corning, Pittsburgh Corning Corp., or equal.

2.16 DUCTWORK INSULATION

A. EPDM-Rubber: ASTM C534 Type I and II, ASTM D1056, flexible, closed-cell EPDM-rubber based elastomeric, tube and sheet, UV resistant, indoor/outdoor, mold and fungal growth resistant, paintable.
1. Physical Properties:
a. k Value: 0.245 at 75 degrees F (ASTM C518/C117)
b. Service Temperature (continuous): -297^{O}F to 300^{O}F
c. Water Vapor Permeability: 0.03 perm (ASTM E96)
d. Water Absorption (weight %): 0.2% (ASTM C209)
e. Flame Spread/Smoke Developed Ratings: 25/50, self-extinguishing
2. Acceptable Products:
a. Aerocel by Aeroflex, 423-337-2493, www.aeroflexusa.com

B. Schedule:
1. Installer's option where more than one type is indicated.
2. Exhaust Ducts, Exposed to Outdoor Air, in Unconditioned Spaces:
a. All:

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1) Insulation: EPDM Rubber: 1 inch thick.
2) Finished Jacket: None

3. Damper Frames:
   a. Exposed: EPDM Rubber: 1 inch thick.

2.17 CONTROLS

A. Contractor shall be responsible for all automatic electric controls for HVAC equipment as indicated on the Drawings and as described herein.

B. Furnish all motorized dampers, protected relays, interlocks, and transformers as required. Contractor shall mount same in suitable control panels, occupied space, or on equipment as required, specified herein, or shown on drawings. Furnish low voltage relays as required for all fans and motors automatically controlled.

C. Furnish necessary wiring diagrams and be responsible for obtaining proper working installation. Furnish all multi-speed switches and control apparatus.

D. Damper Operators:
   1. Furnish and install commercial quality damper actuators for all dampers requiring operators.
   2. Actuator type, which meet requirements of operation described in the sequence of control.
   3. Furnish proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to seal against maximum system pressures.
   4. Electric Operators: Adjustable stroke motor with spring, having oil immersed gear train.
   5. Acceptable Manufacturer: Belimo. [Greenheck.] Quick acting type where scheduled.

E. Damper actuators and controls installed in Corrosion Areas or exposed to air exhausted from Corrosion Areas shall be installed in a NEMA 3R plastic enclosure.

F. Controls located inside the building shall be installed in a NEMA 1 box, unless noted otherwise.

2.18 FLASHING AND TRIM

A. Provide all opening trim as shown on drawings and as required for a complete and weather-tight installation.

2.19 MECHANICAL IDENTIFICATION

A. Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light background color.

B. Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering. Larger sizes may have a minimum sheet size with stainless steel spring fastener. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Conform to ASME A13.1 and State of Wisconsin Plumbing Code.
   1. Acceptable Manufacturers: Marking Services Incorporated, Seton Nameplate Corporation, or equal.

C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings. Minimum width of 3 inches, to comply with State of Wisconsin Plumbing Code. Color and Lettering: Comply with ASME A13.1 and State of Wisconsin Plumbing Code.
   1. Acceptable Manufacturers: Marking Services Incorporated, Seton Nameplate Corporation, or equal.

D. Plastic Underground Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

E. Framed, typewritten directory under glass for all valves.

F. All items in Hazardous, Corrosion or Chemical areas shall be Type 316 stainless steel, epoxy coated, plastic, or equal chemical resistance.

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2.20 OTHER MATERIALS

A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the approval of the Engineer.

B. Formed steel channels:
   1. Galvanized 12 gage thick steel with holes 1 1/2 inches on center.
   2. Manufacturers: Allied Tube & Conduit Corp., B-Line Systems, Midland Ross Corp., Unistrut Corp., or equal.

C. Provide all supporting steel and related materials not indicated on structural drawings as required for the installation of equipment and materials, including angles, channels, beams and hangers.

D. Prime coat paint all supports.

E. All items in Corrosion and Chemical areas shall be Type 316 stainless steel, epoxy coated, plastic or equal chemical/corrosion resistance.

F. Manufactured Equipment Pads: textured 3-inch thick reinforced plastic equipment pad, polypropylene or equal; complying with ASTM D2299; UV, weather, refrigerant, compressor oil, canine urine, and salt resistant. Pad shall extend a minimum of 1-inch beyond face of equipment.

PART 3 EXECUTION

3.01 JOB CONDITIONS

A. Section 01 30 00 - Administrative Requirements [01 31 13 - Project Coordination]: Coordination and project conditions.

B. Surface Conditions: Examine the areas and conditions under which the work of this section will be preformed. Correct conditions detrimental to timely and proper completion of the work. Do not proceed until unsatisfactory conditions are corrected.

C. Cooperate as necessary with other trades in order that all system the work may be installed in the best arrangement. Coordinate as required with all other trades to share space in common areas and to provide the maximum access to each system.

D. Measurements:
   1. Field measure existing conditions.
   2. Lay out work, properly locate all apparatus, piping, ductwork, equipment, etc. Adjust work, as necessary, to insure that work shall fit into the spaces that have been allotted for such work. Due regard shall be taken for the work of other trades.

E. Proceed as rapidly as the building construction will permit.

F. Start of work means acceptance of existing conditions.

3.02 ELECTRICAL PROVISIONS

A. Control Wiring:
   1. Exposed low voltage (less than 100 volts) control wiring in connection with work of this section shall be provided and installed under this section in strict accordance with the applicable sections of Division 26.
   2. All control wiring shall be less than 100 volts, unless noted otherwise. If Contractor opts to install control wiring of 100 volts or over, Contractor shall contract with a certified electrical contractor for its installation under this section in strict accordance with the applicable sections of Division 26.

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B. Division 26: All line voltage (100 volts and greater) electrical wiring connections. Certain equipment connections have been assumed to be over 100 volts, see Electrical Drawings for equipment and locations.

C. Furnish complete list and location of equipment requiring electrical connections and necessary wiring diagrams to Division 26.

3.03 INSTALLATION - GENERAL

A. Locations: Install all equipment in the locations shown on the drawings, except where specifically otherwise approved on the job by the Owner.
   1. Install all thermostats, switches, and timers 4 feet 0 inch above finished floor.

B. All equipment, as called for on the drawings and herein specified, shall be installed in strict accordance with manufacturer's recommendations.

C. Interferences: Avoid interference with structure, and with work of other trades, preserving adequate headroom and clearing all doors and passage ways.

D. Inspection: Check each piece of equipment in the system for defects, verifying that all parts are properly furnished and installed, that all items function properly, and that all adjustments have been made.

E. Section 07 92 00: Caulking around the exterior perimeter of exterior equipment and where called for on the drawings in areas visible after finished construction.

F. General: All valves, volume dampers, equipment, and accessories shall be installed to permit access to equipment for maintenance, servicing, or repairs. Relocation of piping, ducts, or equipment to accomplish equipment access shall be completed by the Contractor, at no additional cost to the Owner.

G. Provide access panels in ductwork at all dampers not accessible from open end of duct.

H. Provide access doors where equipment is located in chases or inaccessible locations. Access panels shall be furnished by the Contractor and installed by the specific trade responsible for the material in which the access panels are installed.

3.04 FLOOR, WALL, ROOF, AND CEILING OPENINGS

A. All openings for work of this section shall be provided under other sections. Openings shall be made as necessary in ceiling, floors, walls, etc., as required to permit the installation of Work specified or shown on the Drawings. Openings shall be made with care to avoid damage which cannot be concealed when work is completed.

B. Provisions for openings and holes and clearances through walls, floors, and ceilings to be made in advance of construction of such parts of the building. Contractor is responsible for the correct size and location of these openings.

3.05 INSTALLATION - SLEEVES

A. Provide and install sleeves wherever ductwork or piping passes through floors, walls, partitions, etc.

B. Sleeves shall be set and maintained in place during the progress of the work. Set sleeves in position in forms. Set sleeves in place before concrete is placed. Provide reinforcing around sleeves.

C. Sleeves shall be securely fastened in place.

D. Extend sleeves through floors 1 inch above finished floor level.

E. Exterior watertight entries:
   1. Below-grade: Sleeve pipe and seal with mechanical sleeve seals.

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2. Above-grade: Sleeve pipe and seal with caulk.

F. Where duct penetrates wet well, close off space between pipe and sleeve with mechanical sleeve seals.

G. Where ductwork penetrates floor, close off space between sleeve and duct with insulation to within 1/2 inch of top of sleeve. Caulk the space between the sleeve and duct per Section 07 92 00.

H. Where ductwork or piping penetrates floor, ceiling, or wall, close off space between duct or pipe and adjacent work with stuffing, for penetrations through non-rated assemblies, and firestopping, for penetrations through rated assemblies, insulation to within 1/2 inch of wall face.

I. Caulk the space between the sleeve and duct or pipe for all sleeves and penetrations not visible after finished installation at non-rated assemblies.

J. Section 07 92 00: Caulking of all sleeves and penetrations visible after finished installation.

K. Section 07 84 00: Firestopping of all openings in and penetrations through fire-rated assemblies.

L. Provide close fitting metal collar, escutcheon cover, or plate wherever piping or hanger rods are exposed to view and pass through floor, wall, ceiling, partition, or similar locations. Hold escutcheons in place with set screw.

M. Provide close fitting metal collar wherever duct is exposed to view and passes through ceiling. Hold escutcheons in place with screws.

3.06 INSTALLATION - INSERTS

A. Install inserts for placement in concrete forms.

B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

C. Where concrete slabs from finished ceiling, locate inserts flush with slab surface.

D. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.07 INSTALLATION - PIPE HANGERS AND SUPPORTS

A. Support horizontal piping as scheduled.

B. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.

C. Place hangers within 12 inches of each horizontal elbow.

D. Use hangers with 1 1/2-inch minimum vertical adjustment.

E. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.

F. Support riser piping independently of connected horizontal piping.

G. For copper piping, provide sheet lead packing between hanger or support and piping.

H. Design hangers for pipe movement without disengagement of supported pipe.

I. Prime coat exposed steel hangers and supports. Hangers and supports located in suspended ceiling spaces are not considered exposed.

J. Pipe Hanger Spacing Schedule:

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Pipe size:	max. hanger spacing	hanger rod diameter
1/2 to 1-1/4	6’	3/8”
1-1/2 to 2	10’	3/8”
2-1/2 to 3	10’	1/2”

3.08 INSTALLATION - PIPING SYSTEMS

A. Install dielectric connections wherever jointing dissimilar metals.

B. Install unions downstream of valves and at equipment or apparatus connections.

C. Route piping parallel to building structure and maintain gradient.

D. Install piping to maintain headroom. Group piping to conserve space. Group piping wherever practical at common elevations.

E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

F. Provide clearance to hangers and from structure and other equipment for installation of insulation and access to valves and fittings.

G. Install piping system allowing clearance for insulation and access to valves and fittings.

H. Install identification on piping system including underground piping.

3.09 INSTALLATION - VALVES

A. Install valves with stems upright or horizontal, not inverted.

B. Install gate, ball, or butterfly valves for shut-off and to isolate equipment.

C. Provide lug end butterfly valves adjacent to equipment when functioning to isolate equipment.

3.10 INSTALLATION - REFRIGERANT PIPING

A. Install refrigerant piping in accordance with ASME B31.5.

B. Arrange refrigeration piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.4 percent in direction of flow.

C. Flood refrigerant piping system with nitrogen when brazing.

D. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.

E. Install line size liquid indicators in main liquid line leaving condenser. When system contains a receiver, install in liquid line leaving receiver.

F. Install line size strainer upstream of each automatic valve. Where multiple expansion valves with integral strainers are used install single main liquid line strainer.

G. On steel piping systems, install strainer in suction line.

H. Install shut-off valve on each side of strainer.

I. Install permanent filter-dryers in low temperature systems and systems using hermetic compressors.

J. Install replaceable cartridge filter-dryers with three-way bypass assembly to allow isolation of dryers for servicing.

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K. Install filter-dryers in liquid line adjacent to receivers and for each solenoid valve.

L. Install solenoid valves in liquid line of systems operating with single pump-out or pump-down compressor control, in liquid line of single or multiple evaporator systems, and in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into suction line when system shuts down.

M. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.

N. Install refrigerant charging valve connections in liquid line between receiver shut-off valve and expansion valve.

O. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft, near compressor connections.

P. Connect inlet and outlet of condensing units and refrigerant condensers to piping.

Q. Fully charge completed system with refrigerant after testing.

R. Provide electrical connection to solenoid valves.

S. Test refrigeration system in accordance with ASME B31.5.

T. Pressure test system with nitrogen to 200 psig. Test to no leakage.

3.11 INSTALLATION - DUCTWORK

A. Examination:
1. Verify sizes of equipment connections before fabricating transitions
2. Verify ducts and equipment installation is ready for accessories.
3. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangements.

B. Installation:
1. Install in accordance with State of Wisconsin and Industry Standards.
2. Metal Ducts: Install in accordance with SMACNA Duct Construction Standards - Metal and Flexible.
3. Connect flexible ducts to metal ducts with liquid adhesive plus sheet metal screws.
4. Use crimp joints with or without bead for joining round duct sizes to 8 inches and smaller with crimp in direction of airflow.
5. All ductwork joints shall be sealed, including longitudinal joints. Sealing shall be in compliance with SMACNA Duct Construction Standards and meet requirements of the State of Wisconsin Commercial Mechanical and Energy Conservation Codes.
6. Install flexible connections immediately adjacent to fans and motorized equipment. Install flexible connections specified between fan inlet and discharge ductwork. Prevent flexible connectors being in tension while running.
7. Install back-draft dampers on discharge of exhaust fans, except where actuated dampers are installed, and as indicated on Drawings.
8. Prevent passage of unfiltered air around filters by installing felt, rubber, or neoprene gaskets.
9. Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.
10. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Apply duct insulation.
11. Connect diffusers to low pressure ducts with 5 feet maximum length of flexible duct. Hold in place with strap or clamp. Flexible duct shall not deflect more than 3 inches.
12. During construction install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.

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13. Install duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, and elsewhere as indicated on Drawings. Install minimum 8 inch by 8 inch size for hand access, 18 inch by 18 inch for shoulder access.
14. Support terminal units individually from structure. Do not support from adjacent ductwork. Install with minimum of 5 feet of 2 inch thick lined ductwork downstream of unit.
15. Install balancing dampers on duct take-off to diffusers and grilles and registers and louvers, regardless of whether dampers are specified as part of the diffuser, louver, or grille and register assembly.
16. Do not operate fans until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
17. Paint ductwork visible behind air outlets and inlets matte black in accordance with Section 09 91 00.
18. Exterior of all non-insulated ductwork and non-finished jacket of insulated ductwork installed exposed within building shall be painted under Division 09.

3.12 INSTALLATION - FANS

A. Install fans with resilient mountings and flexible electrical leads.

B. Install sheaves required for final air balance. Speed controls may be used on direct drive motors for final air balance. Duct mounted balancing dampers may also be used where speed controls and sheave replacement is impractical.

C. Install safety screen where fan inlet or outlet is exposed.

D. Install fans with access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

3.13 INSTALLATION - GAS VENTS

A. Install concentric vent kit, as required by manufacturer and as indicated on drawings, as close to the exterior wall as practical.

B. Install vent pipes continuously from appliance to exterior of building.

C. Maintain UL listed minimum clearances from combustibles. Assemble pipe and accessories for complete installation.

D. Install vent dampers, locating close to draft hood collar, and secured to breeching.

E. Completely insulate combustion air intake vent, flue vent, and concentric vent kit to discharge point from building.

F. Install exterior hood per manufacturer's written instructions. Maintain minimum clearances to doors, windows, and intake louvers, and to roof overhang. Maintain minimum distance above roof surface.

3.14 INSTALLATION - ELECTRIC HEATERS

A. Install units from manufacturer bracket where available.

B. Install to provide minimum clearances to combustibles.

C. Install control wiring between unit and remotely mounted control components and thermostats.

3.15 INSTALLATION - FUEL-FIRED HEATERS

A. Install make-up air units from vibration isolators.

B. Install flexible duct connections on inlet and outlet of fuel-fired air units.

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C. Install control wiring between unit and remotely mounted control components and thermostats.

3.16 INSTALLATION – CONTROL DAMPERS

A. Install dampers in accordance with manufacturer's Installation Instructions.

B. Dampers must be accessible to allow inspection, adjustment, and replacement of components. The sheet metal contractor shall furnish any access doors or removable section of duct in ductwork or plenums required to provide this access. The general contractor shall furnish any access doors required in walls, ceilings, or other general building construction.

C. Install dampers square and free from racking.

D. The installing contractor shall provide and install bracing for multiple section assemblies to support assembly weight and to hold against system pressure.

E. Do not compress or stretch the damper frame into the duct or opening.

F. Attach multiple damper section assemblies together in accordance with manufacturer's instructions. Install support mullions as reinforcement between assemblies as required.

G. Handle dampers using the frame or sleeve. Do not lift or move dampers using blades, actuator or jackshaft.

H. Install connections to electric actuators per Division 26.

3.17 INSTALLATION - CONTROLS

A. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

B. Install panels and other hardware in position on permanent walls not subject to excessive vibration.

3.18 TESTING, ADJUSTING, AND BALANCING

A. Examination:
1. Before starting work, verify systems are complete and operable.
2. Report defects, deficiencies, or abnormal conditions in mechanical systems preventing system balance.
3. Beginning of work means acceptance of existing conditions.

B. Installation Tolerances:
1. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent for return and exhaust systems.
2. Air Outlets and Inlets: Adjust to within plus or minus 10 percent of design.
3. Positive, negative, or neutral system design relationship shall be maintained during final balance of system.

C. Air System Procedure:
1. Adjust air handling and distribution systems to deliver design supply, return, and exhaust air quantities within previously stated tolerances.
2. Make air quantity measurements in ducts by traverse of entire cross sectional area of duct.
3. Measure air quantities at air inlets and outlets.
4. Use volume control devices to regulate air quantities only to extent those adjustments do not create objectionable air motion or sound levels. Change volume using dampers mounted in ducts.
5. Vary total system air quantities by adjustment of fan speeds. Provide drive changes to accomplish system air flow, speed controls may be used on direct drive motors where allowed by manufacturer. Vary branch air quantities by damper regulation.

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6. Measure static pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across fan. Allow for pressure drop equivalent to 50 percent loading of filters.
7. Adjust automatic outside air, return air, and exhaust dampers for design conditions.
8. Measure temperature conditions across outside air, return air, and exhaust air dampers to check leakage.
9. At modulating damper locations, take measurements and balance at extreme conditions.

D. Field Quality Control:
1. Verify recorded data represents actually measured or observed conditions.
2. Permanently mark settings of valves, dampers, or other adjustment devices. Set and lock memory stops.

3.19 MECHANICAL IDENTIFICATION

A. Install adequate marking of exposed accessible HVAC equipment, ductwork and control devices, per ANSI A13.1.

B. Install plastic nameplates with adhesive.

C. Install tags with corrosion resistant metal chain.

D. Equipment:
1. Identify all major HVAC equipment with plastic nameplates minimum 1 1/2 inches high. Lettering size and plate length to be sufficient to convey adequate information at each location. Minimum length: 4 inches. Minimum lettering height: 3/8 inch.
2. Control Equipment: 1 1/2 inch by 4 inch plastic nameplates with 1/4 inch high lettering.

E. Valves:
1. Tag all valves with tags.
2. Install valve directory where directed.

F. Piping: Plastic pipe markers or plastic tape pipe markers. Space no farther than 15 feet apart, with a minimum of one marker on each straight section of pipe.

3.20 PAINTING

A. Section 09 91 00 [09 96 00]: Painting of concealed ductwork where indicated and exposed piping, ductwork, and equipment, without factory finish or finished cover.

B. Touch-up all factory finishes damaged during construction.

3.21 CLEANING

A. Equipment: After the equipment has been started and proved operational, carefully clean all accessible parts of each piece of equipment, thoroughly removing all traces of dirt, oil, grease, and other foreign substances.

B. High efficiency furnaces must not operate without adequate filters to prevent plugging secondary coils. Contractor is responsible for cleaning secondary coil, if necessary, prior to turning over to Owner.

3.22 LUBRICATION

A. Upon completion of the work and before turning over to the Owner, clean and lubricate all bearings, except sealed and permanently lubricated bearings. Use only lubricant recommended by the manufacturer.

B. Contractor is responsible for maintaining lubrication of all mechanical equipment under his contract until work is accepted by the Owner.

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C. Furnish a chart with each piece of equipment listed, itemizing location for lubricant required and recommended periods of lubrication. Incorporate chart in Instruction Manual.

3.23 INSTRUCTIONS

A. Instruct Owner's representative in the operation and maintenance of all mechanical systems.

B. Assemble two (2) complete sets of manufacturer's printed operating and maintenance instructions for all mechanical equipment installed under the contract. Prepare in bound copies with index tabs. Information must include parts list and wiring diagrams. Submit to Engineer for presentation to the Owner.

3.24 CLOSEOUT OPERATIONS

A. Section 01 70 00 - Execution and Closeout Requirements [01 77 00 - Closeout Procedures]: Closeout provisions.

B. Closeout Equipment/System Operations: Sequence operations properly so that work of the project will not be damaged or endangered. Coordinate with seasonal requirements.
   1. Operate each item of equipment and each item in a test run of appropriate duration with the Owner's operating personnel present to demonstrate sustained, satisfactory performance.
   2. Adjust and correct operations as required for proper performance.
   3. Clean and lubricate each system, and replace dirty filters, especially worn belts and parts and similar expendable items of the work.

C. Instruction, O&M: Instruct Owner or Owner's personnel in the proper operation and maintenance of the HVAC systems. Train personnel in the setting and scheduling of programmable thermostats for occupied/unoccupied periods.

D. Service Organization: At time of substantial completion, Contractor shall provide Owner with a listing of qualified service organizations, including addresses and telephone numbers, for each piece of major equipment.

E. Turn-Over of Operations: At time of substantial completion, turn over the prime responsibility for operation of HVAC equipment and systems to the Owner's operating personnel. However, during the guarantee period, provide an operating engineer, who is completely familiar with work, to consult with and continue training the Owner's personnel on an as-needed basis.

F. Extra Materials.

G. Record Drawings.

3.25 SEQUENCE OF OPERATION

A. Building 95 – Well and Building:
   1. Chemical Room
      a. Written Description:
         1) Ventilation: System operation shall be controlled by SCADA
         2) Heating: Systems shall be controlled by thermostats.
      b. 95-EF-3: Interlock control with dampers 95-D-2, 95-D-5.
         1) Fan ON/OFF shall be by SCADA.
         2) When switch is turned on, fan shall turn on and dampers shall open.
         3) When switch is turned off, fan shall turn off and dampers shall close.
         4) Fan is intended to run continuously.
      c. Dampers:
         1) 95-D-5: Interlock with fan 95-EF-3
            a) Two-position actuator, normal enclosure. Spring open, power closed.
            b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.

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c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.

2) 95-D-2: Interlock with fan 95-EF-3
   a) Two-position actuator, NEMA 3R enclosure. Spring open, power closed.
   b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
   c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.
3) 95-EUH-2 shall be controlled from local NEMA 4X rated thermostat.
4) 95-EWH-2 shall be controlled from integral thermostat.

2. Chlorine Room
   a. Written Description:
      1) Ventilation: System operation shall be controlled by SCADA.
      2) Heating: Systems shall be controlled by thermostats.
   b. 95-EF-1: Interlock control with dampers 95-D-3, 95-D-1.
      1) Fan ON/OFF shall be by SCADA.
      2) When switch is turned on, fan shall turn on and dampers shall open.
      3) When switch is turned off, fan shall turn off and dampers shall close.
      4) Fan is intended to run continuously.
   c. 95-EF-2: Interlock control with damper 95-D-4.
      1) Fan ON/OFF shall be by Div 26 provided switch.
   d. Dampers:
      1) 95-D-3: Interlock with fan 95-EF-1
         a) Two-position actuator, normal enclosure. Spring open, power closed.
         b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
         c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.
      2) 95-D-4: Interlock with fan 95-EF-2
         a) Two-position actuator, normal enclosure. Spring open, power closed.
         b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
         c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.
      3) 95-D-1: Interlock with fan 95-EF-1
         a) Two-position actuator, NEMA 3R enclosure. Spring open, power closed.
         b) When unit is activated, damper shall be in 100% open position. Damper shall be in 100% open position for unit to be activated.
         c) When unit is deactivated, damper shall be in 100% closed position. Damper need not be in 100% closed position for unit to be deactivated.
   e. 95-EUH-1 shall be controlled from local NEMA 4X rated thermostat.
3. Toilet Room
   a. 95-EF-4 shall be controlled by Div 26 provided switch.
   b. 95-EWH-1 shall be controlled by integral thermostat.
4. Treatment Room
   a. 95-DF-1 shall be controlled by manufacturer provided controller.
   b. 95-GUH-1 shall be controlled by local thermostat.
   c. 95-GUH-2 shall be controlled by local thermostat.
   d. Dehumidifiers shall be controlled by local controls.
5. Electrical Room
   a. 95-SS-1 shall be controlled from manufacturer provided thermostat.

END OF SECTION

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SECTION 23 84 16
HIGH EFFICIENCY DEHUMIDIFIER

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. National Electrical Manufacturers Associations (NEMA), Specifications and Standards, Current Edition.
   2. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover providing the following high efficiency dehumidifier(s) as shown on the contract drawings.

Model	Quantity
Hi-E Dry 100	
Hi-E Dry 195	

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Plumbing - Division 22

C. Electrical - Division 26

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

1.07 WARRANTY

A. Furnish five (5) year manufacturer's limited warranty.

PART 2 PRODUCTS AND MATERIALS

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2.01 ACCEPTABLE MANUFACTURERS

A. Dehumidifier shall be HI-E Dry Model 195, Hi-E Dry Model 100, as manufactured by Therma-Stor Products, or equal.

2.02 OPERATING CRITERIA

A. Dehumidifier shall meet the following criteria:

Model	Hi-E Dry Model 195	Hi-E Dry Model 100
Blower	540 CFM	255 CFM
Supply Voltage	115 Volt, 1-phase, 60 Hertz	115 Volt, 1-phase, 60 Hertz
Running Amps	12.0 (Standard)	6.8 (Standard)
Temperature Range	33EF - 110EF	33EF - 110EF
Warranty	5 year	5 year

B. Dehumidifier shall meet minimum performance at the following intake air temperature and humidity conditions:

Hi-E Dry Model 195			
Intake Air	60°F, 80%	80°F, 60%	80°F, 80%
Capacity (pints)	159	183	239
Hi-E Dry Model 100			
Intake Air	60°F, 80%	80°F, 60%	80°F, 80%
Capacity (pints)	94	106	129

2.03 CONTROLS

A. Dehumidifier shall be controlled by a dehumidistat with setting from 20 to 80 percent relative humidity and a positive “on” and “off” setting.

B. Dehumidifier shall have a blower switch that permits continuous blower operation independent of dehumidification.

2.04 DELIVERY

A. Dehumidifier shall be delivered to the job site substantially assembled, tested, and ready for installation.

PART 3 CONSTRUCTION METHODS

3.01 EXECUTION

A. Dehumidifier shall be installed according to manufacturer’s instruction.

B. Dehumidifier shall be placed on a level surface.

PART 4 MEASUREMENT AND PAYMENT

4.01 HIGH EFFICIENCY DEHUMIDIFIER

A. General. High efficiency dehumidifier shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. High Efficiency Dehumidifier, Lump Sum. When so provided, payment for high efficiency dehumidifier shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
2. High Efficiency Dehumidifier, Inclusive. When no quantity is provided, shall high efficiency dehumidifier be considered inclusive to payment for work scheduled under this contract.

END OF SECTION

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SECTION 26 05 00
COMMON WORK RESULTS FOR ELECTRICAL

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. COMMON WORK RESULTS FOR ELECTRICAL.

B. Common Work Results for Electrical shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
   1. Common Work Results for Electrical, Lump Sum. When so provided, payment for Common Work Results for Electrical shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
   2. Common Work Results for Electrical, Inclusive. When no quantity is provided, Common Work Results for Electrical shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   2. National Electrical Contractors Association (NECA), current edition.
      a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable electrical systems as indicated on the drawings and as specified herein.

B. Design Requirements:
   1. The table included in this section under Hardware Design Requirements specifies the usage requirements for the hardware and equipment specified in the following sections:
      a. Section 26 05 29 Hangers and Supports for Electrical Systems.
      b. Section 26 05 34 Conduit.
      c. Section 26 05 35 Boxes.

C. Electrical Work Specified Elsewhere:
   1. Every attempt has been made to indicate in these specifications and drawings all work required under Division 26. However, there may be additional specific requirements in the specifications, drawings, or addenda of other trades which pertain to the work of this trade, and any such requirements are hereby made a part of the requirements for this trade.

D. Design Intent:
   1. The Contractor shall furnish and install all the necessary materials, apparatus, and devices to complete the electrical equipment and systems installation herein specified, except such parts as are specifically exempted herein.

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2. If an item is either called for in the specifications or shown on the plans, it shall be considered sufficient for the inclusion of said item in this contract. If a conflict exists within the Specifications or Drawings, the Contractor shall furnish the item, system, or workmanship that is the highest quality, largest, or most closely fits the design intent.
3. Refer to the General Conditions of the Contract for further clarification of Design Intent.
4. The details and drawings are diagrammatic. The Contractor shall verify all dimensions at the site and be responsible for their accuracy.
5. All sizes as given are minimum except as noted.
6. Materials and labor shall be new (unless noted or stated otherwise), first class, and workmanlike, and shall be subject at all times to inspections, tests and approval from the commencement until the acceptance of the completed work.
7. Electrical requirements for equipment are based on design data. It shall be the responsibility of the Contractor to verify actual requirements with the provider of the equipment and adjust electrical installation based upon actual requirements.

E. Substitution of Materials:
1. Refer to General Conditions of the Contract.
2. Where equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those indicated on the contract documents, the Contractor is responsible for all costs involved in integrating the equipment or accessories into the system and the assigned space and for obtaining the specified performance from the system into which these items are placed.

F. Continuity Of Existing Services And Systems:
1. No outages shall be permitted on existing systems except at the time and during the interval specified by the Owner and the Engineer. Any outage must be scheduled when the interruption causes the least interference with normal schedules and routines. No extra costs will be paid to the Contractor for such outages that must occur outside of regular weekly working hours.
2. This Contractor shall restore any circuit interrupted as a result of this work to proper operation as soon as possible.

1.05 RELATED SECTIONS

A. Common Work Results for Electrical are applicable to all Division 26 sections.

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submittal Requirements for Division 26 Shop Drawings:
1. Submit individual shop drawings for each section requiring submittal.
2. 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.
3. Mark dimensions and values in units to match those specified. Include wiring diagrams of electrically powered or controlled equipment.
4. Clearly notate any exceptions taken to these specifications.
5. Do not release equipment for construction until submittal has been reviewed.
6. Failure to comply with these requirements does not relieve the Contractor of responsibility for meeting the project schedule.

C. Review of shop drawings constitutes acceptance of general design only and will not release the Contractor for fulfilling the terms and intent of the contract documents.

D. Costs of Review of Shop Drawing Submittals. The Owner shall be responsible for the cost of Engineer's review of shop drawing submittals. However, if shop drawings for any individual part of the work are

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rejected or returned to the Contractor for additional information, all cost for subsequent shop drawing review shall be borne by the Contractor.

E. Shop Drawings shall be prepared and submitted for the following work:
1. Lighting - See Fixture Schedule on drawings.
2. Section 26 05 02 - Utility Services.
3. Section 26 05 19 - Building Wire and Cable.
4. Section 26 05 34 - Conduit for Electrical Systems.
5. Section 26 05 35 - Boxes for Electrical Systems.
6. Section 26 05 41 - Wiring Devices.
7. Section 26 05 75 - Electrical Systems Analysis.
8. Section 26 22 00 - Low Voltage Transformers.
9. Section 26 24 16 - Panelboards.
10. Section 26 28 19 - Enclosed Switches.
11. Section 26 32 10 - Engine Generators.
12. Section 26 36 00 - Transfer Switches.
13. Section 26 43 00 - Surge Protection Devices.
14. Section 26 90 00 - Process Instrumentation & Control.

1.07 FACTORY TESTING

A. Refer to the requirements the individual technical sections.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submittal Requirements for Division 26 Operation & Maintenance Manuals and Instructions:
1. 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:
a. Copies of as-built submittals.
b. Wiring diagrams for electrically powered or controlled equipment.
c. Records of tests performed to certify compliance with system requirements.
d. Certificates of inspection by regulatory agencies.
e. Parts lists for manufactured equipment.
f. Preventive maintenance recommendations.
g. Warranties.
h. Additional information as indicated in the technical specification sections.
i. Test Reports and Demonstration Log:
1) Permanently record checks and tests and demonstrations.
2) Submit copy of complete testing or demonstration report no later than 30 days after testing or demonstration is complete.

C. Operation & Maintenance Manuals and Instructions shall be prepared and submitted for the following equipment:
1. Section 26 24 16 - Panelboards.
2. Section 26 32 10 - Engine Generators.
3. Section 26 36 00 - Transfer Switches.
4. Section 26 90 00 - Process Instrumentation & Control.

1.09 QUALITY ASSURANCE

A. All work and materials shall conform to or exceed in every detail the applicable rules and requirements of the [Wisconsin State Electrical Code Volumes 1 and 2], the National Electrical Code (ANSI/NFPA 70), other

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applicable National Fire Protection Association standards, the National Electrical Safety Code, and present manufacturing standards (including NEMA).

B. All work shall be performed under the direction of a [State of Wisconsin Licensed Master Electrician].

C. All materials shall be listed by and shall bear the label of an approved electrical testing laboratory. If none of the approved electrical testing laboratories has published standards for a particular item, then other national independent testing standards shall apply and such items shall bear those labels. Where one of the approved electrical testing laboratories has an applicable system listing and label, the entire system shall be so labeled.

D. The following laboratories are approved for providing electrical product safety testing and listing services as required in these specifications:
   1. Underwriters Laboratories Inc.
   2. Electrical Testing Laboratories, Inc.

E. Certificates And Inspections:
   1. Refer to the General Conditions of the Contract.
   2. Obtain and pay for all required inspections including but not limited to state or local electrical inspections and fuel tank inspections. Deliver original inspection certificates to the Engineer.

1.10 WARRANTY

A. See Division 01 for additional requirements.

1.11 EXTRA MATERIALS - NOT USED

A. See Division 01 for additional requirements.

1.12 DESIGN REQUIREMENTS

A. The following table specifies the usage requirements for the hardware and equipment specified in the following sections:
   1. Section 26 05 29 Hangers and Supports for Electrical Systems.
   2. Section 26 05 34 Conduit for Electrical Systems.
   3. Section 26 05 35 Boxes for Electrical Systems.

HARDWARE USAGE REQUIREMENTS

ATMOSPHERE	CONSTRUCTION	CONDUIT	HARD WARE	BOXES	NOTES
General, Dry New Construction	Concealed/Exposed	RMCS/ RMCA	Galv.	NEMA 1	
General, Damp, New Construction	Exposed	RMCS/ RMCA	SS	NEMA 12	
General, Wet, New Construction	Concealed/Exposed	RMCS/ RMCA	SS	NEMA 4X	
Corrosive, Damp, New Construction	Exposed	RNC	SS	NEMA 4X	2
Underground Construction	Direct-Buried	RNC	N/A	N/A	1

NOTES:

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1. Provide RMCS conduit for low voltage wiring.
2. Applies to Chemical Room and Chlorine Room.

PART 2 PRODUCTS

2.01 ACCESS PANELS AND DOORS

A. Lay-in Ceilings:
   1. Removable lay-in ceiling tiles in 2 x 2 foot or 2 x 4 foot configuration are sufficient; no additional access provisions are required unless specifically indicated.

B. Drywall and Plaster Walls and Ceilings:
   1. 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 application, 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 needed service; minimum size is 12 x 12 inch.

2.02 SEALING AND FIRE-STOPPING

A. Refer to Architectural requirements.

B. Sealing and fire stopping of sleeves/openings between conduits, cable trays, wire ways, troughs, cable bus, bus duct, etc. and the structural or partition opening shall be the responsibility of the Contractor whose work penetrates the opening. Individuals skilled in such work shall perform the sealing and fire stopping.

C. Whenever possible, avoid penetrations of fire and smoke rated partitions. When they cannot be avoided, verify that sufficient space is available for the penetration to be effectively fire and smoke stopped.

D. Manufacturers:
   1. 3M, STI/SpecSeal, Tremco, or approved equal.
   2. The same manufacturer shall provide all fire stopping systems.
   3. The Contractor will be responsible for selecting the appropriate UL tested fire stop system for each application required on the project.

E. 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.

F. Contractor shall use fire stop putty, caulk sealant, intumescent wrap strips, intumescent fire stop collars, fire stop 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.

2.03 NON-RATED PENETRATIONS

A. Conduit Penetrations Through Below Grade Walls:
   1. 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 conduit and the cored opening or a water-stop type wall sleeve.

B. Conduit and Cable Tray Penetrations:
   1. At conduit and cable tray penetrations of non-rated interior partitions, floors and exterior walls above grade, use urethane caulk in annular space between conduit and sleeve, or the core drilled opening.

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PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. The Contractor shall obtain from the appropriate trades and review shop drawings for all equipment requiring electrical connections.

B. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

C. Identify conflicts with the work of other trades prior to installation of electrical system.

D. Electrical installation shall be based upon shop drawing requirements and field verified measurements. Adjust electrical system installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept electrical equipment on site. Inspect for damage.

B. Protect electrical equipment from weather, corrosion, and entrance of debris.

3.03 INSTALLATION

A. Excavation And Backfill:
1. Perform all excavation and backfill work to accomplish indicated electrical systems installation in accordance with other sections of this specification.

B. Concrete Work:
1. Coordinate the quantity and location of all cast-in-place concrete work with the architectural drawings.
2. All cast-in-place concrete will be performed by the General Contractor unless noted otherwise. Provide all layout drawings, anchor bolts, metal shapes, and/or templates required to be cast into concrete or used to form concrete for the support of electrical equipment.

C. Cutting And Patching:
1. Cutting and patching shall be performed in accordance with the requirements for architectural work. Refer to other sections of these specifications.

D. Building Access:
1. 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.

E. Equipment Access:
1. Install all piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors, making sure that access is available for all equipment and specialties. Where access is required in plaster or drywall walls or ceilings, furnish access doors and arrange for installation bt appropriate trades.

F. Working Clearances:
1. Minimum installed equipment working clearances as required by the NEC shall be maintained.
2. Minimum required dedicated electrical equipment space as required by the NEC shall be maintained.
3. Coordinate these requirements with the work of other trades.
4. Identify conflicts with working space requirements prior to installation of equipment.

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G. Coordination:
1. 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 electrical work to better fit the general installation, such work shall be done at no extra cost to the Owner. The Contractor shall check location of electrical outlets with respect to other installations before installing.
2. Verify that all devices are compatible for the surfaces on which they will be used. This includes, but is not limited to, light fixtures, panel boards, devices, etc. and recessed or semi-recessed heating units installed in/on architectural surfaces.
3. Coordinate all work prior to installation. Any installed work that is not coordinated and that interferes with the work of another trade shall be removed or relocated at no additional cost to the Owner.
4. Verify the integrity of fire or smoke ratings where penetrations are required.

H. Sleeves:
1. Process Equipment Areas:
a. New poured concrete construction: cast in place, Schedule 40, PVC sleeve.
b. All other construction: core drill sleeve openings large enough to insert Schedule 40 PVC sleeve and grout around the sleeve.
c. Floor penetrations:
1) Extend top of sleeve two inches above the floor.
2) Where installation of sleeve in floor is not practical, provide two inch deep housekeeping pad extending three inches around cast in place conduits.
2. Non-Process Equipment Areas:
a. Hollow walls: Schedule 40, PVC sleeves, grout around sleeve in masonry construction.
b. All other Areas: core drill sleeve openings large enough to insert Schedule 40 PVC sleeve and utilize the core drilled opening as the sleeve.
3. Conduit Support:
a. 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 the floor structure.

I. Sealing And Firestopping:
1. Fire and/or Smoke Penetrations:
a. Install approved product in accordance with the manufacturer's instructions where a pipe (i.e. cable tray, bus, cable bus, conduit, wire way, trough, etc.) penetrates a fire rated surface.
b. Where fire stop mortar is used to infill large fire-rated floor openings that could be required to support weight, provide permanent structural forming. Fire stop mortar alone is not adequate to support any substantial weight.
2. Non-Rated Surfaces:
a. When the opening is through a non-fire rated wall, floor, ceiling or roof the opening must be sealed using an approved type of material.
b. Install escutcheons or floor/ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
c. In exterior wall openings below grade, assemble rubber links of mechanical seal to the proper size for the conduit and tighten in place, in accordance with the manufacturer's instructions.
d. At interior partitions, conduit penetrations are required to be sealed for all areas. Apply sealant to both sides of the penetration in such a manner that the annular space between the conduit sleeve and the conduit is completely filled.

J. Housekeeping and Clean-up.
1. On a daily basis, clean up and remove all debris and rubbish resulting from work and repair all damage to new and existing equipment resulting from work.
2. Remove all tools, excess material, and unused equipment from the site when job is complete.

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K. General Inspection and Cleaning of Electrical Equipment.
   1. Inspect for physical damage and abnormal mechanical or electrical conditions.
   2. Any item found to be out of tolerance, or in any other way defective as a result of the required testing, shall be reported to the Engineer. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.
   3. Compare equipment nameplate information with the Contract Drawings and report any discrepancies.
   4. Verify proper auxiliary device operation and indicators.
   5. Check tightness of accessible bolted electrical joints. Use torque wrench method.
   6. Make a close examination of equipment and remove any shipping brackets, insulation, packing, etc. that may not have been removed during original installation.
   7. 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.
   8. Vacuum inside of panelboards, switchboards, switchgear, transformer core and coils, horizontal and vertical busducts, MCC's, control panels, and any other similar equipment.
   9. Clean All Equipment:
      a. Loosen attached particles and vacuum them away.
      b. Remove any remaining packing material adhesives with suitable cleaning solution.
      c. Touch-up factory applied finishes damaged during installation using manufacturer approved means to match original finish.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements the individual technical sections.

3.05 TRAINING

A. Refer to the requirements the individual technical sections.

END OF SECTION

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SECTION 26 05 02
UTILITY SERVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. UTILITY SERVICES.

B. Utility Services shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
   1. Utility Services, Lump Sum. When so provided, payment for utility services shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 01.
   2. Utility Services, Inclusive. When no quantity is provided, utility services shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards:
      a. ANSI/NFPA 70 - National Electrical Code (NEC) and state amendments thereto, Current Edition.
   2. National Electrical Contractors Association (NECA), Standard of Installation, Current Edition.
   3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
   4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Provide and install complete and operable utility services as required on the drawings and as specified herein.

B. Payment of Utility Company charges for service will be paid by an allowance as found in Section 01 21 00 which will be adjusted up or down by a change order to the Contract to reflect actual utility company invoices. Contractor handling charges, overhead, and mark-up shall be included in the base bid and are not included under this allowance.

C. Arrange with Electric Utility for permanent and temporary electric service.
   1. Electric Service:
      a. Utility Company: Xcel Energy.
         1) Contact person: Kip Shock.
         2) Phone number: 715-492-7268
      b. System Characteristics:
         1) Facility type: Water Treatment Plant and Well House.
         2) Required service voltage: 277/480V 3-phase, 4-wire.
         3) Required service size: 800A.

D. Arrange with City's internet service provider for internet service as specified herein.
   1. Internet Service:

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a. Service Provider: West Wisconsin Telecom.
   1) Phone number: 715-231-2000.
b. System Characteristics:
   1) Required service type: Public Fiber Optic Network.

1.05 RELATED WORK ELSEWHERE (NOT USED)

1.06 SHOP DRAWINGS

A. Submit shop drawings in accordance with the requirements of Division 01.

B. The following information shall be submitted specifically for utility services:
   1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Documentation required by utility company for approval.

1.07 FACTORY TESTING (NONE)

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.09 QUALITY ASSURANCE

A. Service entrance and metering equipment provided under this section shall be UL Listed for the service intended and shall be approved by the utility company.

B. All materials, equipment, and parts shall be new and unused of current manufacture.

C. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 DIVISION OF WORK

A. The Contractor shall be responsible for coordinating conductor marking and color coding requirements with control system equipment supplier(s).

3.02 FIELD MEASUREMENTS

A. Verify existing conditions and dimensions.

B. Verify that service equipment is ready to be connected and energized.

C. Make arrangements with utility company and obtain required inspections before energizing service(s).

D. Coordinate location of utility company facilities to ensure proper access is available.

3.03 DELIVERY, STORAGE, AND HANDLING (NONE)

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3.04 INSTALLATION

A. Install service entrance conduit and conductors in accordance with utility company instructions.

B. Install metering equipment in accordance with utility company instructions.

END OF SECTION

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SECTION 26 05 19
BUILDING WIRE AND CABLE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Building Wire and Cable:
1. Building Wire and Cable shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Building Wire and Cable, Lump Sum. When so provided, payment for Building Wire and Cable shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Building Wire and Cable, Inclusive. When no quantity is provided, Building Wire and Cable shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. ASTM International, originally known as the American Society for Testing and Materials, Specifications and Standards, current edition:
a. ASTM B800-05 Standard Specification for 8000 Series Aluminum Alloy Wire for Electrical Purposes-Annealed and Intermediate Tempers.
b. ASTM B801-99 Standard Specification for Concentric-Lay- Stranded Conductors of 8000 Series Aluminum Alloy for Subsequent Covering or Insulation.
3. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.
a. U.L. 44 - Rubber-Insulated Wires and Cables.
b. U.L. 50 - Enclosures for Electrical Equipment.
c. U.L. 83 - Thermoplastic-Insulated Wires.
d. U.L. 514B - Conduit, Tubing, and Cable Fittings.
e. U.L. 758 - 105 degree C Appliance Wiring Materials.
f. U.L. 854 - Service Entrance Cables.
g. U.L. 1063 - Machine-Tool Wires and Cables.
h. U.L. 1277 - Type TC Power and Control Tray Cables.
i. U.L. 1569 - Metal-Clad Cables.
j. UL 1581 - Vertical Tray.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable wire and cable systems as indicated on the drawings and as specified herein.

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1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. The following information shall be submitted specifically for wire and cable:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Clearly identify the types of wire and cable proposed.

1.06 QUALITY ASSURANCE

A. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

B. Wire and cable manufacturers shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development and production in accordance with ISO 9001.

C. All materials, equipment, and parts shall be new and unused of current manufacture.

D. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

PART 2 PRODUCTS

2.01 WIRE AND CABLE - GENERAL PURPOSE (600V, COPPER)

A. Manufacturer: Contractor option.

B. General:
   1. THWN/THHN general purpose building wire insulated with polyvinyl chloride (PVC) and covered with protective sheath of nylon intended for lighting and power circuits at 600 volts or less, in residential, commercial and industrial buildings.
   2. The wire shall be suitable for 90 degree C maximum continuous conductor temperature in dry locations and 75 degree C in wet locations and listed by Underwriters Laboratories for use in accordance with the National Electrical Code.

C. Conductors:
   1. Class B or Class C stranded, annealed uncoated copper per UL Standard 83 or 1063.

D. Insulation:
   1. Each conductor shall be insulated with PVC and sheathed with nylon complying with the requirements of UL Standard 83 for Types THHN/THWN and UL Standard 1063 for Type MTW and CSA C22.2 No. 75 for T90 Nylon.
   2. Types THWN/THHN shall comply with the optional Gasoline and Oil Resistant rating of UL Standard 83. The insulation shall also comply with UL requirements for 105 degree C Appliance Wiring Material.
   3. The average thickness of PVC insulation, for a given conductor size, shall be as specified in UL Standard 83 for Types THWN or THHN. The minimum thickness at any point, of the PVC insulation, shall be not less than 90 percent of the specified average thickness.
   4. The minimum thickness at any point of the nylon sheath shall be as specified in UL Standard 83 for Types THWN or THHN.
   5. The PVC insulation shall be applied tightly to the conductor and shall be free-stripping.

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E. Identification:
1. The wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, type designations and optional ratings. The wire shall also be identified as C(UL) Type T90 Nylon or TWN75, FT1.

F. Tests:
1. Wire shall be tested in accordance with the requirements of UL Standard 83 for Types THWN or THHN wire and for the optional Gasoline and Oil Resistant listings; as Type MTW to UL Standard 1063 (stranded items); as AWM to UL Standard 758 (stranded items); and as C(UL) Type T90 Nylon or TWN75.

G. Usage:
1. General use power wiring, minimum size No.12 AWG.
2. General use control wiring, minimum size No.14 AWG.

2.02 WIRE AND CABLE - UNDERGROUND IN CONDUIT OR DUCTBANK (600V)

A. General:
1. XHHW-2 or RHH, cross linked polyethylene insulated cables for use in circuits not exceeding 600 volts. Cables listed by UL and recognized for underground use in wet locations at a maximum continuous conductor temperature of 90ºC in accordance with Article 338 of the National Electric Code.
2. UL listed as Type RHH or RHW-2 for general purpose wiring applications at maximum continuous conductor temperature of 90ºC in dry locations (RHH) or 90ºC in wet or dry locations (RHW-2).
3. Installed in air, conduit, or other recognized raceways in accordance with Article 310 of the National Electric Code.

B. Conductors:
1. Conductors shall be Class B stranded annealed uncoated copper per UL Standard 854 and 44.
2. A suitable separator over the conductor may be used at the option of the manufacturer.

C. Insulation:
1. Each conductor shall be insulated by surface marking indicating manufacturer’s identification, conductor size and metal, voltage rating, UL Symbol, and type designations.

D. Tests:
1. Wire shall be tested in accordance with the requirements of UL Standard 8654 for Type USE-2, UL Standard 44 for Types XHHW-2, RHW-2 or RHH.

E. Usage:
1. Underground power wiring, minimum size No. 12 AWG.

2.03 WIRE AND CABLE - GENERAL PURPOSE (600V, ALUMINUM)

A. Manufacturer: Contractor option.

B. General:
1. XHHW-2 general purpose building wire insulated with cross linked polyethylene intended for service and feeder circuits circuits at 600 volts or less, in residential, commercial and industrial buildings.
2. The wire shall be suitable for 90 degree C maximum continuous conductor temperature in wet or dry locations and listed by Underwriters Laboratories for use in accordance with the National Electrical Code.

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C. Conductors:
1. Compact stranded aluminum AA-8000 series alloy conductors of a recognized Aluminum Association 8000 Series aluminum alloy per ASTM B800-05 and constructed in accordance with the specifications of ASTM B801-99.

D. Insulation:
1. Each conductor shall be insulated with cross linked polyethylene complying with the requirements of UL Standard 83 for Type XHHW-2.
2. Type XHHW-2 shall comply with the optional Gasoline and Oil Resistant rating of UL Standard 83.
3. The average thickness of cross linked polyethylene insulation, for a given conductor size, shall be as specified in UL Standard 83 for Types XHHW-2. The minimum thickness at any point shall be not less than 90 percent of the specified average thickness.

E. Identification:
1. The wire shall be identified by surface marking indicating manufacturer's identification, conductor size and metal, voltage rating, UL Symbol, type designations and optional ratings.

F. Tests:
1. Wire shall be tested in accordance with the requirements of UL Standard 83 for Types XHHW-2 wire and for the optional Gasoline and Oil Resistant listings.

G. Usage:
1. Service and feeder circuit wiring, minimum size No.2 AWG.

2.04 SHIELDED POWER CABLE (600V)

A. Manufacturer: Contractor option.

B. General:
1. Three conductor type TC Tray Cable insulated with cross linked polyethylene and PVC jacket overall, for use on circuits rated 600 volts and 90 degree C maximum continuous conductor temperature in wet or dry locations.
2. Cables approved for installation in cable trays in accordance with the NEC and for installation in air, in ducts or conduits, in tray or trough, in open wiring or direct buried.

C. Conductors:
1. Shall be Class B stranded uncoated soft copper.
2. Suitable separator over the conductor may be used at the option of the manufacturer.
3. Three phase conductors shall be cabled together with a Class B stranded, uncoated copper grounding conductor and suitable non-hygroscopic fillers to make round.
4. Length of lay shall not exceed 35 times the phase conductor diameter.
5. The grounding conductor shall comply with the requirements of UL Standard 1277.
6. The cable assembly shall be covered with a copper tape shield with drain wire, applied with a 10 percent minimum lap.

D. Insulation:
1. Each phase conductor shall be insulated with chemically cross linked polyethylene, meeting Type XHHW-2 requirements of Underwriters Laboratories.
2. The average thickness of insulation shall be as specified in UL Standard 44 for Type XHHW-2 conductors. The minimum thickness at any point shall be not less than 90 percent of the specified average thickness.
3. The insulated phase conductors shall be black in color and shall be printed with the numerals "1", "2", and "3" on their surface.
4. Each cable shall have a PVC protective jacket applied over the taped assembly. The jacket shall meet the Sunlight Resistant requirements of UL Standard 1277.

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5. The average jacket thickness shall be in accordance with UL Standard 1277. The minimum thickness at any point shall be not less than 80 percent of the specified average thickness.

E. Identification:
1. Cables shall be identified by means of surface ink printing indicating manufacturer, number of conductors, size, voltage rating, and required UL information.

F. Tests:
1. Individual conductors and completed cables shall be tested in accordance with UL requirements for Type TC Power Control Tray Cables having XHHW-2 conductors.
2. Cables shall be capable of passing the ribbon burner cable tray flame test requirements of UL and IEEE.

G. Usage:
1. Power wiring for motor loads controlled by adjustable frequency drives, where so indicated on the drawings.

2.05 SHIELDED INSTRUMENTATION CABLE (300V)

A. Manufacturer: CONTRACTOR option.

B. General:
1. Power limited tray cable - two conductor, No.16 AWG (7x24) bare copper, PVC insulation, overall shield with No.18 AWG (7x26) tinned copper drain wire, PVC jacket with nylon ripcord.

C. Electrical Characteristics:
1. Max. Operating voltage: 300Vrms.
2. Conductor DC resistance at 20 deg. C: 3.7 Ohms/1000 ft.
3. Shield DC resistance at 20 degrees C: 5.1 Ohms/1000 ft.
4. Capacitance between conductors at 1 kHz: 61 pF/ft.
5. Capacitance between conductor and shield at 1 kHz: 114 pF/ft.
6. Inductance: 0.19 uH/ft.

D. Physical Characteristics:
1. Temperature rating: -30 to 105 degrees C.
2. Insulation material: PVC.
3. Average insulation thickness: 0.016-in.
4. Jacket material: Sun resistant PVC.
5. Jacket thickness: 0.037-in. nominal.
6. Shield: Aluminum/Polyester, 100 percent coverage.
7. Overall lay length: 2-in. (6 twists/ft).
8. Maximum pulling tension: 94 lbs.
9. Minimum bend radius: 2.6-in.
10. Flame resistance: UL 1581 vertical tray.

E. Usage:
1. Instrumentation cable.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

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B. Identify conflicts with the work of other trades prior to installation of electrical system.

C. Adjust electrical system installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept electrical equipment on site. Inspect for damage.

B. Protect electrical equipment from weather, corrosion, and entrance of debris.

3.03 INSTALLATION

A. Pre-Installation:
1. Verify that interior of building has been protected from weather.
2. Verify that mechanical work likely to damage wire has been completed.
3. Completely and thoroughly swab raceway prior to installation.
4. Verify that field measurements are as shown on drawings.
5. Wire and cable routing shown on drawings is approximate unless dimensioned. Route wire and cable to satisfy project conditions.
6. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required.
7. Determine required separation between cable and other work.
8. Determine cable routing to avoid interference with other work.
9. Any single conduit or raceway utilized for a feeder circuit shall contain only power conductors of a single feeder circuit. Do not combine feeder circuits without engineer's written approval.
10. Contract drawings indicate individual homerun equipment connections.
11. Contractor may combine branch circuits of common types in single conduits provided the following conditions are met:
    a. NEC requirements for conductor de-rating are satisfied.
    b. Conduit fill does not exceed thirty percent. Ten percent fill shall be reserved for future use.
12. No more than eight 24VDC analog circuits may be combined in a single conduit unless specifically stated otherwise on the drawings.

B. Conductor Sizing:
1. Conductor sizes are based on copper unless otherwise noted.
2. Use conductor not smaller than No.12 AWG for power and lighting circuits.
3. Use No.10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet.
4. Where circuit wiring length exceeds length identified on the feeder schedule, increase wire size as needed to maintain a maximum voltage drop of three percent.
5. Use conductor not smaller than No.14 AWG for control circuits.
6. Unless shown otherwise on the contract drawings, power wiring shall be No.12 AWG.

C. Wire Pulling:
1. Pull all conductors into raceway at same time.
2. No.4 AWG and larger wire and power cables shall lubricated with pulling lubricant to reduce pulling tension and abrasion damage. The lubricant shall be water or wax based containing no oils or greases that may adversely affect cable jackets.
3. The minimum bend radius and maximum pulling tension ratings of the wire and cable shall not be exceeded.

D. Splices and Terminations:
1. Splices and terminations shall not be made within raceways.
2. Clean conductor surfaces before splicing or terminating.
3. Make splices, taps, and terminations to carry full amp capacity of conductors with no perceptible temperature rise.

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4. Insulated spring wire connectors may be used to splice 120V power circuits.
5. Control, communication, and data transmission wire and cable shall not be spliced.
6. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
7. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
8. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

E. Motors:
1. Motor wiring to motors less than 10 horsepower shall be spliced and terminated with fully insulated crimp-on end cap with a layer of self- vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.
2. Motor wiring to motors 10 horsepower or larger shall be spliced and terminated with crimp-on ring terminal lugs, brass nuts, bolts and washers with a layer of self-vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.

F. Unshielded power cables:
1. Unshielded power cables shall be spliced and terminated with crimp-on ring terminal lugs, brass nuts, bolts and washers with a layer of self- vulcanizing rubber tape, followed by five layers of vinyl electrical tape. “SkotchLocks” and similar devices shall not be used.

G. Aluminum Conductor Connections:
1. Do not transition from copper to aluminum conductor when extending existing copper conductors.
2. Mechanical Screw Type Connectors:
   a. Connectors shall be dual rated (AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.
   b. Using a suitable stripping tool, to avoid damage to the conductor, remove insulation from the required length of the conductor.
   c. Clean the conductor surface using a wire brush and apply a Listed joint compound.
   d. Tighten the connection per the connector manufacturer’s recommendation.
   e. Wipe off any excess joint compound.
3. Mechanical Compression Type Connectors:
   a. Connectors shall be dual rated (AL7CU or AL9CU) and Listed by UL for use with aluminum and copper conductors and sized to accept aluminum conductors of the ampacity specified.
   b. The lugs shall be marked with wire size, die index, number and location of crimps and shall be suitably color coded. Lug barrel shall be factory prefilled with a joint compound Listed by UL.
   c. Using a suitable stripping tool, to avoid damage to the conductor, remove insulation from the required length of the conductor.
   d. Clean conductor surface using a wire brush.
   e. Crimp the connection per the connector manufacturer’s recommendation.
   f. Wipe off any excess joint compound.
4. Termination of Aluminum Conductor to Aluminum Bus:
   a. Prepare a mechanical screw or compression type connection.
   b. Hardware:
      1) Bolts: Anodized aluminum alloy 2024-T4 and conforming to ANSI B18.2.1 and to ASTM B211 or B221 chemical and mechanical property limits.
      2) Nuts: Aluminum alloys 6061-T6 or 6262-T9 and conforming to ANSI B18.2.2.
      3) Washers: Flat aluminum alloy 2024-T4, Type A plain, standard wide series conforming to ANSI B27.2.
   c. Lubricate and tighten the hardware as per the manufacturer’s recommendations.
5. Termination of Aluminum Conductor to Copper Bus:
   a. Prepare a mechanical screw or compression type connection.

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b. Hardware:
   1) Bolts: Plated or galvanized medium carbon steel; heat treated, quenched and tempered equal to ASTM A-325 or SAE grade 5.
   2) Nuts: Heavy semi-finished hexagon, conforming to ANSI B18.2.2, threads to be unified coarse series (UNC), class 2B.
   3) Washers: Should be of steel, Type A plain standard wide series conforming to ANSI B27.2.
   4) Belleville conical spring washers: shall be of hardened steel, cadmium plated or silicone bronze.
c. Lubricate and tighten the hardware as per the manufacturer's recommendations.

6. Termination of Aluminum Conductor to Equipment Not Equipped for Termination of Aluminum Conductor:
   a. Prepare compression connection using an adapter Listed by UL for the purpose or by pigtailing a short length of suitable size of copper conductor to the aluminum conductor with a compression connector Listed by UL.
   b. Provide an insulating cover over adapter body or the compression connector.
   c. Terminate the adapter or the pigtail on to the equipment per manufacturer's recommendation.

3.04 TESTING AND START-UP SERVICES

A. Inspect wire for physical damage and proper connection.

B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.

C. Verify continuity of each conductor.

D. Feeder or branch circuits with ampacity greater than 100 amperes shall be tested after installation to measure insulation resistance of each conductor.

E. All equipment shall be disconnected and the wire ends shall be cleaned and dried.

F. Connect Megohmeter between conductor and a grounded point in the enclosure and energize until the reading stabilizes.

G. Perform an infrared survey of all aluminum conductor connections after the installation is complete and in normal service. Infrared surveys shall be performed with a minimum of 30 percent of rated full load. All connections with elevated temperatures shall be corrected by the contractor.

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 26
GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Grounding and Bonding for Electrical Systems:
1. Grounding and Bonding for Electrical Systems shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Grounding and Bonding for Electrical Systems, Lump Sum. When so provided, payment for Grounding and Bonding for Electrical Systems shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Grounding and Bonding for Electrical Systems, Inclusive. When no quantity is provided, Grounding and Bonding for Electrical Systems shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
b. ANSI/NFPA 99 - Health Care Facilities.
2. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition.
4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.
5. Institute of Electrical and Electronics Engineers (IEEE), Specifications and Standards, current edition:
a. IEEE 837 - Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable grounding and bonding systems as indicated on the drawings and as specified herein.

1.05 RELATED SECTIONS - NOT USED

1.06 SUBMITTALS - NOT USED

1.07 FACTORY TESTING - NOT USED

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

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1.09 QUALITY ASSURANCE

A. Measure ground resistance from system neutral connection at service entrance to convenient ground reference point using suitable ground testing equipment. Resistance shall not exceed 2 ohms. Additional grounding electrodes shall be used to satisfy ground resistance requirements where required by earth conditions.

PART 2 PRODUCTS

2.01 ROD ELECTRODE

A. Material: Copper-clad steel.

B. Diameter: 3/4-inch minimum.

C. Length: 10-feet minimum. Rod shall be driven at least 9.5-feet deep.

D. Use one or more ground rods to obtain the minimum specified ground resistance. This applies to manholes, padmount switches, transformers, service entrances, and all other equipment requiring a supplemental grounding electrode. Minimum of three ground rods shall be used to ground the service entrance as indicated on plans.

2.02 MECHANICAL CONNECTORS

A. The mechanical connector bodies shall be manufactured from high strength, high conductivity cast copper alloy material. Bolts, nuts, washers and lockwashers shall be made of silicon bronze and supplied as a part of the connector body and shall be of the two bolt type.

B. Split bolt connector types are not allowed.

C. The connectors shall meet or exceed UL 467 and be clearly marked with the catalog number, conductor size and manufacturer.

2.03 COMPRESSION CONNECTORS

A. The compression connectors shall be manufactured from pure wrought copper. The conductivity of this material shall be no less than 99 percent.

B. The connectors shall meet or exceed the performance requirements of IEEE 837, latest revision.

C. The installation of the connectors shall be made with a compression, tool and die system, as recommended by the manufacturer of the connectors.

D. The connectors shall be clearly marked with the manufacturer, catalog number, conductor size and the required compression tool settings.

E. Each connector shall be factory filled with an oxide-inhibiting compound.

2.04 EXOTHERMIC CONNECTIONS

A. Select the appropriate kit for specific types, sizes, and combinations of conductors and other items to be connected. Field personnel shall be trained in execution of welds.

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2.05 WIRE

A. Material: Stranded copper (aluminum not permitted).

B. Grounding Electrode Conductor: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger.

C. Manhole and Vault Bonding: No. 4/0 minimum.

D. Feeder and Branch Circuit Equipment Ground: Size as shown on drawings, specifications or as required by NFPA 70, whichever is larger. Differentiate between the normal ground and the isolated ground when both are used on the same facility.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base electrical installation or equipment locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical system.

C. Adjust electrical system installation to satisfy field requirements.

3.02 INSTALLATION

A. General:
1. Verify that final backfill and compaction has been completed before driving rod electrodes.
2. Install products in accordance with manufacturer instructions.
3. Mechanical connections shall be accessible for inspection and checking. No insulation shall be installed over mechanical ground connections.
4. Ground connection surfaces shall be cleaned and all connections shall be made so that it is impossible to move them.
5. Attach grounds permanently before permanent building service is energized.
6. Install rod electrodes at locations indicated or as required by local code, whichever requires the most rods. Install additional rod electrodes as required to achieve specified resistance to ground.
7. Connect grounding electrode conductor and reinforcing steel in foundation footing. Bond steel together.
8. Bond all conductive components to meet Regulatory Requirements.
9. Bond together metal siding not attached to grounded structure; bond to ground.
10. All separate ground wires shall be enclosed in rigid galvanized steel conduit and bonded at both ends to the rigid galvanized steel conduit with an approved fitting.

B. Less than 600 volt system grounding:
1. Supplementary Grounding Electrode: Use driven ground rod on exterior of building.
2. Copper grounding electrode conductor shall be sized as indicated or as required by NEC, whichever is larger and shall be extended from secondary service system neutral to street side of water meter, building steel, ground rod, and any concrete encased electrodes. Bonding jumper shall be installed around water meter. Install conductor in separate rigid conduit. Bond conduit as described above.
3. Receptacle Grounding: All receptacles installed shall have a separate grounding contact.
4. Bond together system neutrals, service equipment enclosures, exposed non-current carrying metal parts of electrical equipment, metal raceway systems, grounding conductor in raceways and cables, receptacle ground connectors, and plumbing systems.
5. Bond together each metallic raceway, pipe, duct and other metal objects.

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6. Equipment Grounding Conductor: Separate, insulated green conductor shall be installed within each raceway and cable tray, sized per NEC or as indicated in the contract documents whichever is larger. Terminate each end on suitable lug, bus, enclosure or bushing, per NEC. Install a ground wire from each device to the respective enclosure.

3.03 TESTING AND START-UP SERVICES

A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.

3.04 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 29
HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Hangers and Supports for Electrical Systems:
1. Hangers and Supports for Electrical Systems shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Hangers and Supports for Electrical Systems, Lump Sum. When so provided, payment for Hangers and Supports for Electrical Systems shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Hangers and Supports for Electrical Systems, Inclusive. When no quantity is provided, Hangers and Supports for Electrical Systems shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American Iron and Steel Institute (AISI), Specifications and Standards, current edition.
2. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
3. American Society for Testing and Materials (ASTM), Specifications and Standards, current edition:
a. ASTM A653 - General Requirements for Steel Sheet, Zinc-Coated Galvanized by the Hot-Dip Process.
b. ASTM A1011 - Specification for Steel Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Ally and High-Strength Low Alloy with Improved Formability (Formerly ASTM A570).
c. ASTM F1136 - Standard Specification for Chromium/Zinc Corrosion Protective Coatings for Fasteners.
d. ASTM A907 - Standard Specification for Steel, Sheet, and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled, Structural Quality.
e. ASTM B633 - Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
4. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
b. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT).
5. Metal Framing Manufacturers Association (MFMA), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Furnish and install supporting devices as indicated on the drawings, scheduled in Section 26 05 00, and as specified herein.

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1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. The following information shall be submitted specifically for supporting devices:
   1. Submit outline drawings and dimensions for equipment support racks.

1.06 QUALITY ASSURANCE

A. Bolted framing channels and fittings shall have the manufacturers name, part number, and material heat code identification number stamped in the part itself for identification. Material certification sheets and test reports must be made available by the manufacturer upon request.

B. Stainless steel bolted framing parts shall be stamped to identify the material. Material certification sheets and test reports must be made available by the manufacturer upon request.

C. All materials, equipment, and parts shall be new and unused of current manufacture.

D. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

PART 2 PRODUCTS

2.01 STRUT, CHANNELS, AND CONNECTORS

A. Manufacturers:
   1. Cooper B-Line, Inc.
   2. or equal.

B. General:
   1. Strut shall be 1-5/8-inches wide in varying heights and welded combinations as required to meet load capacities and designs indicated on the drawings.

C. Materials and Finish:
   1. Electro-Galvanized Steel: Strut shall be made from steel meeting the minimum mechanical properties of ASTM A1011 SS, Grade 33 and shall be Electro- galvanized after fabrication in accordance with ASTM B633.
   2. Fittings shall be manufactured from steel meeting the minimum requirements of ASTM A907 SS, Grade 33, and hot-dip galvanized after fabrication in accordance with ASTM A123. All hardware shall be stainless steel Type 304 or chromium zinc ASTM F1136 Gr. 3. All hot-dip galvanized after fabrication products must be returned to point of manufacture after coating for inspection and removal of all sharp burrs.
   3. Stainless Steel: All strut, fittings and hardware shall be made of AISI Type 304 stainless steel.

2.02 ANCHORS AND FASTENERS

A. Concrete and Structural Elements: Use stainless steel precast insert system, expansion anchors and preset inserts.

B. Steel Structural Elements: Use stainless steel beam clamps.

C. Concrete Surfaces: Use stainless steel self-drilling anchors and expansion anchors.

D. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.

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E. Solid Masonry Walls: Use stainless steel expansion anchors and preset inserts.

F. Sheet Metal: Use stainless steel sheet metal screws.

G. Wood: Use stainless steel wood screws.

H. All other fasteners: stainless steel screws, suitable for the required usage.

2.03 HARDWARE

A. Conduit and equipment supports, clamps, and other miscellaneous materails shall be constructed of the following materials as scheduled in Section 26 05 00.
   1. Steel.
   2. Zinc plated steel.
   3. Galvanized, malleable iron.
   4. PVC coated, galvanized, malleable iron.
   5. Stainless steel.
   6. PVC.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base locations and dimensions on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust equipment support rack installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept supporting devices on site. Inspect for damage.

B. Protect supporting devices from corrosion and damage. Do not install damaged materials.

3.03 INSTALLATION

A. General:
   1. Furnish and install supports and fasteners for all electrical components required for the project, including free standing supports required for those items remotely mounted from the building structure, catwalks, walkways etc.
   2. Thoroughly clean and remove construction debris from installation.

B. Strut Channel:
   1. Install strut in accordance with MFMA-102 "Guidelines for the Use of Metal Framing"; in accordance with equipment manufacturer's recommendations, and with recognized industry practices.
   2. Fabricate supports from channel. Rigidly weld members or use hexagon head bolts to present a neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
   3. File and de-bur cut ends of galvanized support channel and spray paint with cold galvanized paint to prevent rusting.
   4. Bridge studs top and bottom with channels to support flush-mounted cabinets and panelboards in stud walls.

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C. Anchors and Fasteners:

1. Provide anchors, fasteners, and supports in accordance with NECA "Standard Practices for Good Workmanship in Electrical Contracting".
2. Do not fasten supports to piping, ductwork, mechanical equipment, cable tray or conduit.
3. Do not use spring steel clips and anchors.
4. Do not use powder-actuated anchors.
5. Obtain permission from Engineer before drilling or cutting structural members.
6. Install surface-mounted cabinets and panelboards with minimum of four anchors.
7. Use channel supports to stand cabinets and panelboards 1-5/8-inch off interior or exterior surfaces of exterior walls.
8. Fasten hanger rods, conduit clamps, and outlet and junction boxes to building structure using anchors and fasteners.
9. Install free-standing electrical equipment on 3-inch concrete pads unless indicated otherwise on the drawings.
10. Use threaded rod, minimum size 3/8-inch, for supports where indicated on the drawings.
11. Install products in accordance with manufacturer instructions.

END OF SECTION

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SECTION 26 05 34
CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Conduit:
1. Conduit shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Conduit, Lump Sum. When so provided, payment for Conduit shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Conduit, Inclusive. When no quantity is provided, Conduit shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 GENERAL CONDITIONS

A. Applicable provisions of the General Conditions shall govern the work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. ANSI C80.1 - Electrical Rigid Steel Conduit (ERSC).
b. ANSI C80.3 - Steel Electrical Metallic Tubing (EMT).
c. ANSI C80.5 - Electrical Rigid Aluminum Conduit (ERAC).
d. NFPA 70 - National Electrical Code.
2. American Society for Testing and Materials (ASTM), Specifications and Standards, current edition:
a. ASTM F2160 - Solid Wall High Density Polyethylene (HDPE) Conduit Based on Controlled Outside Diameter.
b. ASTM D2239 - Polyethylene (PE) Plastic Pipe (SIDR) Based on Controlled Inside Diameter.
c. ASTM D3035 - Polyethylene (PE) Plastic Pipe (SDR) Based on Controlled Outside Diameter.
d. ASTM D3350 - Polyethylene Plastics Pipe and Fittings Materials.
3. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
b. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT).
4. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
a. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
b. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association.
c. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers Association.
d. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association.
e. NEMA TC 7 - Smooth Wall Coilable Polyethylene Electrical Plastic Conduit.
5. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.

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a. UL 1 - Standard for Flexible Metal Conduit.
b. UL 6 - Electrical Rigid Metal Conduit - Steel.
c. UL 6A - Standard for Electrical Rigid Metal Conduit - Aluminum and Stainless Steel.
d. UL 651A Type EB and A Rigid PVC Conduit and HDPE conduit.
e. UL 651B Continuous Length HDPE.
f. UL 1660 - Liquid-Tight Flexible Nonmetallic Conduit.
g. UL 2239 - Standard for Safety for Hardware for the Support of Conduit, Tubing, and Cable.

1.05 DESCRIPTION OF WORK

A. Furnish and install complete and operable conduit system as indicated on the drawings, scheduled in Section 26 05 00, and as specified herein.

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for conduit:
1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
2. Clearly identify the types of conduit and fittings proposed.

1.07 FACTORY TESTING - NOT USED

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.09 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 WARRANTY - NOT USED

1.11 EXTRA MATERIALS - NOT USED

PART 2 PRODUCTS

2.01 GALVANIZED RIGID METAL CONDUIT (TYPE RMCS)

A. Manufacturer: Contractor option.

B. Conduit:
1. Impact and crush resistant mild steel tube with an accurate circular cross section, a uniform wall thickness, a defect free interior surface, and a continuous welded seam.
2. Interior and exterior surfaces thoroughly and evenly coated with zinc using the hot-dip galvanizing process.

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3. Top-coated with a compatible organic layer to inhibit white rust and increase corrosion resistance.
4. Factory cut threads, 0.75-inch taper per foot, protected after cutting with an application of molten zinc.

C. Conduit Bodies:
1. Ferrous metal construction electro-galvanized inside and out and coated with aluminum acrylic paint.
2. Tapered, threaded hubs with integral bushing.
3. Stainless steel hardware.
4. Cover constructed of same material with solid gasket.

D. Fittings:
1. Ferrous metal construction electro-galvanized inside and out.
2. Components critical to performance such as set screws, split rings, and locknuts constructed of hardened steel or adequately designed to insure positive bonds.

2.02 RIGID ALUMINUM CONDUIT (TYPE RMCA)

A. Manufacturer: Contractor option.

B. Conduit:
1. Heavy wall tube manufactured of 6063 aluminum alloy in temper designation T-1 with an accurate circular cross section, a uniform wall thickness and a defect free interior surface.
2. Factory cut threads, 0.75-inch taper per foot.

C. Conduit Bodies:
1. Copper free aluminum construction coated with aluminum acrylic paint.
2. Tapered, threaded hubs with integral bushing.
3. Stainless steel hardware.
4. Cover constructed of same material with solid gasket.

D. Fittings:
1. Copper free aluminum construction.
2. Components critical to performance such as setscrews, split rings, and locknuts are adequately designed to insure positive bonds.

2.03 RIGID NON-METALLIC CONDUIT (TYPE RNC)

A. Manufacturer:
1. Carlon.
2. Champion.
3. Or equal.

B. PVC Conduit:
1. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
2. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-2.
3. The conduit and fittings shall be homogeneous plastic material free from visible cracks, holes or foreign inclusions. The conduit bore shall be smooth and free of blisters, nicks or other imperfections, which could mar conductors or cables.
4. Conduit, fittings and cement shall be produced by the same manufacturer to assure system integrity.
5. Schedule 80 non-metallic conduit shall be used in locations subject to physical damage. Schedule 40 non-metallic conduit may be used in all other locations.

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C. Fiberglass Conduit:
1. Epoxy based resin system using an anhydrid curing agent.
2. Temperature Rating: -60 to 250 degrees F.
3. Above grade rated: Halogen free additive for flame spread and smoke control.
4. Coefficient of Friction: .38.
5. Ultraviolet inhibitor: Carbon Black.
6. No Conductor Burn Through.
7. Conduits and fittings to be joined with an interference joint and epoxy adhesive creating a concrete and water tight connection.
8. Integral bell and spigot.
9. Dimensions: Iron PIpe Size (IPS).

D. Conduit Bodies - PVC:
1. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
2. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.
3. Stainless steel hardware.
4. Cover constructed of same material with solid gasket.

E. Fittings - PVC:
1. Made from polyvinyl chloride compound (recognized by UL), which includes inert modifiers to improve weatherability and heat distortion.
2. Rated for use with 90 degree C conductors. Material shall comply with NEMA Specification TC-3.

F. Fittings - Fiberglass.
1. Coupling and adapters shall be of the same material, thinckness, and construction as the conduit.
2. Epoxy adhesive for joining conduits and fittings shall be supplied by the same manufactuer as the conduit and fittings.
3. Temperature Rating: -60 to 250 degrees F.
4. Coefficient of Friction: .38.
5. No Conductor Burn Through.

2.04 LIQUIDTIGHT FLEXIBLE METALLIC CONDUIT (TYPE LFMC)

A. Manufacturer: CONTRACTOR option.

B. Usage:
1. Use in conjunction with galvanized rigid metal conduit.
2. Use in conjunction with PVC coated galvanized rigid metal conduit.
3. Use in conjunction with rigid aluminum conduit.

C. Conduit:
1. Single strip, helically wound, galvanized steel core inside and outside with smooth interior surface with sunlight resistant thermoplastic jacket suitable for ambient environmental conditions conforming to applicable UL Standards.
2. Jacket shall be positively locked to core to prevent sleeving.
3. All runs of flexible conduit shall be as short as practicable, of the same size as the conduit it extends and with enough slack to reduce the effects of expansion and vibration.

D. Fittings:
1. Where used in conjunction with galvanized rigid metal conduit, connectors shall be malleable iron or steel, electro zinc plated, with insulated throat and taper threaded hub.
2. Where used in conjunction with PVC coated galvanized rigid metal or rigid aluminum conduit connectors shall be malleable iron or steel, electro zinc plated and PVC coated, with insulated throat and taper threaded hub.

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3. Particular attention shall be given to maintaining ground bond and firm support through flexible connections.
4. All fittings shall be liquid tight.

2.05 LIQUIDTIGHT FLEXIBLE NON-METALLIC CONDUIT (TYPE LFNC)

A. Manufacturer:
1. Carlon Carflex.
2. Or equal.

B. Usage:
1. Use in conjunction with rigid nonmetallic PVC conduit.

C. Conduit:
1. Conduit shall have a smooth inner surface with integral reinforcement within the conduit wall.
2. Conduit shall be designated as a Type LFNC-B (or FNMC-B), listed to UL standard UL1660 and suitable for use at conduit temperatures of 80 degrees C (dry), 60 degrees C (wet and oil resistant).
3. Conduit shall be flame resistant and when used with listed fittings, approved for the installation of electrical conductors.
4. Conduit shall be installed in accordance with applicable sections of the NEC and/or local electrical codes.
5. Conduit shall be marked OUTDOOR for outdoor applications exposed to sunlight and weathering conditions and marked DIRECT BURIAL for direct burial applications.
6. The National Evaluation Service, Inc shall evaluate conduit for installation within a three-hour or less fire-resistive floor/ceiling and two-hour fire- resistive wall construction.

D. Fittings:
1. Molded from high strength, chemical resistant, glass filled thermoplastic.
2. Fittings shall be listed for the use with liquid tight flexible nonmetallic conduit and shall be marked LFNC-B (FNMC-B).
3. Fittings uses for direct burial applications shall be listed for wet locations.
4. Particular attention shall be given to maintaining ground bond and firm support through flexible connections.
5. All fittings shall be liquid tight.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. The Contractor shall obtain from the appropriate trades and review shop drawings for all equipment requiring electrical connections. Conduit rough-in shall be based upon shop drawing requirements.

B. The Contractor shall be responsible for coordinating conduit location and rough-in with actual equipment conditions and requirements.

C. Field verify all measurements. Do not base conduit rough-in or equipment locations on the contract drawings.

D. Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.

E. Adjust conduit system installation to satisfy field requirements.

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3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept conduit on site. Inspect for damage.

B. Protect conduit from corrosion and entrance of debris.

C. Store conduit above grade. Protect from environment with suitable covering.

D. Protect PVC conduit from sunlight.

3.03 INSTALLATION

A. General:
1. Install conduit in accordance with NECA "Standard Practices for Good Workmanship in Electrical Contracting", all requirements of the NEC, and manufacturer recommended practices.
2. Arrange conduit to maintain headroom and present neat appearance.
3. Design raceway systems to minimize the number of fittings, couplings, kicks, and offsets.
4. Raceways located above lowest floor level:
   a. Route conduit parallel and perpendicular to walls.
   b. All raceways shall be level and straight.
   c. Vertical conduits shall be plumb.
5. Raceways located in or under lowest level floor:
   a. Route conduit in and under slab from point-to-point.
   b. Do not cross conduits in slab.
6. Do not use flexible conduit in place of bends, conduit bodies, or expansion fittings.
7. Flexible conduit shall be used at all equipment terminations. Maximum length of 24-inches unless specifically allowed otherwise by Engineer based upon field conditions.
8. Do not use cords for equipment connections unless specifically allowed otherwise by Engineer based upon field conditions.

B. Raceway sizing:
1. Size raceways as indicated on drawings.
2. Where raceways sizes are not indicated on drawings, size in accordance with NEC requirements. Minimum size 3/4-inch.
3. Exposed conduit runs not longer than 10-feet in length and terminating at a single device may be 1/2-inch unless prohibited by NEC.

C. Raceway Installation:
1. Maintain adequate clearance between conduit and piping.
2. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
3. Cut conduit square using saw or pipe cutter; de-burr cut ends.
4. Bring conduit to shoulder of fittings; fasten securely.
5. Use conduit hubs to fasten conduit to NEMA 4X and NEMA 12 boxes.
6. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic factory elbows for bends in metal conduit larger than 2-inch size.
7. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
8. Suitable pull string shall be installed in each empty conduit, sleeves and nipples excepted.
9. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
10. Remove all debris and moisture from raceways prior to installing conductors.
11. Ground and bond conduit under provisions of Section 26 05 26.
12. Identify conduit under provisions of Section 26 05 53.
13. Install plastic coated conduit in accordance with manufacturer's instructions. All 90 degree bends shall be manufactured elbows. Touch-up PVC coating after installation.

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14. All field cut threads shall be coated with Thomas & Betts Kopr-Shield prior to assembly.

D. Structural Coordination:
1. Suitable fittings, designed and listed for the purpose, shall be used to accommodate expansion and deflection where conduit crosses seismic, control and expansion joints.
2. Install conduit to preserve fire resistance rating of partitions and other elements.
3. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.
4. Where conduit passes between areas subject to variable temperatures, seal conduits to prevent air interchange and condensation formation. Use conduit fitting specifically manufactured for this purpose.

E. Raceway Support:
1. General:
   a. Arrange supports to prevent misalignment during wiring installation.
   b. Do not permanently support conduit with wire or perforated pipe straps.
   c. Remove wire used for temporary supports.
   d. Do not attach conduit to ceiling support wires.
   e. Channel, rod, and hardware shall comply with the requirements of Section 26 05 29.
2. Hardware:
   a. Construct conduit support rack with channel and rod to support conduits not supported from structure.
   b. Support conduit with channel anchored to structure when conduit offset from structure is required.
   c. Secure conduits to channel with pipe straps.
   d. Support conduit from structure when conduit offset from structure is not required.
   e. Secure conduits directly to structure with one-hole strap and conduit spacer.

F. Conduit Separation:
1. Separate conduit systems shall be used for the following circuit categories:
   a. 120-volt power circuits.
   b. 480-volt power circuits.
   c. 120-volt control circuits.
   d. 24 VDC analog control circuits.
   e. Intrinsically safe control circuits.
   f. UTP control cables.
   g. Manufacturer supplied cables (for example, magnetic flow meter cables).
   h. Radio frequency coaxial cables (for example, antenna cables).
2. The contract drawings show individual homerun equipment connections. The Contractor may combine circuits of common types (as identified above) into single conduits provided the following conditions are met:
   a. NEC requirements for conductor de-rating are satisfied.
   b. Conduit fill does not exceed thirty percent. Ten percent fill shall be reserved for future use.
   c. No more than eight 24VDC analog circuits are combined in a single conduit, unless specifically stated otherwise on the drawings.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 35
BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Boxes:
1. Conduit shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedurse - Division 01.
a. Boxes, Lump Sum. When so provided, payment for Boxes shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 1.
b. Boxes, Inclusive. When no quantity is provided, Boxes shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
b. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT).
3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
a. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association.
b. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
c. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable box systems as indicated on the drawings, scheduled in Section 26 05 00, and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for boxes:
1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
2. Clearly identify the types of boxes proposed.

1.06 FACTORY TESTING - NOT USED

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

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1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 OUTLET BOXES

A. Sheet Metal Outlet Boxes:
   1. Galvanized steel, with stamped knockouts.
   2. Gangable, suitable for number of devices shown.
   3. Suitable for flush mounting with drywall, FRP panel, masonry block, and poured concrete wall and ceiling finishes.

B. Sheet Metal Concrete/Masonry Boxes:
   1. Galvanized steel, with stamped knockouts.
   2. Gangable, suitable for number of devices shown.
   3. Suitable for flush mounting with masonry block and poured concrete walls.

C. Luminaire and Equipment Supporting Boxes:
   1. Rated for weight of equipment supported; include 3/8-inch male fixture studs where required.

D. Cast Boxes:
   1. Cast ferralloy or aluminum, deep type, gasketed cover, threaded hubs.
   2. Suitable for surface or flush mounting with drywall, FRP panel, masonry block, and poured concrete wall and ceiling finishes.

2.02 PULL AND JUNCTION BOXES

A. General:
   1. Pull boxes and junction boxes shall be minimum 4 inch square (100 mm) by 2 1/8th inches (54 mm) deep for use with 1 inch (25 mm) conduit and smaller. On conduit systems using 1 1/4 inch (31.75 mm) conduit or larger, pull and junction boxes shall be sized per NEC but not less than 4 11/16 inch square (117 mm).
   2. For telecommunication, fiber optic, security, and other low voltage cable installations the NEC box size requirements shall apply. All boxes, used on telecommunication, security, other low voltage and fiber optic systems with conduits of 1 1/4” and larger, shall be sized per the NEC conduit requirements. For determining box size, the conduit is the determining factor not the wire size.

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B. Sheet Metal Boxes: code gauge galvanized steel, screw covers, flanged and spot welded joints and corners.

C. Boxes Larger than 12 Inches (300 mm) in any dimension shall have a hinged cover, be rated NEMA 4X, and constructed of stainless steel.

D. Cast Metal Boxes for Outdoor and Wet Location Installations: Type 4 and Type 6, flat-flanged, surface-mounted junction box, UL listed as rain-tight. Galvanized cast iron or aluminum box and cover with ground flange, neoprene gasket, and stainless steel cover screws.

E. Cast Metal Boxes for Hazardous Locations: Type 7, cast malleable iron with drilled and tapped conduit entrance. Cast malleable iron cover, non-hinged with Type 316 stainless steel screws and gasketed.

F. Cast Metal Boxes for Underground Installations: Type 4, inside flanged, recessed cover box for flush mounting, UL listed as raintight. Hot dipped galvanized cast iron box and plain cover with neoprene gasket and stainless steel cover screws. Cover Legend: ELECTRIC.

G. Box extensions and adjacent boxes within 48” of each other are not allowed for the purpose of creating more capacity.

H. Junction boxes 6" x 6" or larger size shall be without stamped knock-outs.

I. Wireways shall not be used in lieu of junction boxes.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. The Contractor shall obtain from the appropriate trades and review shop drawings for all equipment requiring electrical connections. Box rough-in shall be based upon shop drawing requirements.

B. The Contractor shall be responsible for coordinating box location and rough-in with actual equipment conditions and requirements.

C. Field verify all measurements. Do not base box rough-in or equipment locations on the contract drawings.

D. Identify conflicts with the work of other trades prior to installation of electrical equipment and conduit work.

E. Adjust box locations to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept boxes on site. Inspect for damage.

B. Protect boxes from corrosion and entrance of debris.

C. Store boxes above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. General:
   1. Install conduit in accordance with NECA "Standard Practices for Good Workmanship in Electrical Contracting", all requirements of the NEC, and manufacturer recommended practices.

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B. Box Installation:
1. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
2. Install electrical boxes to maintain headroom and to present neat mechanical appearance.
3. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
4. Align adjacent wall-mounted outlet boxes for switches, thermostats, and similar devices with each other.
5. Use flush mounting outlet boxes in all areas.
6. Do not install flush mounting boxes back-to-back in walls; provide minimum 6-inch separation. Provide minimum 24 inches separation in acoustic rated walls.
7. Use gang box where more than one device is mounted together. Do not use sectional box.
8. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Install at location required for box to serve intended purpose. Include installation within 10 feet of location shown.
9. Position outlet boxes to locate luminaires as shown on lighting plans.
10. Adjust flush-mounting outlets to make front flush with finished wall material.
11. Install knockout closure in unused box opening.

C. Structural Coordination:
1. Install boxes to preserve fire resistance rating of partitions and other elements.
2. Install flush mounting box without damaging wall insulation vapor barrier or reducing its effectiveness. Provide vapor box or vapor barrier hat for each box flush mounted in an exterior wall.
3. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
4. Coordinate mounting heights and locations of outlets mounted above counters, benches and backsplashes.

D. Box Support:
1. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
2. Use stamped steel bridges to fasten flush mounting outlet box between studs.
3. Use adjustable stainless steel channel fasteners for hung ceiling outlet box.
4. Do not fasten boxes to ceiling support wires.
5. Support boxes independently of conduit.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 41
WIRING DEVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Wiring Devices:
1. Wiring devices shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the bid schedule or special Procedures - Division 1.
a. Wiring Devices, Lump Sum. Where so provided, payment for wiring devices shall be made at the contract lump sum price bid or as specified in special conditions - Division 1.
b. Wiring Devices, Inclusive. When no quantity is provided, wiring devices requirements shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA70 - National Electrical Code.
b. ANSI/NFPA 820 - Standard for Fire Protection in Wastewater Treatment and Collection Facilities.
2. National Electrical Contractors Association (NECA), Standard of Installation, current edition.
3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
a. NEMA WD 1 - General Purpose Wiring Devices.
b. NEMA WD 6 - Wiring Device Configurations.
4. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.

1.04 DESCRIPTION OF WORK

A. Provide and install complete and operable wiring devices as required on the drawings and as specified herein.

1.05 SHOP DRAWINGS

A. Submit shop drawings in accordance with Division 01.

B. The following information shall be submitted specifically for wiring devices:
1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.
2. Clearly identify the types of wiring devices proposed.

1.06 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

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B. Contractor shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for purpose specified and shown.

D. Manufacturer shall specialize in manufacture of products specified in this Section with minimum three years experience.

PART 2 PRODUCTS

2.01 120V EXTRA HEAVY DUTY SPECIFICATION GRADE WALL SWITCHES

A. Single Pole Switch:
1. 20A - Hubbell #HBL1221I.
2. Or equal.

B. Double Pole Switch:
1. 20A - Hubbell #HBL1222I.
2. Or equal.

C. Three-way Switch:
1. 20A - Hubbell #HBL1223I.
2. Or equal.

D. Four-way Switch:
1. 20A - Hubbell #HBL1224I.
2. Or equal.

2.02 120V PIR OCCUPANCY SENSOR SWITCHES

A. Acceptable Manufacturers:
1. Leviton ODS10-IDT.
2. Or equal.

2.03 120V EXTRA HEAVY DUTY SPECIFICATION GRADE RECEPTACLES

A. Duplex Convenience Receptacle:
1. 20A - Hubbell #HBL5362I.
2. Or equal.

B. Simplex Receptacle.
1. 20A - Hubbell #HBL5361I.

C. GFCI Duplex Receptacle:
1. 20A - Hubbell # GFR8300HILU.
2. Or equal.

D. Corrosion Resistant Simplex Receptacle:
1. 20A - Hubbell #HBL53 CM 61.
2. Or equal.

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E. Corrosion Resistant Duplex Receptacle:
   1. 20A - Hubbell #HBL53 CM 62.
   2. Or equal.

2.04 WALL PLATES

A. Wall plates shall be installed as follows:
   1. Use smooth stainless steel plates for receptacles and switches in sheet steel or PVC boxes.
   2. Use multi-screw gasketed cast plate where cast outlet boxes are required. Covers shall not be attached by using a single screw mounting into the wiring device, but shall be attached by mounting directly to the box.
   3. Use Crouse Hinds WLRS or WLRD wet location covers for receptacles identified as “WP” which are located inside structures.
   4. Use aluminum or cast metal cover rated for “Constant Use” for receptacles identified as “WP” and that are exposed to the weather.
   5. Use Crouse-Hinds DS185 cover for all switches identified as “WP”.

PART 3 EXECUTION

3.01 DIVISION OF WORK

A. The Contractor shall have overall system responsibility and shall provide all materials and labor necessary provide a complete and operable system and comply with all requirements of this section.

B. The Contractor shall be responsible for coordinating device locations with actual equipment conditions and requirements.

3.02 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact wiring device locations on the contract drawings.

B. Adjust location of wiring devices to satisfy field requirements.

3.03 INSTALLATION

A. Wiring Device Installation:
   1. Verify branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
   2. Provide extension rings to bring outlet boxes flush with finished surface.
   3. Clean debris from outlet boxes.
   4. Install products in accordance with manufacturer's instructions.
   5. Install devices plumb and level.
   6. Install switches with OFF position down.
   7. Install receptacles with grounding pole on top.
   8. Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
   9. Install plates on switch, receptacle, and blank outlets in all areas.
   10. Connect wiring devices by wrapping conductor around screw terminal.
   11. Provide stainless steel hardware.
   12. Install wall switch 46 inches above finished floor to centerline.
   13. Install convenience receptacle in office space at 18 inches above finished floor to centerline.
   14. Install convenience receptacle in electrical, process, mechanical or storage room at 42 inches above finished floor to centerline.
   15. Install convenience receptacle 6 inches above counter to centerline.
   16. Install convenience receptacle 4 inches above counter backsplash to centerline.

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17. Install exterior convenience receptacle 30 inches above finished grade to centerline.
18. Adjust devices and wall plates to be flush and level.

B. Structural Coordination:
1. Verify outlet boxes are installed at proper height.
2. Verify wall openings are neatly cut and will be completely covered by wall plates.
3. Verify floor boxes are adjusted properly.

3.04 TESTING AND STARTUP SERVICES

A. Inspect each wiring device for defects.

B. Operate each wall switch with circuit energized and verify proper operation.

C. Verify that each receptacle device is energized.

D. Test each receptacle device for proper polarity.

E. Test each GFCI receptacle device for proper operation.

END OF SECTION

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SECTION 26 05 53
IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Identification for Electrical Systems:
1. Identification for Electrical Systems shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Identification for Electrical Systems, Lump Sum. When so provided, payment for Identification for Electrical Systems shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Identification for Electrical Systems, Inclusive. When no quantity is provided, Identification for Electrical Systems shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
b. ANSI Z535.4 - Product Safety Signs and Labels.
2. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. Furnish and install electrical identification systems as indicated on the drawings and as specified herein.

1.05 SUBMITTALS - NOT USED

1.06 FACTORY TESTING - NOT USED

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.08 QUALITY ASSURANCE - NOT USED

1.09 WARRANTY - NOT USED

1.10 EXTRA MATERIALS - NOT USED

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PART 2 PRODUCTS

2.01 NAMEPLATES

A. Engraved three-layer laminated plastic, black letters on white background.

B. Lettering:
1. 1/4-inch letters for identifying individual equipment and loads.

2.02 CONDUCTOR MARKING

A. The ends of each conductor shall be marked with circuit number, motor number, wire or terminal number.

B. Control system wire marking shall be coordinated with control system and equipment shop drawings.

C. Labels shall be typed in black lettering with indelible ribbons on a white, heat shrink sleeve. Markers shall be shrunk around the wire to ensure a tight, non-slip bond with a compatible heat gun.

D. Heat shrink wire markers shall be Brady Bradysleeve Type B-321 or B-322.

2.03 CONDUCTOR COLOR CODING

A. Conductors No.6 AWG and smaller shall be provided with color coded insulation as described herein. Conductors larger than No.6 AWG may be color coded with appropriately colored Scotch No.35 tape at each end.

B. Color Coding:
1. 277/480 vac system shall be colored brown, orange, yellow, and gray for phases A, B, C, and neutral respectively.
2. 120/208 vac system shall be colored black, red, blue, and white for phases A, B, C, and neutral respectively.
3. 120/240 vac shall be colored black, red, and white for Line 1, Line 2, and neutral respectively.
4. 120 vac control wiring shall be colored red.
5. 24 VDC control wiring shall be colored purple and purple with white stripe for positive and negative conductors respectively.
6. Intrinsically safe control wiring shall be colored light blue.
7. Conductors within control cabinets and motor control centers which are supplied from an external source shall be colored yellow.
8. Grounding conductor and equipment ground conductors shall be colored green.

2.04 EQUIPMENT, ENCLOSURE, AND CABINET WARNING SIGNS

A. Electrical Voltage and Shock Hazard Signs.
1. Provide OSHA Voltage and Shock Hazard sign for each electrical enclosure, cabinet, or other piece of equipment that presents an electrical hazard under normal operating circumstances or presents an electrical hazard while the enclosure is open.

B. Electrical Arc Flash Hazard Signs.
1. Provide Arc Flash Hazard sign for each each electrical enclosure, cabinet, or other piece of equipment that presents an arc flash hazard in accordance with NEC and ANSI Z535.4.

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C. Electrical Source Signs.
1. Provide sign indicating voltage level and source for each component of the power distribution system and for all control panels.
2. Provide indicating multiple sources where equipment is fed from multiple sources or where signal wiring is present that is powered from a source external to the equipment.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS - NOT USED

3.02 DELIVERY, STORAGE, AND HANDLING - NOT USED

3.03 INSTALLATION

A. Nameplates:
1. Provide nameplates for grouped equipment such as panelboards, transformers, motor control centers, and control panels. Nameplate shall identify tag number, voltage, ampere rating, and description.
2. Provide nameplates for individual equipment such as motor control center compartments, field instruments, and field control stations. Nameplate shall identify tag number and description.
3. Provide nameplates for individual receptacles. Nameplate shall identify panel and circuit number supplying the receptacle.
4. Provide nameplates for control cabinets and motor control center compartments which contain wiring supplied from an external source. Nameplate shall state: Multiple power sources within, verify all power supplies are disconnected before servicing equipment.
5. Nameplates shall be secured to the front of equipment enclosures with stainless steel screws or rivets. Double sided tape will not be acceptable.
6. Secure nameplates for flush mounted panelboards behind the panelboard door.

B. Conductor Marking:
1. Mark conductors at every termination and splice point.
2. Mark conductors with wire numbers identified by control system supplier, with panel and circuit identification, or with MCC compartment and wire numbers.

C. Conduit Marking:
1. Furnish colored band markers for each conduit longer than six feet and mark each conduit a minimum of twenty feet on center.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 05 75
ELECTRICAL SYSTEMS ANALYSIS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Electrical Systems Analysis:
1. Electrical Systems Analysis shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Electrical Systems Analysis, Lump Sum. When so provided, payment for Electrical Systems Analysis shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Electrical Systems Analysis, Inclusive. When no quantity is provided, Electrical Systems Analysis shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
b. NFPA 70E - Standard for Electrical Safety in the Workplace.
2. Institute of Electrical and Electronics Engineers (IEEE), Specifications and Standards, current edition:
a. IEEE 141 - Recommended Practice for Electric Power Distribution and Coordination of Industrial and Commercial Power Systems.
b. IEEE 241 - Recommended Practice for Electric Power Systems in Commercial Buildings.
c. IEEE 242 - Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems.
d. IEEE 399 - Recommended Practice for Industrial and Commercial Power System Analysis.
e. IEEE 1015 - Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems.
f. IEEE 1584 -Guide for Performing Arc-Flash Hazard Calculations.

1.04 DESCRIPTION OF WORK

A. Furnish short-circuit and protective device coordination studies.

B. Furnish an Arc Flash Hazard Analysis Study per the requirements set forth in the current issue of NFPA 70E -Standard for Electrical Safety in the Workplace. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 - 2018, the IEEE Guide for Performing Arc-Flash Calculations.

C. The electrical power system studies shall encompass the following electrical equipment located at the Wellhouse:
1. Service Entrance Disconnect Switch.
2. Automatic Transfer Switch.
3. Standby Generator.
4. 95-PDP-001.

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5. 95-MCC-1.
6. 95-LP-1.
7. Largest load in each MCC, Power Distribution Panel, and Lighting Panel listed.

1.05 RELATED SECTIONS - NOT USED

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Preliminary short-circuit and protective device coordination studies shall be submitted and approved prior to the approval of any electrical equipment submittals that may be affected by the results of the study.

C. Final short-circuit, protective device coordination, and arc flash hazard analysis studies shall be prepared and submitted based upon actual installed system characteristics.

D. Submit the following information specifically for Electrical Systems Analysis:
1. The results of the short-circuit, protective device coordination, and arc flash hazard analysis studies shall be summarized in a final report. A minimum of five (5) bound copies of the complete final report shall be submitted. Electronic PDF copies of the report shall be provided.
2. The report shall include the following sections:
   a. Executive Summary including Introduction, Scope of Work and Results/Recommendations.
   b. Short-Circuit Methodology Analysis Results and Recommendations.
   c. Short-Circuit Device Evaluation Table.
   d. Protective Device Coordination Methodology Analysis Results and Recommendations.
   e. Protective Device Settings Table.
   f. Time-Current Coordination Graphs and Recommendations.
   g. Arc Flash Hazard Methodology Analysis Results and Recommendations including the details of the incident energy and flash protection boundary calculations, along with Arc Flash boundary distances, working distances, Incident Energy levels and Personal Protection Equipment levels.
   h. Arc Flash Labeling section showing types of labels to be provided.
   i. Section shall contain descriptive information as well as typical label images.
   j. One-line system diagram that shall be computer generated and will clearly identify individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location, device numbers used in the time-current coordination analysis, and other information pertinent to the computer analysis.
3. Submit an electronic version of the software model used to prepare the final short-circuit, protective device coordination, and arc flash hazard analysis studies.

1.07 FACTORY TESTING - NOT USED

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS- NOT USED

1.09 QUALITY ASSURANCE

A. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer skilled in performing and interpreting the power system studies.

B. The Registered Professional Electrical Engineer shall be an employee of the approved engineering firm.

C. The Registered Professional Electrical Engineer shall have a minimum of five (5) years of experience in performing power system studies.

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D. The approved engineering firm shall demonstrate experience with Arc Flash Hazard Analysis by submitting names of at least ten actual arc flash hazard analyses it has performed.

E. The studies shall be performed using SKM Systems Analysis Power*Tools for Windows (PTW) software program or an approved equivalent software tool.

PART 2 PRODUCTS

2.01 DATA COLLECTION

A. Field data collection shall be performed by a technician, qualified (as defined by NFPA 70E - 2004) to ensure accurate equipment modeling. The technician shall have completed an 8-hour instructor-led Electrical Safety Training Course. The course shall include NFPA 70E training which includes the selection and use of personal protective equipment.

B. The technician shall visually inspect to verify the equipment ratings, conductor ratings and overcurrent device data by removing panels, covers and doors where required to document the necessary data used in the analysis. The technician shall be qualified to perform these inspections with the equipment energized provided the incident energy values are less than 40cal/cm^2, greater values or unusual site conditions will require an equipment shutdown so the equipment can be inspected de-energized.

C. The Owner or Contractor shall provide qualified personnel to show the technician the equipment locations and to open all equipment doors, locks, etc. necessary to collect nameplate data.

D. Verify one-line drawings and provide marked corrections where discrepancies are found.

E. Data collection shall begin downstream from the utility service and continue down through the electrical distribution system as defined under scope of work. The study shall not include any single phase AC circuits or DC distribution systems as these types of circuits and systems are excluded from IEEE 1584 Arc Flash calculation guidelines. The study need not include equipment rated 240 volts or less per NFPA 70E, when supplied by a single transformer rated less than 125kVA.

F. Obtain from the utility the minimum, normal, and maximum operating service voltage levels, three-phase short circuit MVA and X/R ratio, as well as line-to-ground short circuit MVA and X/R ratio at the point of connection as shown on the drawings.

2.02 SHORT-CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:
   1. Calculation methods and assumptions.
   2. Selected base per unit quantities.
   3. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis.
   4. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions, and other circuit information as related to the short-circuit calculations.
   5. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.

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6. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly-grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

D. Protective Device Evaluation:
1. Evaluate equipment and protective devices and compare to short circuit ratings.
2. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Identify in writing, any circuit protective devices improperly rated for the calculated available fault current.

2.03 PROTECTIVE DEVICE TIME-CURRENT COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
1. Electric utility's overcurrent protective device.
2. Medium voltage equipment overcurrent relays.
3. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
4. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands.
5. Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
6. Medium voltage conductor damage curves.
7. Ground fault protective devices, as applicable.
8. Pertinent motor starting characteristics and motor damage points, where applicable.
9. Pertinent generator short-circuit decrement curve and generator damage point.
10. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Provide the following:
1. A one-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. A sufficient number of log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time- current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Computer printouts shall accompany the log-log plots and will contain descriptions for each of the devices shown, settings of the adjustable devices, and device identification numbers to aid in locating the devices on the log-log plots and the system one-line diagram.

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4. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram.
5. A discussion section which evaluates the degree of system protection and service continuity with overcurrent devices, along with recommendations as required for addressing system protection or device coordination deficiencies.
6. Identify in writing of any significant deficiencies in protection and/or coordination. Provide recommendations for improvements.

2.04 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in NFPA70E-2009, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis and the protective device time-current coordination analysis.

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Circuits 240V or less fed by single transformer rated less than 125 kVA may be omitted from the computer model and will be assumed to have a hazard risk category 0 per NFPA 70E.

D. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

E. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short-circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations.

F. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

G. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

H. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:
   1. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required and it shall be based on a device located upstream of the equipment to clear the arcing fault.

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J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

M. Provide the following:
   1. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, personal-protective equipment classes and AFIE (Arc Flash Incident Energy) levels.
      a. The Arc-Flash Hazard Analysis shall report incident energy values based on recommended device settings for equipment within the scope of the study.
         1) The Arc-Flash Hazard Analysis may include recommendations to reduce AFIE levels and enhance worker safety.

PART 3 EXECUTION

3.01 FIELD ADJUSTMENT

A. The Contractor or equipment manufacturer's start-up technician shall adjust relay and protective device settings according to the recommended settings table provided by the coordination study.

B. The Contractor shall make minor modifications to equipment as required to accomplish conformance with short circuit and protective device coordination studies.

C. Square D shall notify Owner in writing of any required major equipment modifications.

3.02 ARC FLASH LABELS

A. Provide a 4.0 in. x 4.0 in. thermal transfer type label of high adhesion polyester for each work location analyzed.

B. The labels shall be designed according to the following standards:
   1. UL969 - Standard for Marking and Labeling Systems.
   2. ANSI Z535.4 - Product Safety Signs and Labels.
   3. NFPA 70 (National Electric Code) - Article 110.16.

C. The label shall include the following information:
   1. System Voltage.
      a. Flash protection boundary.
      b. Personal Protective Equipment category.
      c. Arc Flash Incident energy value (cal/cm^2).
      d. Limited, restricted, and prohibited Approach Boundaries.
         1) Study report number and issue date.

D. Labels shall be printed by a thermal transfer type printer, with no field markings.

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E. Arc flash labels shall be provided for equipment as identified in the study and the respective equipment access areas per the following:
   1. Floor Standing Equipment - Labels shall be provided on the front of each individual section. Equipment requiring rear and/or side access shall have labels provided on each individual section access area. Equipment line-ups containing sections with multiple incident energy and flash protection boundaries shall be labeled as identified in the Arc Flash Analysis table.
   2. Wall Mounted Equipment - Labels shall be provided on the front cover or a nearby adjacent surface, depending upon equipment configuration.
   3. General Use Safety labels shall be installed on equipment in coordination with the Arc Flash labels. The General Use Safety labels shall warn of general electrical hazards associated with shock, arc flash, and explosions, and instruct workers to turn off power prior to work.

F. Label Installation.
   1. Labels shall be field installed by the Contractor. The technician providing the installation shall have completed an 8-Hour instructor led Electrical Safety Training Course with includes NFPA 70E material including the selection of personal protective equipment.

3.03 TRAINING - NOT USED

END OF SECTION

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SECTION 26 22 00
LOW-VOLTAGE TRANSFORMERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Low-Voltage Transformers.
1. Low-Voltage Transformers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Low-Voltage Transformers, Lump Sum. When so provided, payment for Low-Voltage Transformers shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Low-Voltage Transformers, Inclusive. When no quantity is provided, Low-Voltage Transformers shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA70 - National Electrical Code.
2. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
a. NEMA ST 1 - Specialty Transformers.
b. NEMA ST20 - Dry Type Transformers for General Applications.
4. International Electrical Testing Association (NETA).
a. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
5. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.
a. UL 1561 - Standard for Dry-Type General Purpose and Power Transformers.
6. Department of Energy 10 CFR Part 431.

1.04 DESCRIPTION OF WORK

A. The primary overcurrent protective devices and associated feeder conductors for dry type transformers shown on one-line drawings are sized for 125% of the transformer nameplate primary current. If the manufacturer elects to supply transformers that require higher / lower rated primary overcurrent protective devices to account for higher / lower inrush characteristics, then the manufacturer shall be responsible for communicating the requirements for manufacturer recommended primary overcurrent protection to all contractors prior to project bidding.

B. Furnish and install complete and operable lighting and distribution transformers as indicated on the drawings and as specified herein.

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1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for low voltage transformers:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Performance data and physical dimensions including outline and support point dimensions of enclosures and accessories, unit weight, voltage, kVA, and impedance ratings and characteristics, loss data, efficiency at 25, 50, 75 and 100 percent rated load, sound level, tap configurations, insulation system type, and rated temperature rise.

1.06 FACTORY TESTING - NOT USED

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS - NOT USED

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: All transformers provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than fifty years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Panelboard manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 ENERGY EFFICIENT, DRY-TYPE TRANSFORMERS

A. Manufacturer:
   1. Square D.
   2. Cutler-Hammer.
   3. or equal.

B. Ratings:
   1. Insulating materials shall exceed NEMA ST20 standards and be rated for 220 degree C, UL component recognized insulation system.

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2. Transformers rated 15kVA and larger shall be 150 degree C temperature rise above 40 degree C ambient.
3. Transformers rated 25kVA and larger shall have a minimum of 4 - 2.5 percent full capacity primary taps.
4. The maximum temperature of the top of the enclosure shall not exceed 50 degree C rise above a 40 degree C ambient.
5. Transformer voltage and kVA ratings shall be as indicated on the drawings.

C. Efficiency:
1. Transformers shall be low loss type with minimum efficiencies per Department of Energy 10 CFR 431.196, (a) (2) when operated at 35 percent of full load capacity. Efficiency shall be tested in accord with DOE Test Method for Measuring the Energy Consumption of Distribution Transformers under Appendix A to Subpart K of 10 CFR Part 431.
2. Minimum transformer efficiency shall comply with the following table:

TRANSFORMER MINIMUM EFFICIENCY			
SINGLE PHASE		THREE PHASE	
KVA	PERCENT EFFICIENCY	KVA	PERCENT EFFICIENCY
15	97.7	15	97.89
25	98.0	30	98.23
37.5	98.2	45	98.40
50	98.3	75	98.60
75	98.5	112.5	98.74
100	98.6	150	98.83
167	98.7	225	98.94
250	98.8	300	99.02
333	98.9	500	99.14
		750	99.23

D. Construction:
1. Transformer coils shall be of the continuous wound construction and shall be impregnated with nonhygroscopic, thermosetting varnish.
2. All cores shall be constructed with low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point to prevent core overheating. Cores for transformers greater than 500kVA shall be clamped utilizing insulated bolts through the core laminations to ensure proper pressure throughout the length of the core. The completed core and coil shall be bolted to the base of the enclosure but isolated by means of rubber vibration-absorbing mounts. There shall be no metal-to- metal contact between the core and coil and the enclosure except for a flexible safety ground strap. Sound isolation systems requiring the complete removal of all fastening devices will not be acceptable.
3. The core of the transformer shall be visibly grounded to the enclosure by means of a flexible grounding conductor sized in accordance with applicable UL and NEC standards.
4. The transformer enclosures shall be ventilated and be fabricated of heavy gauge, sheet steel construction. The entire enclosure shall be finished utilizing a continuous process consisting of degreasing, cleaning and phosphatizing, followed by electrostatic deposition of polymer polyester powder coating and baking cycle to provide uniform coating of all edges and surfaces. The coating shall be UL recognized for outdoor use. The coating color shall be ANSI 49.

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E. Sound Levels:
1. Sound levels shall not to exceed the following:
a. 15 to 50KVA - 45dB.
b. 51 to 150kVA - 50dB.
c. 151 to 300kVA - 55dB.
d. 301 to 500kVA - 60dB.
e. 501 to 700kVA - 62dB.
f. 701 to 1000kVA - 64dB.
g. 1001 to 1500kVA - 65dB.
h. 1501 to 2000kVA- 66dB.

F. Accessories.
1. Provide the following accessories where indicated on the drawings:
a. Weathershields.
b. Wall mounting brackets.
c. Ceiling mounting brackets.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact transformer locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust transformer installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept transformers on site. Inspect for damage.

B. Protect transformers from corrosion and entrance of debris.

C. Store transformers above grade. Protect from environment with suitable covering.

D. Handle transformers using only lifting eyes and brackets provided for that purpose.

3.03 INSTALLATION

A. General:
1. Install transformers in accordance with NECA "Standard of Installation.", all requirements of the NEC, and manufacturer recommended practices.

B. Separately Mounted Transformer Installation:
1. Set transformer plumb and level.
2. Use flexible conduit, 2-foot minimum length, for connections to transformer case. Make conduit connections to side panel of enclosure.
3. Mount transformers on vibration isolating pads suitable for isolating the transformer noise from the building structure.
4. Provide sufficient space around transformer for cooling as recommended by the manufacturer.

C. Structural Coordination:
1. Provide structural supports suitable for the transformer weight for wall and ceiling mounted units.

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3.04 TESTING AND START-UP SERVICES

A. Check for damage and tight connections prior to energizing transformer.

B. Measure primary and secondary voltages and make appropriate tap adjustments within 2-1/2 percent of the nominal operating voltage after the building is in full operation.

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 24 16
PANELBOARDS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Panelboards.
1. Panelboards shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Panelboards, Lump Sum. When so provided, payment for Panelboards shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Panelboards, Inclusive. When no quantity is provided, Panelboards shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
3. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
a. NEMA PB 1 - Panelboards.
b. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
c. NEMA AB 1 - Molded Case Circuit Breakers.
d. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
e. NEMA 250 - Enclosures for Electrical Equipment.
4. International Electrical Testing Association (NETA).
a. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
5. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
a. UL 50 - Enclosures for Electrical Equipment.
b. UL 67 - Panelboards.
c. UL 98 - Enclosed and Dead-front Switches.
d. UL 489 - Molded-Case Circuit Breakers and Circuit Breaker Enclosures.
6. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA Standard C22.2 No. 29-M1989 - Panelboards and Enclosed Panelboards.
b. CSA Standard C22.2 No. 5-M91 - Molded Case Circuit Breakers.
7. Federal Specifications and standards, current edition:
a. W-P-115C - Type I Class 1.
b. W-C-375B - Molded Case Circuit Breakers.
c. W-C-375B/Gen - Circuit Breakers, Molded Case, Branch Circuit and Service.
d. W-P115C - Type 1 Class 2 Load Center.

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1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable panelboards as indicated on the drawings and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for panelboards:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Overall panelboard dimensions, interior mounting dimensions, and wiring gutter dimensions. The location of the main, branches, and solid neutral shall be clearly shown. Illustrate one line diagrams with applicable voltage systems.
   3. Equipment ratings for voltage, amperage, and short circuit.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit the following information specifically for panelboards:
   1. Manufacturer shall provide installation instructions and NEMA Standards Publication PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.07 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: All panelboards provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than fifty years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Panelboard manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.08 WARRANTY

A. See Division 01 for additional requirements.

1.09 EXTRA MATERIALS

A. See Division 01 for additional requirements.

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PART 2 PRODUCTS

2.01 600 VAC POWER DISTRIBUTION PANELBOARD

A. Manufacturers:
1. Square D Company I-LINE - Class 2110.
2. Cutler-Hammer Pow-R-Line.
3. ABB ReliaGear
4. or equal.

B. Interior:
1. Rated 600 vac or 250 VDC maximum. Continuous main current ratings as indicated on drawings not to exceed 1200 amperes maximum. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.
3. The panelboard interior shall have three flat bus bars stacked and aligned vertically with glass reinforced polyester insulators laminated between phases. The molded polyester insulators shall support and provide phase isolation to the entire length of bus.
4. The bussing shall be fully rated with sequentially phased branch distribution. Panelboard bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. The entire interleaved assembly shall be contained between two U-shaped steel channels, permanently secured to a galvanized steel mounting pan by fasteners.
5. Interior trim shall be of dead-front construction to shield user from all energized parts. Main circuit breakers through 800 amperes shall be vertically mounted. Main circuit breaker and main lug interiors shall be field convertible for top or bottom incoming feed.
6. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided where indicated on the drawings.
7. Solid neutral shall be equipped with a full capacity bonding strap for service entrance applications. UL Listed panelboards with 200 percent rated solid neutrals shall have plated copper neutral bus for non-linear load applications where indicated on the drawings. Gutter-mounted neutral will not be acceptable.
8. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label, and Short Circuit Current Rating shall be displayed on the interior or in a booklet format. Leveling provisions shall be provided for flush mounted applications.

C. Circuit Breakers:
1. Interiors shall accept group mounted circuit breakers through 1200A.
   a. Circuit breakers shall be group mounted plug-on with mechanical restraint on a common pan or rail assembly.
   b. Circuit breakers equipped with line terminal jaws shall not require additional external mounting hardware. Circuit breakers shall be held in mounted position by a self-contained bracket secured to the mounting pan by fasteners. Circuit breakers of different frame sizes shall be capable of being mounted across from each other.
   c. Line-side circuit breaker connections shall be jaw type.
2. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.

D. Enclosures:
1. Type 1:
   a. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Zinc-coated galvannealed steel will not be acceptable.

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b. Boxes shall have removable blank end walls and interior mounting studs. Interior support bracket shall be provided for ease of interior installation.
c. Maximum enclosure dimensions shall be 44-inches wide and 9.5-inches deep.
d. Trim Fronts:
1) Trim front steel shall meet strength and rigidity requirements per UL 50 standards. Shall have an ANSI 49 medium gray enamel electrodeposited over cleaned phosphatized steel.
2) Trim front shall be hinged 1-piece with door suitable for flush or surface mount as indicated on the drawings. Trim front door shall have rounded corners and edges free of burrs. A clear plastic directory cardholder shall be mounted on the inside of the door.
3) Locks shall be cylindrical tumbler type with larger enclosures requiring sliding vault locks with 3-point latching. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock.

2.02 240VAC LIGHTING AND APPLIANCE PANELBOARDS

A. Manufacturers:
1. Square D Company NQ - Class 1640.
2. Cutler-Hammer Pow-R-Line.
3. ABB ReliaGear
4. or equal.

B. Interior:
1. Rated for 240VAC / 48VDC maximum. Continuous main current ratings, as indicated on the drawings, not to exceed 600 amperes maximum.
2. UL Listed short circuit current ratings as indicated on the drawings with a maximum of 200,000 RMS symmetrical amperes.
3. Provide one continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors suitable for plug-on or bolt- on branch circuit breakers. The bussing shall be fully rated.
4. Panelboard bus current ratings shall be determined by heat-rise tests conducted in accordance with UL 67. Bussing shall be plated copper. Bus bar plating shall run the entire length of the bus bar. Main lug and main breaker panelboards shall be suitable for use as Service Equipment.
5. All current-carrying parts shall be insulated from ground and phase-to-phase by high dielectric strength thermoplastic.
6. A solidly bonded copper equipment ground bar shall be provided. An additional copper isolated/insulated ground bar shall also be provided where indicated on the drawings.
7. Split solid neutral shall be plated and located in the mains compartment up to 225 amperes so all incoming neutral cable may be of the same length. UL Listed panelboards with 200 percent rated solid neutrals shall have plated copper neutral bus for non-linear load applications where indicated on the drawings.
8. Interior trim shall be of dead-front construction to shield user from energized parts. Dead-front trim shall have pre-formed twist-outs covering unused mounting space.
9. Nameplates shall contain system information and catalog number or factory order number. Interior wiring diagram, neutral wiring diagram, UL Listed label and short circuit current rating shall be displayed on the interior or in a booklet format.
10. Interiors shall be field convertible for top or bottom incoming feed. Main lug interiors up to 400 amperes shall be field convertible to main breaker. Interior leveling provisions shall be provided for flush mounted applications.
11. Circuit Breakers:
a. Main circuit breakers shall be vertically mounted.
b. Sub-feed circuit breakers shall be vertically mounted.
c. Molded case branch circuit breakers shall have bolt-on type bus connectors.

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d. All unused spaces provided, unless otherwise specified, shall be fully equipped for future devices, including all appropriate connectors and mounting hardware.
e. The exposed faceplates of all branch circuit breakers shall be flush with one another.

C. Enclosures:
1. Type 1:
a. Boxes shall be galvanized steel constructed in accordance with UL 50 requirements. Zinc-coated galvannealed steel will not be acceptable.
b. Boxes shall have removable endwalls with knockouts located on one end. Boxes shall have welded interior mounting studs. Interior mounting brackets are not required.
c. Box width shall be 26-inch wide maximum.
d. Type 1 Fronts:
1) Front shall meet strength and rigidity requirements per UL 50 standards. Front shall have ANSI 49 gray enamel electrodeposited over cleaned phosphatized steel.
2) Fronts shall be hinged 1-piece with door. Mounting shall be flush or surface as indicated on the drawings.
3) Panelboards shall have fronts with concealed door hinges and mounted with trim screws. Front shall not be removable with the door locked. Doors on front shall have rounded corners and edges shall be free of burrs.
4) Front shall have cylindrical tumbler type lock with catch and spring-loaded stainless steel door pull. All lock assemblies shall be keyed alike. One (1) key shall be provided with each lock. A clear plastic directory cardholder shall be mounted on the inside of door.

2.03 MOLDED CASE CIRCUIT BREAKERS

A. General.
1. Circuit breakers shall be constructed using glass reinforced insulating material. Current carrying components shall be completely isolated from the handle and the accessory mounting area.
2. Circuit breakers shall have an over center, trip free, toggle operating mechanism which will provide quick-make, quick-break contact action. The circuit breaker shall have common tripping of all poles.
3. The circuit breaker handle shall reside in a tripped position between ON and OFF to provide local trip indication. Circuit breaker escutcheon shall be clearly marked ON and OFF in addition to providing International I/O markings.
4. The maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings shall be clearly marked on face of circuit breaker.
5. Each circuit breaker shall be equipped with a push-to-trip button, located on the face of the circuit breaker to mechanically operate the circuit breaker tripping mechanism for maintenance and testing purposes.
6. Circuit breakers shall be factory sealed with a hologram quality mark and shall have date code on face of circuit breaker.
7. Circuit breaker/circuit breaker combinations for series connected interrupting ratings shall be listed by UL as recognized component combinations. Any series rated combination used shall be marked on the end use equipment along with the statement "Caution - Series Rated System. <insert> A Available. Identical Replacement Component Required".
8. Manufacturer shall provide electronic and hard copy time/current characteristic trip curves (and Ip & I^2t let through curves for current limiting circuit breakers) for each type of circuit breaker.
9. The circuit breakers shall be UL Listed for use with and provided with the following accessories where indicated on the drawings: Shunt Trip, Under Voltage Trip, Ground Fault Shunt Trip, Auxiliary Switch, Alarm Switch, Mechanical Lug Kits, and Compression Lug Kits. Circuit breaker handle accessories shall provide provisions for locking handle in the ON and OFF position for all circuits that supply exit signs, emergency lights, energy management, control system panels, and fire alarm panels.
10. All circuit breakers shall be UL Listed for reverse connection without restrictive line and load markings and be suitable for mounting in any position.

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11. Circuit breakers shall be fixed construction with factory installed mechanical lugs. All circuit breakers shall be UL Listed to accept field installable/removable lugs. Lug body shall be bolted in place; snap in design not acceptable. All lugs shall be UL Listed to accept solid (not larger than #8 AWG) and/or stranded copper and aluminum conductors. Lugs shall be suitable for 90 degree C rated wire, sized according to the 75 degree C temperature rating in the National Electrical Code.
12. All circuit breakers shall be capable of accepting bus connections.

B. Thermal-Magnetic Circuit Breakers.
1. Circuit breakers shall have a permanent trip unit containing individual thermal and magnetic trip elements in each pole.
2. Thermal trip elements shall be factory preset and sealed. Circuit breakers shall be true rms sensing and thermally responsive to protect circuit conductor(s) in a 40 degree C ambient temperature.
3. Circuit breaker frame sizes above 100 amperes shall have a single magnetic trip adjustment located on the front of the circuit breaker.
4. Standard two- and three-pole circuit breakers up to 250 amperes at 600 VAC shall be UL Listed as HACR type.

C. Electronic Trip Circuit Breakers With Standard Function Trip System.
1. Circuit breaker trip system shall be a microprocessor-based true rms sensing design with sensing accuracy through the thirteenth (13th) harmonic. Sensor ampere ratings shall be as indicated on the drawings.
2. The integral trip system shall be independent of any external power source and shall contain no less than industrial grade electronic components.
3. The ampere rating of the circuit breaker shall be determined by the combination of an interchangeable rating plug, the sensor size and the long-time pickup adjustment on the circuit breaker. The sensor size, rating plug and adjustment positions shall be clearly marked on the face of the circuit breaker. Circuit breakers shall be UL Listed to carry 80 percent of their ampere rating continuously.
4. The following time/current response adjustments shall be provided. Each adjustment shall have discrete settings and shall be independent of all other adjustments.
    a. Long Time Pickup Instantaneous Pickup.
    b. Long Time Delay.
    c. Short Time Pickup (I^2t OUT only).
    d. Short Time Delay (I^2t IN only).
5. A means to seal the trip unit adjustments in accordance with NEC Section 240-6(b) shall be provided.
6. Local visual trip indication for overload, short circuit and ground fault trip occurrences shall be provided.
7. An ammeter to individually display all phase currents flowing through the circuit breaker shall be provided. Indication of inherent ground fault current flowing in the system shall be provided on circuit breakers with integral ground fault protection. All current values shall be displayed in true rms with 2 percent accuracy.
8. Long Time Pickup indication to signal when loading approaches or exceeds the adjusted ampere rating of the circuit breaker shall be provided.
9. The trip system shall include a Long Time memory circuit to sum the time increments of intermittent overcurrent conditions above the pickup point. Means shall be provided to reset Long Time memory circuit during primary injection testing.
10. Circuit breakers shall be equipped with back-up thermal and magnetic trip system.
11. Circuit breaker trip system shall be equipped with an externally accessible test port for use with a Universal Test Set. Disassembly of the circuit breaker shall not be required for testing. Test set shall be capable of verifying the operation of all trip functions with or without tripping the circuit breaker.

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PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact panelboard locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust panelboard installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept panelboard on site. Inspect for damage.

B. Protect panelboard from corrosion and entrance of debris.

C. Store panelboard above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Install panelboards plumb and flush with wall finishes.

B. Install panelboards such that top of panel is located at an elevation of 6-feet above finished floor elevation.

C. Provide filler plates for unused spaces in panelboards.

D. Provide typed circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.

E. Stub five empty 1-inch conduits to accessible location above ceiling or below floor of each flush-mounted panelboard to allow for future expansion.

F. Measure steady state load currents at each panelboard feeder. Should the difference at any panelboard between phases exceed 10 percent, rearrange circuits in the panelboard to balance the phase loads within 10 percent. Take care to maintain proper phasing for multi wire branch circuits.

G. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections for circuit breakers, fusible switches, and fuses.

H. Verify that bonding jumper is properly installed in service entrance rated panels.

I. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 24 19
MOTOR CONTROL CENTERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Motor Control Centers.
1. Motor Control Centers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Motor Control Centers, Lump Sum. When so provided, payment for Motor Control Centers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Motor Control Centers, Inclusive. When no quantity is provided, Motor Control Centers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
3. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
4. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition:
a. IEC-60439 - Low Voltage Switchgear and Control Gear Assemblies.
5. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition:
a. ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
b. ICS 2.3-1995 (R2002) - Industrial Control and Systems: Instructions for the Handling, Installation, Operation, and Maintenance of Motor Control Centers Rated Not More than 600 Volts.
c. ICS 4-2000 - Industrial Control and Systems: Terminal Blocks.
d. ICS 5-2000 - Industrial Control and Systems: Control Circuit and Pilot Devices.
7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition:
a. UL 845 - Standard for Motor Control Centers.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 90 00 - Process Instrumentation & Control.

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B. Furnish and install complete and operable motor control centers as indicated on the drawings and as specified herein.

C. Motor control equipment specified under this section shall be the product of a single manufacture unless stated otherwise.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for motor control centers:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Equipment ratings for voltage, amperage, and short circuit.
   3. Dimension drawings.
   4. Conduit entrance drawings:
      a. Maximum conduit and cable size.
      b. Locations.
   5. Unit wiring diagrams:
      a. Individual diagram for each unit.
      b. Show tag numbers and descriptions.
      c. Show wire and terminal numbers.
   6. Unit layout diagrams:
      a. Individual diagram for each unit.
      b. Show tag numbers and descriptions.
   7. Control Logic Diagrams:
      a. Individual diagram for each unit.
      b. Show tag numbers and descriptions.
      c. Show wire and terminal numbers.
      d. Show field device interconnections.
      e. Custom drawings are required to fulfill this requirement. Manufacturer's standard diagrams are not acceptable.
   8. Bus size and ratings.
   9. Protective device frame sizes and trip ratings.
   10. Nameplate legend.
   11. Symbol and abbreviation list.
   12. Manufacturer's installation instructions.
      a. Indicate application conditions and limitations of use.
      b. Indicate instructions for storage, handling, protection, examination, preparation, installation, starting, and testing of equipment.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for motor control centers:
   1. As-built wiring and layout diagrams.
   2. Manufacturer maintenance instructions.

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3. Motor controller data listing identifying all adjustable settings and configurable.

1.07 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: All motor control centers provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Motor Control Center manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.08 WARRANTY

A. See Division 01 for additional requirements.

1.09 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Allen Bradley.

B. ABB.

2.02 MOTOR CONTROL CENTER STRUCTURE

A. Enclosure:
   1. NEMA Type 1 with closed cell neoprene gaskets.
   2. 90-inch high by 20-inch deep structure consisting of one or more vertical sections of varying widths bolted together.

B. Vertical Sections:
   1. Construction:
      a. Rigid, freestanding structure.
      b. Heavy-duty internal base mounting angles at bottom of structure, continuous within shipping block.
      c. Removable heavy duty lifting angle, continuous within shipping block. Lifting eyelets are not acceptable.
      d. Rounded-edge tightly fitted metal work with no visible air gaps.
      e. Full metal side sheets for isolation and minimization of fault propagation between adjacent vertical sections.
      f. Removable end plates:

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1) Horizontal power bus.
2) Horizontal wire way.
3) End of structure vertical sections only.

g. Removable one-piece top plate.

h. Bottom plate.

2. Wire ways:

a. Horizontal:

1) Top and bottom extending full depth of structure.
2) Ninety square inches of unobstructed wiring space at top and bottom of each vertical section.
3) Six inches high, extending entire length of structure with twenty-five square inch opening between vertical sections.
4) Isolated from horizontal and vertical bus.
5) Removable front covers held in place with captive screws.
6) Seven inch deep horizontal wire way in incoming line section, isolated from incoming line compartment.

b. Vertical:

1) Full height 4.37-inch wide by 7-inch deep in each vertical section.
2) Isolated from horizontal and vertical bus.
3) Integral to vertical section, independent from plug-in units.
4) Removable hinged cover with quarter-turn latches.
5) Vertical wire way tie bars for securing wiring in place.

3. Structure Coatings:

a. Structural metal parts cleaned, rinsed, and painted to uniform thickness.

b. Coatings:

1) Paint all surfaces ANSI 49 medium light gray except as noted.
2) Paint vertical wire ways and unit back plates gloss white.
3) Do not paint stainless steel parts.
4) Plate unpainted parts for corrosion resistance.

C. Bus bars:

1. Horizontal Power Bus:

a. The horizontal bus shall be rated as shown on the drawings.

b. The horizontal bus material shall be copper with tin plating.

c. The horizontal bus shall be supported, braced and isolated from the vertical bus with a high strength, non-tracking glass polyester material.

d. For standard sections the horizontal bus shall be continuous within each shipping block and shall be braced within each section.

e. Horizontal bus splices shall have at least 2 bolts on each side.

2. Vertical Bus:

a. The vertical power bus shall have an effective rating of 600A. If a center horizontal bus construction is utilized, then the rating shall be 300A above and below the horizontal bus for an effective rating of 600A. If a top or bottom mounted horizontal bus is utilized, then the full bus must be rated for 600A.

b. The vertical bus material shall be copper with tin plating.

c. The vertical bus shall attach to the horizontal bus with at least 2 bolts.

d. The vertical bus shall be continuously braced by a high strength non-tracking glass-filled polyester material and sandwiched by a glass-filled polycarbonate molded cover.

e. Automatic shutters shall cover plug-in stab openings when units are removed.

3. Ground Bus:

a. Provide a ground bus system consisting of a horizontal ground bus connected to vertical ground buses mounted in each section.

b. Provide an unplated copper (0.25 inch by 2 inch) horizontal ground bus mounted in the bottom of the MCC unless otherwise specified in the drawings.

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c. Provide a pressure type mechanical lug mounted on the ground bus in the incoming line section.
d. Provide a unit ground stab on all unit inserts. The ground stab shall establish unit insert grounding to the vertical ground bus before the plug-in power stabs engage the power bus. The grounding shall be maintained until after the plug-in power stabs are disengaged.

4. Neutral Bus.
a. If a 4-wire system is specified, yet there are no neutral loads in the MCC, only a neutral connection plate is required in the MCC; i.e. a full neutral bus is not required.
b. If neutral loads are specified within the MCC, a full neutral bus is required. Provide a neutral bus across the full width of the MCC, an incoming neutral lug pad in the incoming section, and neutral connection plates in sections as required.

D. Isolation and Insulation:
1. Shutters shall automatically open when a unit is inserted and automatically close when a unit is removed, so that personnel are not exposed to live vertical bus bars and so that the bus is isolated from arcing faults.

2.03 PLUG-IN UNITS

A. General.
1. Plug-in units shall consist of unit assembly, unit support pan and unit door assembly.
2. Units shall be supplied with removable doors. The unit doors shall be fastened to the structure so that the doors can be closed when the unit is removed.
3. A unit support pan shall be provided for support and guiding units. Unit support pans shall remain in the structure when units are removed to provide isolation between units.
4. A service position shall be provided for plug-in units that allows for the unit to be supported, but disengaged from the bus. The unit shall be capable of being padlocked in the service position.

B. Power Stabs.
1. Unit stabs for engaging the power bus shall be tin plated copper and provided with stainless back-up springs to provide and maintain a high pressure 4-point connection to the vertical bus.
2. Wiring from the unit disconnecting means to the plug-in stabs shall not be exposed to the rear of the unit. A separate isolated pathway shall be provided for each phase to minimize the possibility of unit fault conditions reaching the power bus system.
3. The power cable termination at the plug-in stab shall be a maintenance-free crimp type.

C. Unit Mounting:
1. After insertion, each plug-in unit shall be held in place by a latch that is located at the front of the unit. Multi-turn latches requiring more than ten turns per latch shall not be acceptable.
2. Mount plug-in stabs in polyester molding at the rear of the unit. Rout wiring from the unit disconnecting means to the plug-in stabs into this molding such that the wiring is not exposed at the rear of the unit.
3. Fasten the unit door to the stationary structure (not the unit itself), so that the door can close with the unit removed. Hinge the door on the left-hand side so that it opens away from the vertical wire way.

D. Disconnecting Means:
1. Units shall be provided with a heavy-duty, industrial, flange mounted handle mechanism for control of each disconnect switch or circuit breaker.
2. The operator units may pivot in the vertical or horizontal plane.
3. The on-off condition shall be indicated by the handle position, red and green color indicators with the words ON and OFF, and the international symbols I and O along with a pictorial indication of the handle position.
4. Handles shall be capable of being locked in the OFF position with up to three padlocks.

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5. The operator handle shall be interlocked with the unit door so that the disconnect cannot be switched to the ON position unless the unit door is closed. A means shall be provided for purposely defeating the interlock during maintenance or testing.
6. The operator handle shall be interlocked with the unit so that the unit cannot be inserted or withdrawn with the operator handle in the ON position.

2.04 MOTOR CONTROLLER UNITS

A. Unit Control Power:
1. Mount control circuit transformer within the unit and provide primary fuses.
2. Provide excess capacity in addition to that required by the starter coil to accommodate loads shown on the drawings.

B. Motor Controllers:
1. Provide combination motor controllers, UL listed as a complete assembly including disconnecting means, contactor or solid-state reduced voltage controller, and overload protection as specified in Section 26 29 13.
2. Provide combination adjustable frequency motor controllers as specified in Section 26 29 23.

2.05 INCOMING LINE UNITS

A. Main circuit breaker:
1. Ampere rating as shown on drawings.
2. Inverse time thermal magnetic, electronic trip where indicated.
3. Mounting: front accessible with removable protective barrier.
4. Service entrance rated where required.

B. Communications compartment (where shown on drawings):
1. 600V rated STP communication cable throughout MCC and up to SCADA switch.
2. Redundant 120VAC power supply for ethernet switches shall be equiped with surge protection and be provided from UPS back-up power. Utilizing devices from local SCADA panel as source is acceptable.

2.06 FEEDER UNITS

A. Unit Mounting:
1. After insertion, each plug-in unit shall be held in place by a latch that is located at the front of the unit. Multi-turn latches requiring more than ten turns per latch shall not be acceptable.
2. Mount plug-in stabs in polyester molding at the rear of the unit. Rout wiring from the unit disconnecting means to the plug-in stabs into this molding such that the wiring is not exposed at the rear of the unit.
3. Fasten the unit door to the stationary structure (not the unit itself), so that the door can close with the unit removed. Hinge the door on the left-hand side so that it opens away from the vertical wire way.

B. Disconnecting Means:
1. The operator handle of all units shall be interlocked with the MCC frame, so that a unit insert can not be withdrawn or inserted when the operator is in the ON position.
2. Feeder breakers shall be molded case circuit breakers with thermal magnetic trip of the ampacity indicated on the drawings and have a short circuit rating greater than the available fault current indicated on the drawings.

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2.07 ETHERNET COMMUNICATIONS

A. The MCC shall have Ethernet wiring incorporated into its design.
   1. The MCC shall have Ethernet cabling incorporated throughout the vertical section.
   2. Each motor starter, AC drive and soft starter unit in the MCC shall be supplied with a means to communicate via Ethernet and shall be capable of monitoring the scheduled points.
   3. Each MCC shall include communication, 24VDC power equipment as shown on the SCADA network drawing allowing Ethernet/IP communication with the SCADA network.
   4. Communication cableing utilized througout MCC shall be as 600V rated and designed for high EMF environments. STP cabeling as specified shall be utilized for Ethernet communication cableing with MCC.

2.08 MISCELLANEOUS REQUIREMENTS

A. Control Terminal Blocks:
   1. Mounting: front interior of unit in accessible location.
   2. Type: as specified in Section 26 90 11.
   3. Machine printed labels.
   4. Wire size: #14 AWG.

B. Power Terminal Blocks:
   1. NEMA Size 1 and 2 units: pull-apart blocks, #4 AWG maximum wire size.
   2. NEMA size 3 units: Fixed blocks, #1/0 AWG maximum wire size.
   3. NEMA size 4 and larger units: None.

C. Control Devices:
   1. As specified in Section 26 90 11 and shown on drawings.
   2. Mounting: door mounted removable control station.
   3. Overload reset: external low profile button.
   4. Auxiliary contacts: as shown, minimum of two normally open and two normally closed.

D. Nameplates.
   1. A master nameplate shall be provided on each MCC lineup.
   2. Unit Nameplates:
      a. Indicate unit identifier and description.
      b. 3-5/8 inch by 1-1/8 inch engraved label in accordance with Section 16195.
   3. Unit identification label:
      a. Indicate catalog number/serial number of unit inside unit.

E. Motor Data Label:
   1. Machine printed adhesive label.
   2. Indicate:
      a. Motor served.
      b. Motor nameplate horsepower.
      c. Motor nameplate full load amperes.
      d. Motor code letter.
      e. Motor design letter.
      f. Motor service factor.
      g. Voltage and phase rating.
      h. Disconnecting means trip setting.
      i. Overload relay settings.

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PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact motor control center locations locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Identify deviation from physical sizes shown on the drawings to Engineer prior to bid date.

D. Contractor shall be responsible for modifications to the installation due to deviations from physical sizes shown on the drawings.

E. Identify conflicts with the work of other trades prior to installation of electrical equipment.

F. Record nameplate data for each motor served.

G. Adjust motor control center installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept motor control centers on site. Inspect for damage.

B. The Contractor shall be responsible for all equipment necessary to receive, unload, move into building, and install motor control centers.

C. The Contractor shall be responsible for coordinating specific shipping split requirements with the manufacturer/supplier.

D. Conform to written instructions of manufacturer.

E. Protect motor control centers from corrosion and entrance of debris.

F. Store motor control centers above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Adjust disconnecting means trip settings to satisfy motor nameplate requirements.

B. Provide overload relays sized and adjusted for the actual nameplate data recorded for each motor. No additional compensation will be allowed due to failure to select overload devices based upon actual motor nameplate data.

C. Record information for motor data labels and install motor data labels.

D. Install interconnecting wiring between vertical sections of MCC. No additional compensation will be allowed due to failure to coordinate wiring requirements with the manufacturer/supplier.

E. Install motor control centers plumb and flush with wall finishes.

F. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all connections.

G. Verify that bonding jumper is properly installed in service entrance rated motor control centers.

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H. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 28 19
ENCLOSED SWITCHES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Enclosed Switches.
1. Enclosed Switches shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Enclosed Switches, Lump Sum. When so provided, payment for Enclosed Switches shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Enclosed Switches, Inclusive. When no quantity is provided, Enclosed Switches shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
a. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
1) NFPA 70 - National Electrical Code.
b. National Electrical Contractors Association (NECA), Standard of Installation, current edition.
c. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition.
1) NEMA FU 1 - Low Voltage Cartridge Fuses.
2) NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
3) NEMA 250 - Enclosures for Electrical Equipment.
d. International Electrical Testing Association (NETA).
1) NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
e. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition.
1) UL 98 - Enclosed and Dead Front Switches.

1.04 DESCRIPTION OF WORK

A. Furnish and install complete and operable enclosed switches as indicated on the drawings and as specified herein.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit the following information specifically for enclosed switches:
1. Manufacturer literature sufficient in scope to demonstrate compliance with the requirements of this specification.

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2. Outline drawings with dimensions.
3. Equipment ratings for voltage, amperage, horsepower and short circuit.

1.06 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 WARRANTY

A. See Division 01 for additional requirements.

1.08 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. Supply [five] spare fuses of each type supplied for this project.

PART 2 PRODUCTS

2.01 250VAC/600VAC HEAVY DUTY DISCONNECT SWITCH

A. Manufacturers:
1. Square D Company.
2. Cutler-Hammer.
3. or equal.

B. Switch Interior:
1. All switches shall have switch blades which are visible when the switch is off and the cover is open.
2. Lugs shall be front removable and UL Listed for 60 degree C or 75 degree C aluminum or copper conductors as required by the application.
3. Fusible switches shall be equipped with factory installed or field installed fuse pullers.
4. Switches shall be equipped with plated copper current carrying parts to resist corrosion.
5. Switches shall be equipped with removable arc suppressors to facilitate access to line side lugs.
6. Switches shall have provisions for a field installable electrical interlock.

C. Switch Mechanism:
1. Switch operating mechanism shall be quick-make, quick-break such that, during normal operation of the switch, the operation of the contacts shall not be restrained by the operating handle after the closing or opening action of the contacts has started.
2. The operating handle shall be an integral part of the box, not the cover.
3. The handle position shall travel at least 90 degrees between off and on positions to clearly distinguish and indicate handle position.
4. All switches shall have a dual cover interlock mechanism to prevent unintentional opening of the switch cover when the switch is on and prevent turning the switch on when the cover is open. The cover interlock mechanism shall have an externally operated override but the override shall not

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permanently disable the interlock mechanism. The tool used to override the cover interlock mechanism shall not be required to enter the enclosure in order to override the interlock.

D. Switch Enclosures:
1. Environmental Rating:
   a. Service entrance switch, exterior: Type 3R.
   b. Disconnect switch, interior when EMT conduit is allowed: Type 1.
   c. Disconnect switch, hazardous location: Type 7/9.
2. Covers:
   a. Type 1, 3R steel enclosures: attached with welded pin-type hinges.
   b. Type 7/9 enclosures: attached with Type 316 stainless steel bolts.
3. Finish:
   a. Type 1, 3R enclosures: gray baked enamel paint electrodeposited on cleaned, phosphate pre-treated steel.
   b. Type 4X stainless steel enclosures: brush finish on type 304 stainless steel.
   c. Type 7/9 enclosures: gray baked enamel on copper free cast aluminum alloy.
4. The enclosure shall have on and off markings stamped or cast into the cover.
5. The operating handle shall be provided with a dual colored, red/black position indication.
6. All switches shall have provisions to accept up to three 3/8-inch hasp padlocks to lock the operating handle in the off position.
7. Exterior switches shall have provisions to accept one 3/8-inch hasp padlocks to lock the operating handle in the on position.
8. Conduit Entrance:
   a. Tangential knockouts shall be provided for Type 1 switches rated 30-200A.
   b. Watertight conduit hubs for Type 3R switches.
   c. Threaded conduit openings in both end walls for Type 7/9 enclosures.
9. Cover sealing means for switches rated through 200 amperes shall be quick release trunk latches (Type 1, 3R steel enclosures) and type 316 stainless steel bolts (Type 7/9 enclosures).
10. Type 7/9 enclosures shall be furnished with a breather and drain kit to allow their use in outdoor applications.
11. Type 4X stainless steel enclosures shall be dual rated as Type 3R to facilitate their use in outdoor applications.

E. Switch Ratings:
1. Switch shall be suitable for use as service entrance equipment where use is indicated on the drawings.
2. Switches shall be horsepower rated for ac and/or dc as indicated on the plans.
3. Switches shall be rated for the voltage applied.
4. The UL Listed short circuit current rating of the switches shall be:
   a. 10,000 rms symmetrical amperes when used with or protected by Class H or K fuses (30-600 ampere).
   b. 200,000 rms symmetrical amperes when used with or protected by Class R or Class J fuses (30-600 ampere switches employing appropriate fuse rejection schemes).
   c. 200,000 rms symmetrical amperes when used with or protected by Class L fuses (800-1200 ampere).

2.02 FUSES

A. Manufacturers:
1. Bussmann.
2. or equal.

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B. 250 Volt Fuses:
   1. Class RK-1, one end rejection or to fit mountings specified. 0-600 ampere, 200,000 ampere interrupting rating.
   2. Low-Peak LPN-R, dual element, time delay with short circuit protection for motor, transformer, feeder and main service protection.

C. 600 Volt Fuses:
   1. Class RK-1, one-end rejection or to fit mountings specified, 0-600 ampere, 200,000 ampere interrupting rating.
   2. Low-Peak LPS-R, dual element, time delay with short circuit protection. 0-600 ampere, 200,000 ampere interrupting rating for motor, transformer, feeder and main service protection.
   3. Class L, bolt-in, 601-6,000 amperes, 200,000 ampere interrupting rating.
   4. HI-CAP KRP-C, time delay for overload and short circuit protection. 601-6,000 amperes, 200,000 ampere interrupting rating for motor, transformer, feeder and main service protection.
   5. Class CC, fast acting, single element, 0-30 amperes, 200,000 ampere interrupting rating.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact enclosed switch locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Adjust enclosed switch installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept enclosed switches on site. Inspect for damage.

B. Protect enclosed switches from corrosion and entrance of debris.

C. Store enclosed switches above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Install fuses where switches are indicated as fusible switches on the drawings.

B. Install enclosed switches plumb and level.

C. Install enclosed switches such that top of enclosure is located at an elevation of 6-feet above finished floor elevation.

D. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of connections.

E. Verify that bonding jumper is properly installed in service entrance rated switches.

F. Thoroughly clean and remove construction debris from switch interior and exterior.

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3.04 TESTING AND START-UP SERVICES - NOT USED

3.05 TRAINING - NOT USED

END OF SECTION

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SECTION 26 29 13
MOTOR CONTROLLERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Motor Controllers.
1. Motor Controllers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Motor Controllers, Lump Sum. When so provided, payment for Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Motor Controllers, Inclusive. When no quantity is provided, Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
3. European Committee for Electrotechnical Standardization (CENELEC), Current Edition.
a. EN 60947 - Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - AC Semiconductor Motor Controllers and Starters.
4. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
5. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition:
a. IEC-60439 - Low Voltage Switchgear and Control Gear Assemblies.
6. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
7. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition:
a. ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
b. ICS 4-2000 - Industrial Control and Systems: Terminal Blocks.
c. ICS 5-2000 - Industrial Control and Systems: Control Circuit and Pilot Devices.
d. ICS 6-1993 - Industrial Control and Systems Enclosures.
8. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition:
a. UL 508 - Industrial Control Equipment.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 24 19 - Motor Control Centers.
2. Section 26 90 00 - Process Instrumentation & Control.

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B. Furnish and install complete and operable motor controllers as indicated on the drawings and as specified herein.

C. Motor control equipment specified under this section shall be the product of a single manufacture and shall be the same as that provided under Section 26 24 19 unless stated otherwise.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

C. The following information shall be provided specifically for adjustable frequency drive systems:
   1. Motor controller data listing identifying the configured values of all adjustable settings and configurable parameters.

1.07 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: All motor controllers provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Motor Control Center manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.08 WARRANTY

A. See Division 01 for additional requirements.

1.09 EXTRA MATERIALS

A. See Division 01 for additional requirements.

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PART 2 PRODUCTS

2.01 MANUFACTURER

A. Allen-Bradley.

B. ABB

2.02 ELECTROMECHANICAL MOTOR CONTROLLERS

A. Overload Protection:
1. General:
a. Provide Type 2 overload protection where indicated on the drawings.
b. Provide Type 1 overload protection where indicated on the drawings and for all motor controllers where overload protection type is not specified on the drawings.
2. Type 1 Overload Protection:
a. Motor starter units shall have a 3-pole manual reset solid-state overload relays with alarm contacts and providing Class 20 operation with the following protection features:
1) Over current.
2) Phase loss.
3) Ground fault.
4) Jam protection.
b. Where under current protection is indicated for motors, provide second solid-state relay with adjustable trip current setting (40- 100% of rated) to detect under current condition and alarm as shown.
3. Type 2 Overload Protection:
a. Motor starter units shall have a manual reset electronic overload relay that incorporates the following features:
1) On-board Ethernet communications.
2) LEDs for status indication.
3) Test/Reset button.
4) Adjustable trip of NEMA Class 5 to 30. Unless indicated, the trip class shall be set for NEMA Class 20 operation.
5) On board 120VAC Discrete IO - 2 inputs / 2 Relay Outputs.
6) Expansion modules - 120VAC Discrete IO 4 inputs / 2 Relay Outputs.
7) Protective Functions:
a) Functions shall provide a programmable trip level, warning level, time delay, and inhibit window.
b) Protective functions shall include thermal overload, underload, jam, current imbalance, stall, phase loss, zero sequence ground fault (if specified), and PTC thermistor input (if specified on drawings).
8) Current Monitoring functions shall include phase current, average current, full load current, current imbalance percent, percent thermal capacity utilized, voltage, power, and ground fault current (if specified).
9) Diagnostic Information shall include device status, warning status, time to reset, trip status, time to overload trip, and history of last five trips.

B. Non-Reversing Starters:
1. Magnetic starters through NEMA Size 9 shall be equipped with double-break silver alloy contacts. The starter must have straight-through wiring. Each starter shall have one (1) NO auxiliary contact.
2. Coils shall be permanently marked with voltage, frequency and part number.
3. NEMA Size 00 through 2 starters shall be suitable for the addition of at least six (6) external auxiliary contacts of any arrangement normally open or normally closed. Size 3 through 8 starters shall be suitable for the addition of up to eight (8) external auxiliary contacts of any arrangement normally open or normally closed.

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PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact motor controller locations locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Identify deviation from physical sizes shown on the drawings to Engineer prior to bid date.

D. Contractor shall be responsible for modifications to the installation due to deviations from physical sizes shown on the drawings.

E. Identify conflicts with the work of other trades prior to installation of electrical equipment.

F. Record nameplate data for each motor served.

G. Adjust motor controller installation to satisfy field requirements.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept motor controller on site. Inspect for damage.

B. The Contractor shall be responsible for all equipment necessary to receive, unload, move into building, and install motor control centers.

C. Conform to written instructions of manufacturer.

D. Protect motor controllers from corrosion and entrance of debris.

E. Store motor controllers above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Adjust disconnecting means trip settings to satisfy motor nameplate requirements.

B. Provide overload relays sized and adjusted for the actual nameplate data recorded for each motor. No additional compensation will be allowed due to failure to select overload devices based upon actual motor nameplate data.

C. Record information for motor data labels and install motor data labels.

D. Install motor controllers plumb and flush with wall finishes.

E. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all connections.

F. Thoroughly clean and remove construction debris from panelboard interior and exterior.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 08 00 - Commissioning of Electrical Systems.

B. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.05 TRAINING

A. Refer to the requirements of Section 26 08 00 - Commissioning of Electrical Systems.

B. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 29 23
ADJUSTABLE FREQUENCY MOTOR CONTROLLERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Adjustable Frequency Motor Controllers.
1. Adjustable Frequency Motor Controllers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Adjustable Frequency Motor Controllers, Lump Sum. When so provided, payment for Adjustable Frequency Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Adjustable Frequency Motor Controllers, Inclusive. When no quantity is provided, Adjustable Frequency Motor Controllers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 GENERAL CONDITIONS

A. Applicable provisions of the General Conditions shall govern the work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
3. European Committee for Electrotechnical Standardization (CENELEC), Current Edition.
a. EN 60947 - Low-Voltage Switchgear and Controlgear - Part 4-2: Contactors and Motor-Starters - AC Semiconductor Motor Controllers and Starters.
4. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
5. Institute of Electrical and Electronics Engineers (IEEE), current edition.
a. IEEE 519-1992 - Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems.
6. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition:
a. IEC-60439 - Low Voltage Switchgear and Control Gear Assemblies.
7. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.
8. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition:
a. ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays Rated 600 Volts.
b. ICS 3.1 - Safety Standards for Construction and Guide for Selection, Installation and Operation of Adjustable Speed Drive Systems.

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c. ICS 4-2000 - Industrial Control and Systems: Terminal Blocks.
d. ICS 5-2000 - Industrial Control and Systems: Control Circuit and Pilot Devices.
e. ICS 6-1993 - Industrial Control and Systems Enclosures.
f. ICS 7-1993 - Industrial Control and Systems Adjustable-Speed Drives.
g. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

9. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition:
   a. 4.UL 508C - Power Conversion Equipment.

1.05 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 24 19 - Motor Control Centers.
   2. Section 26 90 00 - Process Instrumentation & Control.

B. Furnish and install complete and operable adjustable frequency drive systems as indicated on the drawings and as specified herein.

C. Motor control equipment specified under this section shall be the product of a single manufacture and shall be the same as that provided under Section 26 24 19 unless stated otherwise.

D. Adjustable frequency drive systems work may include work in new motor control centers and/or work in existing motor control centers. Refer to the drawings for detailed description of the work.

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

C. In addition to the requirements of Section 26 24 19, the following information shall be submitted specifically for adjustable frequency drive systems:
   1. Submit harmonic voltage distortion analysis based upon the minimum three phase bolted fault short circuit current available at the point of service. Submittal data shall not relieve contractor of specified performance requirements. Analysis shall include:
      a. Calculate percent voltage distortion, with respect to fundamental voltage, for all harmonics up to the 99th.
      b. Comparison with IEEE 519 standards for acceptable voltage distortions on such systems.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation & maintenance manuals and instructions in accordance with Section 01 78 00.

C. Submit operation and maintenance manuals for the equipment specified herein in accordance with the requirements specified under Section 26 24 19, which state that submittals for all motor control equipment be included as part of the submittal for the complete, integrated process instrumentation and control system and in accordance with the requirements specified under Section 26 90 00.

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D. The following information shall be provided specifically for adjustable frequency drive systems:
   1. Motor controller data listing identifying the configured values of all adjustable settings and configurable parameters.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications:
   1. All equipment provided under this section shall be the products of a single company specializing in manufacturing products specified in this section, with not less than twenty years of documented experience.
   2. The adjustable frequency drive system manufacturer shall have been engaged in the manufacture of PWM style adjustable frequency drives for a minimum of ten years.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

E. Adjustable frequency drive system manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

1.09 WARRANTY

A. See Division 01 for additional requirements.

B. See Section 01 78 00 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. See Section 01 60 00 for additional requirements.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Allen-Bradley, Bulletin Power Flex 753/755 Series.

B. Asea Brown-Boveri (ABB) ACQ/ACS-580 Series.

2.02 GENERAL

A. Provide adjustable frequency, drive control systems capable of converting the scheduled voltage, 3-phase, 60 Hz, input power into variable voltage, adjustable frequency, 3-phase output of suitable capacity and

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waveform to serve as input power to squirrel cage induction motors of the scheduled characteristics (constant or variable torque).

B. Harmonic Distortion:
1. The adjustable frequency drive systems shall operate satisfactorily when connected to a bus supplying other solid state power conversion equipment which may be causing up to 10 percent total harmonic voltage distortion and commutation notches up to 36,500 volt microseconds, or when operated from the same bus.
2. Individual or simultaneous operation of the adjustable frequency drive systems shall not add more than 5 percent total harmonic voltage distortion to the normal bus, nor more than 10 percent while operating from the standby generator in accordance with IEEE 519, 1992.
3. Maximum total and individual harmonic current distortion limits for each odd harmonic shall not exceed those set forth by IEEE 519, Latest Edition.
4. If harmonic filters or reactors are needed to meet these requirements, then the manufacturer shall provide and be responsible for the design and manufacture of these items.

2.03 RATINGS

A. The drive shall accept an input voltage of the nominal three phase voltage indicated on the drawings, plus or minus 10 percent.

B. Displacement power factor: shall range between 1.0 and 0.95, lagging, over the entire speed range.

C. Efficiency: minimum of 97 percent at full load and speed.

D. Environmental Ratings:
1. Storage ambient temperature range: -40 to 70 degrees C.
2. Operating ambient temperature range: 0 to 40 degrees C without derating.
3. Relative humidity range: 5 to 95 percent non-condensing.
4. Operating elevation: up to 1000 meters without derating.

E. Provide redundant, thermostatically controlled ventilation fans to maintain interior of drive enclosure within the specified environmental ratings.

F. Output power Ratings:
1. The output voltage shall be adjustable from 0 to rated input voltage.
2. The output frequency range shall adjustable from 0 to 400Hz.
3. The inverter section shall produce a pulse width modulated (PWM) waveform using latest generation IGBTs.

2.04 DRIVE UNIT DESIGN

A. Hardware:
1. Utilize diode or fully gated bridge on the input.
2. Utilize DC bus inductor on all drives rated 7.5hp or greater.
3. Utilize switching logic power supply operating from the DC bus.
4. Incorporate phase to phase and phase to ground MOV protection.
5. Utilize gold plated plug-in connections on printed circuit boards.
6. Microprocessor based inverter logic shall be isolated from power circuits.
7. Utilize latest generation IGBT inverter section.
8. Inverter section shall not require commutation capacitors.
9. Employ interface common for all horsepower ratings. Interface shall include a LCD digital display and programming keypad.
10. Utilize a main control board with common control connections for all ratings.

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B. Control Design:
1. The drive design shall be optimized for NEMA Design B motors.
2. The drive design shall allow for operation of the drive with the motor disconnected.
3. Provide a controlled shut down, when properly fused, with no component failure in the event of an output phase to phase or phase to ground short circuit. Provide annunciation of the fault condition.
4. Utilize an adjustable PWM carrier frequency within a range of 2 to 8 kHz to help eliminate audible noise.
5. Provide either Selectable Sensorless Vector or V/Hz modes.
6. The drive shall have the capability of selecting operation for either variable or constant torque loads. Selection of variable torque shall provide 115 percent of rated VT current for up to one minute. Selection of constant torque shall provide 150 percent of rated CT current for up to one minute.
7. Provide multiple programmable stop modes including:
   a. Ramp.
   b. Coast.
   c. DC-Brake.
   d. Ramp-to-Hold.
   e. S-Curve.
8. Provide multiple acceleration and deceleration rates.
9. The drive shall have an adjustable output frequency up to 400Hz.
10. The drive shall be capable of sensing a loss of the speed reference.
11. All adjustments shall be made with the door closed.

C. Power Conditioning:
1. The drive shall be designed to operate on an AC line which may contain line notching and up to 10 percent harmonic distortion.
2. An input isolation transformer shall not be required for protection from normal line transients. If line conditions dictate the use of a transformer, the K factor shall be 4.0 or less.

2.05 DRIVE UNIT FEATURES

A. Control Mode:
1. Selectable sensorless vector or V/Hz mode selectable through programming.
2. The sensorless vector mode shall use motor nameplate data plus motor operating data such as IR drop, nominal flux current and flux up time.
3. The volts per hertz mode shall be programmable for squared, cubed, straight line, pre-programmed or full custom patterns.

B. Current Limit:
1. Programmable current limit from 20 to 160 percent of constant torque rating.
2. Current limit shall be active for all drive states: accelerating, constant speed and decelerating.
3. The drive shall employ PI regulation with an adjustable gain for smooth transition in and out of current limit.

C. Acceleration / Deceleration:
1. Accel/Decel settings shall provide separate adjustments to allow either setting to be adjusted from 0 to 3600 seconds.
2. A second set of remotely selectable Accel/Decel settings shall be accessible through the control interface.
3. An adaptive current limit circuit shall be available and capable of being disabled through programming for fast acceleration of low inertia loads.

D. Speed Regulation Modes:
1. Open Loop.
2. Slip Compensation with 0.5 percent speed regulation.

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3. Droop - Negative Slip Compensation with 0.5 percent speed regulation.
4. Traverse Function.
5. Closed loop encoder feedback with 0.1 percent speed regulation.
6. Process PI control.

E. Speed Profiles:
1. Programming capability shall allow the user to produce speed profiles with linear acceleration/deceleration or "S-Curve" profiles that provide changing accel/decel rates.
2. S-Curve profiles shall be selectable for fixed or adjustable values.

F. Adjustments:
1. A digital interface shall be used for all set-up, operation and adjustment settings.
2. All adjustments shall be stored in nonvolatile memory (EEPROM).
3. No potentiometer adjustments shall be required.
4. The drive shall provide EEPROM memory for factory default values.

G. Process PI Control:
1. The drive shall incorporate an internal process PI regulator with proportional and integral gain adjustments as well as error inversion and output clamping functions.
2. The feedback shall be configurable for normal or square root functions. If the feedback indicates that the process is moving away from the setpoint, the regulator shall adjust the drive output until the feedback equals the reference.
3. Process control shall be capable of being enabled or disabled with a hardwire input. Transitioning in and out of process control shall be capable of being tuned for faster response by preloading the integrator.
4. Protection shall be provided for a loss of feedback or reference signal.

H. Fault Reset / Run:
1. The drive shall provide up to nine automatic fault reset and restarts following a fault condition before locking out and requiring manual restart.
2. Ground fault, shorted output faults, and other internal microprocessor faults shall not automatically reset/restart.
3. The time between restarts shall be adjustable from 0.5 to 30 seconds.

I. Skip Frequencies:
1. Three adjustable set points that lock out continuous operation at frequencies which may produce mechanical resonance shall be provided.
2. The set points shall have a bandwidth adjustable from 0 to 15Hz.

J. Run on Power Up:
1. A user programmable restart function shall be provided to automatically restart the equipment after restoration of power after an outage.

K. Line Loss Restart:
1. The drive shall have a line loss restart function. This programmable function shall select the reconnect mode of the drive after recovery from a line loss condition.
2. The reconnect modes shall be Last Speed, Speed Search, Track Volts, or Use Encoder.
3. This feature shall be capable of being disabled thus forcing the drive to start from zero hertz.

L. Fault Memory:
1. The last four faults as well as operating frequency, drive status and power mode shall be stored at the time of fault.
2. Information shall be maintained in the event of a power loss.

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M. Overload Protection:
1. The drive shall provide internal Class 10 motor overload protection investigated by UL to comply with N.E.C. Article 430.
2. Overload protection shall be speed sensitive and adjustable for motors with speed ranges of 2:1, 4:1 and 10:1.
3. A viewable parameter shall store the overload usage in percent.
4. An alarm bit shall be available to adjust a process to eliminate an overload trip.

N. Auto Economizer:
1. An auto economizer feature shall automatically reduce the output voltage when the drive is operating in an idle mode (drive output current less than programmed motor FLA). The voltage shall be reduced to minimize flux current in a lightly loaded motor thus reducing kW usage. If the load increases, the drive shall automatically return to normal operation.

O. Flying Start:
1. The drive shall be capable of determining the speed and direction of a spinning motor and adjust its output to "pick-up" the motor at the rotating speed.
2. The flying start feature shall be operable with or without encoder feedback.

P. Control Logic Ride Through:
1. The control logic shall be capable of "riding through" a power outage of up to 2 seconds in duration.

Q. Inertia Ride Through:
1. The drive shall respond to a loss of AC input power by adjusting the output frequency to create a regenerative situation in the motor. The regenerated energy shall be used to power the drive logic during the power outage.
2. The amount of voltage drop required to trigger inertial ride through and the level at which regulation occurs shall both be adjustable.
3. Inertia ride through shall be capable of being enable or disable through programming.

R. Inputs and Outputs:
1. The standard Input / Output board shall consist of both analog and digital I/O.
2. No jumpers or switches shall be required to configure inputs and outputs. All functions shall be fully programmable.
3. If standard Input/ Output board does not have specified I/O additional add-on modules shall be utilized to provide required I/O.
4. The Input / Output board shall have the following analog inputs as standard.
    a. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 11 bit plus sign, 10V common mode noise rejection.
    b. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 11 bit plus sign, 160V common mode noise rejection.
    c. Analog inputs shall be user programmable for a variety of uses including frequency command and process loop input. Analog inputs shall be user programmable for function scaling (including invert), offset, signal loss detect and square root.
5. The Input / Output board shall have the following analog outputs as standard.
    a. Quantity one (1) differentially isolated plus or minus 10V (bi-polar) / 20mA, 11 bit plus sign.
    b. The analog output shall be user programmable to be proportional to one of fourteen process parameters including output frequency, output current, encoder feedback, output power.
    c. Programming shall be available to select either absolute or signed values of these parameters.
6. The Input / Output board shall have the following digital inputs as standard.
    a. Quantity of six (6) digital inputs rated 120Vac.

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b. All inputs shall be individually programmable for functions from a list of twenty-nine (29) that includes Start, Run, Stop, External Fault, Speed Select, Jog and Process PI functions.

7. The Input / Output board shall have the following digital outputs as standard.
   a. Quantity of four (4) relay outputs, form C (1 N.O. - 1 N.C.).
   b. Contact output ratings shall be 250Vac / 30Vdc (2.0 Amps maximum), resistive or inductive.
   c. Relays shall be programmable to twenty-six (26) different conditions including Fault, Alarm, At Speed, Drive Ready and PI Excess Error.
   d. Timers shall be available for each output to control the amount of time, after the occurring event, that the output relay actually changes state.

S. Reference Signals:
1. The drive shall be capable of using the following input reference signals:
   a. Analog inputs.
   b. Preset speeds.
   c. Remote potentiometer.
   d. Digital MOP.
   e. Human Interface.
   f. Communication module commands.

T. Communication:
1. The drive shall be capable of communicating with an Ethernet/IP network.
2. The drive shall be configured such that multi-cast traffic is turned off and all Ethernet messages shall be discriminate communications.

U. Loss of Reference:
1. In the event of loss of the reference signal, the drive shall be user programmable to the following:
   a. Fault the drive.
   b. Alarm and maintain last reference.
   c. Alarm and go to preset speed.
   d. Alarm and go to minimum speed.
   e. Alarm and go to maximum speed.
   f. Alarm and maintain last output frequency.

V. Metering:
1. The following parameters shall be accessible through the human interface module:
   a. Output Current in Amps.
   b. Output Voltage in Volts.
   c. Output Power in kW.
   d. Elapsed MWh.
   e. DC Bus Voltage.
   f. Output Frequency.
   g. Heatsink Temperature.
   h. Last eight (8) faults.
   i. Elapsed Run Time.

W. Faults:
1. Fault information shall be accessible through the human interface module. 2. A fault buffer shall store the last four faults in a first-in / first-out manner.
2. At a minimum the following faults shall be displayed:
   a. Power Loss.
   b. Undervoltage.
   c. Overvoltage.
   d. Overload.
   e. Overtemperature (Heat Sink).

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f. Overcurrent detected in instantaneous overcurrent trip circuit.
g. Maximum retries.
h. Phase-to-phase and phase-to-ground faults.

2.06 DISCONNECTING MEANS

A. Provide a door interlocked motor circuit protector disconnect.

B. Operator Handles.
1. Provide flange mounted operator handles for free standing units.
2. Provide through the door operating handles for wall mounted units.
3. Refer to requirements of Section 26 24 19 for motor control center mounted equipment.
4. Handles shall be padlockable.

C. The system shall be rated for the available fault current identified on the drawings. The rating shall be shown on the drive label.

2.07 DRIVE INPUT FUSES

A. Provide drive input fuses when recommended by the manufacturer.

B. The drive input fuses shall be selected by the manufacturer and mounted in fuse blocks.

2.08 CONTROL POWER TRANSFORMER

A. Provide a control power transformer mounted and wired inside of the drive system enclosure.

B. The transformer shall be rated for drive power plus 250VA for customer use.

2.09 POWER CONDITIONING EQUIPMENT

A. General:
1. Provide [Input Line Reactors] or [Harmonic Mitigation Filters] where indicated on the drawings.

B. Common Mode Choke:
1. Provide a common mode choke at the drive output to help, in conjunction with the proper grounding techniques, reduce or eliminate interference with sensitive electronic equipment or communication devices installed in the same system.

C. Input Line Reactor:
1. Provide a drive input line reactor mounted within the drive system enclosure for drives that do not have a harmonic filter indicated on One- line drawings.
2. The line reactor shall meet the following specifications:
a. The construction shall be iron core with an impedance of (3) percent.
b. The winding shall be copper wound.
c. The insulation shall be Class H with a 115 degree C rise.
d. The unit shall be rated for system voltage and frequency.

D. Harmonic Mitigation Filters:
1. Manufacturer:
a. TCI, INC., HGLSeries HarmonicGuard low capacitance type.
b. MIRUS International Inc. Model LINEATOR AUHF.
c. Or equal.
2. General:

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a. PWM AC Variable Frequency Drives shall be equipped with harmonic mitigation equipment where specified to prevent power system problems resulting from high levels of harmonic distortion.
b. The harmonic mitigation equipment and all of its components shall be manufactured and tested in accordance with the latest applicable standards of UL, CSA and NEMA.
c. Demonstration of compatibility between the harmonic mitigation equipment and the VFD must be available upon request.
d. Harmonic mitigation equipment shall be warranted to be free of defects in materials and workmanship for a period of 12 months from the date of start-up or 18 months from the date of shipment.
e. Factory Performance Testing: Manufacturer must be capable of factory testing for harmonic mitigating performance and energy efficiency under actual variable frequency drive loads. A detailed description of the program and a sample test report must be provided at time of quotation.

3. Key Requirements:
a. The harmonic mitigation equipment shall treat all of the characteristic low frequency harmonics generated by a 3-phase, diode bridge rectifier load (5th, 7th, 11th, 13th, etc.).
b. The characteristic harmonics shall be suppressed without the need for individual tuning or the requirement to phase shift against other harmonic sources.
c. Harmonic mitigation shall be by passive inductor/capacitor network. Active electronic components shall not be used.
d. Power factor shall be 0.98 lagging to 0.95 leading in operating range from full to half load.
e. To ensure compatibility with engine generators, the harmonic mitigation equipment must never introduce a capacitive reactive power (KVAR), which is greater than 20 percent of its kVA rating.
f. The harmonic mitigation equipment shall not resonate with system impedances or attract harmonic currents from other harmonic sources.
g. The harmonic mitigation equipment in combination with the Variable Frequency Drive shall meet all requirements as outlined in the 1992 edition of IEEE std 519 for individual and total harmonic voltage and current distortion. The Point of Common Coupling (PCC) for all voltage and current harmonic calculations and measurements shall be the input terminals to the harmonic mitigation equipment.
h. Total Harmonic Voltage Distortion (THVD) shall meet the requirements of Table 10.2 of IEEE std 519 by not exceeding 5 percent and by limiting the individual harmonic voltage distortion to less than 3 percent. These limits shall apply while operating on either utility supply or generator supply when applicable. The harmonic mitigation equipment vendor shall not be responsible for pre-existing voltage distortion caused by other harmonic sources.
i. Total Demand Distortion (TDD) of the current at the input terminals of the harmonic mitigation equipment shall not exceed the limits as defined in Table 10.3 of IEEE std 519. For Isc/IL ratio < 20, TDD must be less than 5%. For all other Isc/IL ratios, the TDD must not exceed 8 percent even when Table 10.3 allows for more relaxed limits. For single phase applications, the TDD must not exceed 12 percent.
j. The full load efficiency of the harmonic mitigation equipment / VFD combination shall be greater than 96 percent. The harmonic mitigation equipment itself shall have efficiency no less than 99 percent.

4. Basic Requirements:
a. All wiring shall be copper.
b. Insulation class: 220 degree C system. Temperature rise: 130 degree C.
c. Anti-vibration pads shall be used between the reactor or transformer core and the enclosure.
d. Ventilated, sprinkler proof NEMA-3R enclosure.

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2.10 PILOT CONTROL DEVICES

A. Provide front of panel mounted pilot devices as shown on drawings.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify all measurements. Do not base exact equipment locations locations on the contract drawings.

B. Identify conflicts with the work of other trades prior to installation of electrical equipment.

C. Identify deviation from physical sizes shown on the drawings to Engineer prior to bid date.

D. Contractor shall be responsible for modifications to the installation due to deviations from physical sizes shown on the drawings.

E. Identify conflicts with the work of other trades prior to installation of electrical equipment.

F. Record nameplate data for each motor served.

3.02 DELIVERY, STORAGE, AND HANDLING

A. Accept adjustable frequency motor controllers on site. Inspect for damage.

B. The Contractor shall be responsible for all equipment necessary to receive, unload, move into building, and install motor control centers.

C. The Contractor shall be responsible for coordinating specific shipping split requirements with the manufacturer/supplier.

D. Conform to written instructions of manufacturer.

E. Protect adjustable frequency motor controllers from corrosion and entrance of debris.

F. Store adjustable frequency motor controllers above grade. Protect from environment with suitable covering.

3.03 INSTALLATION

A. Adjust disconnecting means trip settings to satisfy motor nameplate requirements.

B. Record information for motor data labels and install motor data labels.

C. Adjust all programmable drive features, including but not limited to auto restart parameters. The drive system must automatically restart after a power fail condition.

D. Provide typed label inside each unit identifying configured values for all programmable drive parameters.

E. Inspect for physical damage, proper alignment, anchorage, and grounding. Check proper installation and tightness of all connections.

F. Verify that cooling fans are operating properly.

G. Thoroughly clean and remove construction debris from filters, enclosure interior, and exterior.

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3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 32 10
ENGINE GENERATORS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Identification for Engine Generators.
1. Identification for Engine Generators shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Identification for Engine Generators, Lump Sum. When so provided, payment for Identification for Engine Generators shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Identification for Engine Generators, Inclusive. When no quantity is provided, Identification for Engine Generators shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA70 - National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
b. NFPA99 - Essential Electrical Systems for Health Care Facilities.
c. NFPA110 - Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Perform level one prototype tests required by this standard on a complete and functional unit; component level type tests will not substitute for this requirement.
2. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA C22.2, No. 14 - M91 Industrial Control Equipment.
b. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.
3. European Committee for Electrotechnical Standardization (CENELEC), Specifications and Standards, current edition:
a. EN50082-2, Electromagnetic Compatibility - Generic Immunity Requirements, Part 2: Industrial.
b. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
4. Federal Communications Commission (FCC), Specifications and Standards, current edition:
a. FCC Part 15, Subpart B.
5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
a. IEC8528 part 4. Control Systems for Generator Sets.
b. IEC Std 801.2, 801.3, and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions.
6. Institute of Electrical and Electronics Engineers, Specifications and Standards, current edition:
a. IEEE446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
b. IEEE587 for voltage surge resistance.

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7. Military Standard (MIL), Specifications and Standards, current edition:
   a. Mil Std 461D -1993. Military Standard, Electromagnetic Interference Characteristics.
   b. Mil Std 462D - 1993. Military Standard, Measurement of Electromagnetic Interference Characteristics.
8. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
   a. NEMA ICS10-1993 - AC Generator sets.
9. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL2200. The genset shall be listed to UL2200 or submit to an independent third party certification process to verify compliance as installed.
   b. UL6200. The entire control system of the generator set shall be UL6200 listed and labeled.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated stand-by power system, the work specified in the following sections shall be included under the scope this section:
   1. Section 26 36 00 - Transfer Switches.

B. Provide factory assembled generator set equipment complete with digital electronic controls.

C. Engine Generator shall be furnished and installed in a Level 2 factory installed sound-attenuating enclosure suitable for exterior mounting with twenty-four hour sub-base fuel tank and installed on exterior concrete pad.

D. Provide factory test, equipment startup by a manufacturer-authorized technician, and on-site testing of the system.

E. The generator set manufacturer shall warrant all equipment provided under this section so that there is one source for warranty and product service. Technicians specifically trained and certified by the manufacturer to support the product and employed by the generator set supplier shall service the generator sets.

F. Stationary emergency engine generator shall be furnished and installed with all regulatory certifications as required and shall comply with all applicable emissions regulations in force at the time of purchase. Unit shall not require additional field certifications to be performed by the owner.

1.05 ENGINE GENERATOR SCHEDULE OF REQUIREMENTS

ENGINE GENERATOR SCHEDULE OF REQUIREMENTS

LOCATION	MINIMUM KW/KVA RATING	MINIMUM STARTING KVA	MINIMUM ENGINE DISPLACEMENT	CONNECTED LOADS
95-G-16-1	400KW/500KVA	871 KVA	4CYL/12.5L Inline 6	Refer to One-lines

Diesel Consumption 27.9 GPH

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

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B. Submit shop drawings for the equipment specified herein as part of the complete, integrated manual for the stand-by power system. Include information in accordance with the requirements specified under Section 26 36 00 - Transfer Switches.

C. Submit the following information specifically for engine generators:
   1. Manufacturer's product literature and performance data, sufficient to conformance with specification requirements.
   2. A paragraph-by-paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
   3. Manufacturer certification of prototype testing.
   4. Manufacturer published warranty documents.
   5. Shop drawings showing plan and elevation views with certified overall dimensions and conduit connection details.
   6. Interconnection wiring diagrams showing all external connections required, with field wiring terminals marked in a consistent point-to-point manner.
   7. Manufacturer published installation instructions.
   8. Emissions Certifications. Submit statement of compliance which states the proposed product(s) is certified to the emissions standards required by the location for EPA, stationary non-emergency application.
   9. Generator Sizing Calculations illustrating compliance with the load starting requirements identified in schedule.

1.07 FACTORY TESTING

A. The generator set supplier shall perform a complete operational test on the generator set prior to shipping from the factory. Provide a certified test report. Fully test equipment for function and performance at the factory.

B. Perform generator set factory tests at rated load and rated power factor. Generator sets that have not been factory tested at rated power factor will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady state governing, single step load pickup, and function of safety shutdowns.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the stand-by power system. Include information in accordance with the requirements specified under Section 26 36 00 - Transfer Switches.

C. Submit the following information specifically for engine generators:
   1. Submit final revised shop drawings incorporating any modifications made because of installation, start-up, operational testing, or for any other cause.
   2. Submit results of all field-testing and corrective actions taken for all operational parameters.
   3. Submit manufacturer's standard operation & maintenance information including installation manuals and safety instructions.
   4. Submit contact list identifying names, addresses, telephone numbers, and any additional contact information for each equipment service organization involved with the Standby Engine/Generator Set.
   5. Submit detailed operation and maintenance procedures for each major equipment item; include description of operation for all modes of operation, routine maintenance procedures, and trouble-shooting guide.
   6. Submit listing spare parts provided under this contract and of recommended additional spare parts not provided under this contract along with costs.

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1.09 QUALITY ASSURANCE

A. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

B. The fuel day tank manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation and service, in accordance with ISO 9001.

C. Production pressure test shall be performed by the manufacturer on each tank prior to shipping in accordance with prevailing standards of UL-142.

D. All materials, equipment, and parts shall be new and unused of current manufacture.

E. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

F. The Standby Engine/Generator Set manufacturer shall have been engaged in the manufacture of generator sets for a minimum of ten years and shall have a factory trained service and parts organization located within one hundred miles of the jobsite.

G. All control equipment shall be the standard product of the engine/generator set manufacturer. Controls systems supplied by a subcontractor of the manufacturer and not incorporated into the standard documentation of the manufacturer will not be acceptable.

1.10 WARRANTY

A. Warrant the generator set and associated equipment for a period of not less than five years from the date of Start-up against defects in materials and workmanship.

B. The warranty shall be comprehensive with no deductibles allowed for travel time, service hours, repair parts cost, etc.

C. The manufacturer of the generator set shall maintain service parts inventory at a central location that is accessible to the service location twenty-four hours per day, three hundred sixty-five days per year.

D. A local service organization that is factory trained and certified in generator set service shall service the generator set. The service organization shall maintain an inventory of critical replacement parts. The service organization shall be on call twenty-four hours per day, three hundred sixty-five days per year.

E. The manufacturer shall maintain model and serial number records of each generator set provided for at least twenty years.

1.11 EXTRA MATERIALS

A. Provide supply of consumables (air cleaner, oil filter, etc) in sufficient quantity to last for one year from the date of substantial completion.

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PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers.
   1. Caterpillar/Olympian.
   2. rehlko Power Systems.
   3. Cummins/Onan.
   4. MTU / Detroit Diesel.

B. The first named manufacturer is the basis for these specifications, the installation design, the heating/ventilation design, and the fuel system design. If the contractor elects to supply equipment of another named manufacturer, then the contractor shall be responsible for adjusting the installation of the standby engine/generator set to satisfy the requirements of that manufacturer's equipment.

C. The Engineer will only consider equipment of manufacturers, other than those named, as an alternate in accordance with the requirements of Division 1. The following information shall be submitted prior to acceptance of alternate equipment:
   1. Certified dimensional data.
   2. Verification of adequate cooling/combustion air for the installation.
   3. Complete interconnecting wiring and piping diagrams.
   4. Manufacturer certification of prototype testing.
   5. Load study/profile showing non-overloading of genset under steady-state conditions and during motor starting.
   6. Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
   7. A paragraph-by-paragraph listing of exceptions to the specifications, describing the differences between the specified and the proposed equipment.
   8. Short circuit study of the load circuits to verify that selective coordination occurs and that thermal-magnetic stresses on components will not exceed the specified ratings.
   9. Listing of similar projects and owner contact information for projects completed during the previous five years.

2.02 GENERATOR SET

A. Ratings.
   1. The generator set shall operate at 1800 rpm and at the scheduled voltage.
   2. The generator set shall be provided with the scheduled, rated output capacity at 0.8 PF, based upon an altitude of 1000 feet and an ambient temperature of 100 degrees F.
   3. Base generator set ratings upon emergency/standby service.
   4. Generator shall be equipped with 12-lead alternator suitable for use with a [480/277V, 3-phase, 4-wire system].

B. Performance.
   1. Voltage regulation shall be +/-1.0 percent for any constant load between no load and rated load for both parallel and non-parallel applications. Random voltage variation with any steady load from no load to full load shall not exceed +/-1.0 percent.
   2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed +/-0.5 percent.
   3. The engine-generator set shall be capable of single step load pick up of 100 percent nameplate kW and power factor, less applicable derating factors, with the engine-generator set at operating temperature.
   4. Minimum motor starting capability shall be as scheduled.

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5. Motor starting capability shall be adequate to start the specified loads with an instantaneous voltage dip of less than 15 percent.
6. Motor starting capability shall be adequate to start the specified loads with an instantaneous frequency dip of less than 10 percent.
7. The Gen-Set shall be sized to start and run the scheduled loads in twelve or less steps.
8. The Gen-Set shall be sized to start and run the scheduled loads assuming scheduled miscellaneous load and stepped motor starts.
9. The alternator shall produce a clean AC voltage waveform, with not more than 5 percent total harmonic distortion at full linear load, when measured from line to neutral, and with not more than 3 percent in any single harmonic.
10. Telephone influence factor shall be less than 50.

C. Construction.
1. Mount the engine-generator set on heavy-duty steel base and maintain alignment between components. The base shall incorporate a corrosion resistant battery tray with hold-down clamps within the rails for generators smaller than 750KW. For generators 750KW and larger the base shall incorporate a corrosion resistan battery tray with hol-down clamps outside of the skid rails.
2. All switches, lamps, and meters in the control system shall be oil-tight and dust-tight, and the enclosure door shall be gasketed. There shall be no exposed points in the control panel (with the door open) that operate in excess of 50 volts.

D. Connections.
1. The generator set load connections shall be composed of silver or tin plated copper bus bars, drilled to accept mechanical or compression terminations for the number and type cables shown on the drawings. Provide suitable lugs and termination space for use with cables of the number and size as shown on the drawings.
2. Power connections to auxiliary devices shall be made at the devices, with required protection located at the power distribution panel as shown on the drawings.
3. Generator set control interfaces to other system components shall be made on a common, permanently labeled terminal block assembly.

2.03 ENGINE AND ENGINE EQUIPMENT

A. The engine shall be Diesel fueled, 4 cycle, radiator and fan cooled. Minimum displacement and number of cylinders shall be as scheduled. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable.

B. Accessories and features.
1. Complete engine fuel system, including all pressure regulators, strainers, and control valves. Plumb the fuel system to the generator set skid for ease of site connections to the generator set.
2. An electronic governor system shall provide automatic isochronous frequency regulation. The governing system dynamic capabilities shall be controlled as a function of engine coolant temperature to provide fast, stable operation at varying engine operating temperature conditions. The control system shall actively control the fuel rate and excitation as appropriate to the state of the generator set. Regulate fuel rate as a function of starting, accelerating to start disconnect speed, accelerating to rated speed, and operating in various isochronous or parallel states.
3. Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the generator air inlet, based on 0.5 in-H2O external static head. Size radiator based on a core temperature that is 20 degrees F higher than the rated operation temperature, or prototype tested to verify cooling performance of the engine/radiator/fan operation in a controlled environment. Provide radiator with a flexible duct adapter flange. The equipment manufacturer shall fill the cooling system with a 50/50-ethylene glycol/water mixture. Guard rotating parts against accidental contact.
4. Electric starter(s) capable of three complete cranking cycles without overheating.

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5. Positive displacement, mechanical, full pressure, lubrication oil pump. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
6. Replaceable dry element air cleaner with restriction indicator. Flexible fuel supply lines.
7. Engine mounted battery charging alternator, 40-ampere minimum, and solid-state voltage regulator.
8. Coolant heater.
    a. Engine mounted, thermostatically controlled, coolant heater(s) for each engine. Heater voltage shall be as shown on the contract drawings. The coolant heater shall be UL499 listed and labeled.
    b. Connect the coolant heater to the engine with silicone hose connections. Use steel tubing for connections into the engine coolant system wherever the length of pipe exceeds 12 inches. Specifically design the coolant heater installation to provide proper venting of the system. Install coolant heater(s) using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow replacement of the heater element without draining the engine cooling system or significant coolant loss.
    c. Provide a 24 VDC thermostat for the coolant heater and install at the engine thermostat housing. Factory wire the coolant heater system to an AC power connection box allowing for a single AC power connection.
    d. Size the coolant heater(s) as recommended by the engine manufacturer to warm the engine to a minimum of 100 degrees F in a 40 degree F ambient enclosure, in compliance with NFPA110 requirements, or the temperature required for starting and load pickup requirements of this specification.
9. Alternator strip heater. Battery heater.
10. Provide vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.
11. Starting and Control Batteries shall be calcium/lead antimony type, 12 or 24 volt DC, sized as recommended by the engine manufacturer, complete with battery cables and connectors.

2.04 AC GENERATOR

A. The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip- proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 125 degrees C.

B. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

C. Generator shall be reconnectable to operate at various voltage levels.

D. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single-phase or three-phase fault at approximately 300 percent of rated current for not more than 10 seconds.

E. The subtransient reactance of the alternator shall not exceed 12 percent, based on the standby rating of the generator set.

2.05 ENGINE GENERATOR SET CONTROL

A. The generator set shall be provided with a microprocessor-based control system that is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control

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as described in this specification. The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.

B. The generator set mounted control shall include the following features and functions:

1. Control Switches.
   a. Mode Select Switch: The mode select switch shall initiate the following control modes. When in the RUN position the generator set shall start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position, the generator set shall accept a signal from a remote device to start and accelerate to rated speed and voltage.
   b. EMERGENCY STOP switch: Switch shall be red "mushroom- head" push-button. Depressing the emergency stop switch shall immediately shut down the generator set, and prevent automatic restarting.
   c. RESET switch: The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.
   d. PANEL LAMP switch: The panel lamp switch shall illuminate all panels for ten minutes or until the switch is depressed a second time.
2. Generator Set AC Output Metering.
   a. Analog AC Voltmeter, dual range, 90 degree scale, 2% accuracy; Analog AC Ammeter, dual range, 90 degree scale, 2% accuracy; Analog Frequency/RPM meter, 45-65 Hz, 1350-1950 RPM, 90 degree scale, +/- 0.6 Hz accuracy.
   b. Seven position phase selector switch with OFF position to allow meter display of current and voltage in each generator phase. When supplied with re-connectable generators, the meter panel shall be re-connectable for the voltage specified.
3. Generator Set Alarm and Status Display.
   a. Provide alarm and status indicating lamps to indicate non-automatic generator status, warning, and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on an alphanumeric digital display panel:
      1) Low oil pressure (alarm).
      2) Low oil pressure (shutdown).
      3) Oil pressure sender failure (alarm).
      4) Low coolant temperature (alarm).
      5) High coolant temperature (alarm).
      6) High coolant temperature (shutdown).
      7) Engine temperature sender failure (alarm).
      8) Low coolant level (alarm or shutdown-selectable).
      9) Fail to crank (shutdown).
      10) Fail to start/overcrank (shutdown).
      11) Over speed (shutdown).
      12) Low DC voltage (alarm).
      13) High DC voltage (alarm).
      14) Weak battery (alarm).
      15) Low fuel (alarm).
      16) High AC voltage (shutdown).
      17) Low AC voltage (shutdown).
      18) Under frequency (shutdown).
      19) Over current (warning).
      20) Over current (shutdown).
      21) Short circuit (shutdown).
      22) Over load (alarm).
      23) Emergency stop (shutdown).

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24) Make provisions for indication of four customer-specified alarm or shutdown conditions. Labeling of the customer- specified alarm or shutdown conditions shall be of the same type and quality as the above-specified conditions.

25) The non-automatic indicating lamp shall be red, and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

4. Engine Status Monitoring.
   a. The following information shall be available from a digital status panel on the generator set control:
      1) Engine oil pressure (PSI or kPA).
      2) Engine coolant temperature (degrees F or C).
      3) Engine oil temperature (degrees F or C).
      4) Engine speed (rpm).
      5) Number of hours of operation (hours).
      6) Number of start attempts.
      7) Battery voltage (DC volts).
      8) The control system shall also incorporate a data logging and display provision to allow logging of the last 10 warning or shutdown indications on the generator set, as well as total time of operation at various loads, as a percent of the standby rating of the generator set.
5. Engine Control Functions.
   a. The control system provided shall include a cycle cranking system, which allows for user selected crank time, rest time, and number of cycles. Initial settings shall be for three cranking periods of 15 seconds each, with 15 second rest period between cranking periods.
   b. The control system shall include an idle mode control, which allows the engine to run in idle mode in the RUN position only. Disable the alternator excitation system in this mode. (NOTE - Expensive Option only available on HIGH end controllers - Include in desired).
   c. The control system shall include an engine governor control, which functions to provide steady state frequency regulation as noted elsewhere in this specification. The governor control shall include adjustments for gain, damping, and a ramping function to control engine speed and limit exhaust smoke while the unit is starting.
   d. The control system shall include time delay start (adjustable 0-300 seconds) and time delay stop (adjustable 0-600 seconds) functions.
   e. The control system shall include sender failure monitoring logic for speed sensing, oil pressure, and engine temperature that is capable of discriminating between failed sender or wiring components, and actual failure conditions.
6. Alternator Control Functions.
   a. The generator set shall include an automatic digital voltage regulation system matched and prototype tested with the governing system provided. It shall be immune from failure due to load- induced voltage waveform distortion and shall provide a pulse width modulated output to the alternator exciter. The voltage regulation system shall be equipped with three-phase RMS sensing and shall control buildup of AC generator voltage to provide a linear rise and limit overshoot. The system shall include a torque- matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58-59 HZ. The voltage regulator shall include adjustments for gain, damping, and frequency roll-off. Adjustments shall be broad range, and made via digital raise-lower switches, with an alphanumeric LED readout to indicate setting level. Rotary potentiometers for system adjustments are not acceptable.
   b. Monitor the output current of the generator set and initiate an alarm (over current warning) when load current exceeds 110 percent of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator. The protective functions provided shall comply with the requirements of NFPA70 article 445.
   c. Individually monitor all three phases of the output current for short circuit conditions. The control/protection system shall monitor the current level and voltage. The controls shall

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shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator (short circuit shutdown). The protective functions provided shall comply with the requirements of NFPA70 article 445.

d. Monitor the kW load on the generator set, and initiate an alarm condition (over load) when total load on the generator set exceeds the generator set rating for in excess of 5 seconds. Controls shall include a set of dry contacts for load-shed control.

e. Provide an AC over/under voltage monitoring system that responds only to true RMS voltage conditions. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110 percent of the operator-set voltage level for more than 10 seconds or with no intentional delay when voltage exceeds 130 percent. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85 percent for more than 10 seconds.

f. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 25 VDC or more than 32 VDC. Disable the low voltage limit during engine starting. If DC voltage drops to less than 14.4 volts for more than two seconds during cranking, initiate "weak battery" alarm.

7. Control Interfaces for Remote Monitoring.

a. Terminate all generator set control and interconnection points to remote components in a separate connection box. Do not make field connections in the control enclosure or in the AC power output enclosure.

b. Form "C" dry common alarm contact set rated 2A/30VDC to indicate existence of any alarm or shutdown condition on the generator set.

c. Form "C" dry generator run contact set rated 2A/30VDC to indicate existence of generator run condition.

C. Provide a 20-light LED type remote alarm annunciator with horn, located as shown on the drawings or in a location that can be conveniently monitored by facility personnel. The remote annunciator shall provide all the audible and visual alarms called for by NFPA Standard 110 for level 1 systems; and in addition shall provide indications for high battery voltage, low battery voltage, loss of normal power to the charger. Spare lamps shall be provided to allow future addition of other alarm and status functions to the annunciator. Provisions for labeling of the annunciator in a fashion consistent with the specified functions shall be provided. Alarm silence and lamp test switch(es) shall be provided. LED lamps shall be replaceable, and indicating lamp color shall be capable of changes needed for specific application requirements. Alarm horn shall be switchable for all annunciation points. Alarm horn (when switched on) shall sound for first fault, and all subsequent faults, regardless of whether first fault has been cleared, in compliance with NFPA110 3-5.6.2.

D. Provide a mounted main line circuit breaker, sized to carry the rated output current of the generator set on a continuous basis. The circuit breaker shall incorporate an electronic trip unit. The supplier shall submit time over current characteristic curves for the breaker.

E. Sequence of Operation.

1. Generator set shall start on receipt of a start signal from remote equipment. The start signal shall be via hardwired connection to the generator set.
2. The generator set shall complete a time delay start period as programmed into the control.
3. The generator set control shall initiate the starting sequence for the generator set.

a. The control system shall verify that the engine is rotating when the starter is signaled to operate. If the engine does not rotate after two attempts, the control system shall shut down and lock out the generator set, and indicate “fail to crank” shutdown.

b. The engine shall fire and accelerate as quickly as practical to start disconnect speed. If the engine does not start, it shall complete a cycle cranking process as described elsewhere in this specification. If the engine has not started by the completion of the cycle cranking sequence, it shall be shut down and locked out, and the control system shall indicate “fail to start”.

c. The engine shall accelerate to rated speed and the alternator to rated voltage.

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4. On reaching rated speed and voltage, the generator set shall operate as dictated by the control system in isochronous, synchronize, load share, load demand, or load govern state.
5. When all start signals have been removed from the generator set, it shall complete a time delay stop sequence. The duration of the time delay stop period shall be adjustable by the operator.
6. On completion of the time delay stop period, the generator set control shall switch off the excitation system and shall shut down. Any start signal received after the time stop sequence has begun shall immediately terminate the stopping sequence and return the generator set to isochronous operation.

2.06 ENGINE EXHAUST SYSTEM

A. Exhaust system shall comply with and be factory certified to all applicable regulatory requirements for stationary diesel fueled engines in effect at the time of purchase. Install exhaust system according to the engine manufacturer's recommendations and applicable codes and standards.

B. Provide exhaust silencer(s) for each engine of size and type as recommended by the generator set manufacturer and approved by the engine manufacturer along with all necessary appurtenances. The exhaust silencers shall be critical grade.

C. Engine exhaust system not factory installed on the generator skid shall be field installed. Coordinate exact requirements with installing contractor.

D. Provide stainless steel, seamless flexible exhaust manifold connector.

E. Provide exhaust thimble(s) for exhaust penetration of exterior building walls. Construction shall be fireproof.

2.07 DIESEL ENGINE FUEL SYSTEM

A. Diesel fuel sub-base tank.
1. Manufacturer shall be Tramont, or equal. Equal manufacturers shall have a minimum ten years' experience in the design and construction of Underwriters Laboratories (UL) listed sub base tank systems.
2. Tank construction.
   a. Size fuel tank based upon the fuel requirements of the genset to provide a minimum of twenty-four hours of genset runtime at full load.
   b. Construct sub base tank accordance with Underwriters Laboratories Standard UL-142.
   c. Construct sub base tank in accordance with Flammable and Combustible Liquids Code, NFPA 30; The Standard for Installation and use of Stationary Combustible Engine and Gas Turbines, NFPA 37; and The Standard for Emergency and Standby Power Systems, NFPA 110.
   d. Sub base tank shall be rectangular.
   e. Sub base tank shall include reinforced steel box channel for generator support, with load rating of 5,000 lbs. per genset mounting hole location. Provide full height gussets at genset mounting holes.
   f. Sub base tank shall be pressure washed with an iron phosphate solution. Coat interior with a solvent-based film rust preventative, providing inter-operational protection.
   g. Ship sub base tank with a certificate of Structural/Mechanical Integrity, certifying that it has met standards through rigorous testing and has demonstrated specified capabilities.
   h. Sub base tank shall include a welded steel containment basin, sized at a minimum of 110% of the tank capacity to prevent escape of fuel into the environment in the event of a tank rupture.
   i. Sub base tank shall include a direct-reading fuel level gauge.
   j. Provide a fuel containment basin leak detector switch.
   k. Provide exterior manual fill station complete with containment and audible fill alarm.
3. Spill Containment Box:

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a. 5-gallon capacity.
b. Hinged cover lockable with padlock.
c. Powder coated steel body and cover.
d. Morrison Bros. Co., Model 516 or equal.

4. Tank Alarm Panel.
   a. Audible and visual indicators.
   b. NEMA 4X housing.
   c. Morrison Bros. Co., Model 918AC or equal.
5. Tank fittings.
   a. Appropriately sized NPT fuel supply.
   b. Fuel return fitting.
   c. 1-1/4 inch NPT for normal vent.
   d. Appropriately sized NPT emergency vent.
   e. 2 inch NPT for manual fuel fill.
   f. NPT for level gauge, sized as appropriate.
   g. 3/8 inch NPT basin drain.
   h. 2 inch NPT for level alarm.
   i. NPT fitting for leak detection alarm.
6. Tank venting.
   a. Normal venting shall be sized at 1-1/4 inch NPT for tanks through 2,499 gallons (1-1/2 inch NPT for 2,500 to 3,000 gallons; 2 inch NPT for 3,001 to 10,000 gallons) in accordance with The American Petroleum Institute Standard No. 2000, for venting atmospheric and low pressure storage tanks. Provide tank with atmospheric (normal) vent cap with screen.
   b. Size the emergency vent NPT fitting to accommodate the total capacity of both normal and emergency vents, and not less than that derived from NFPA 30, Table 2-8, based on wetted surface area of the tank (calculated based on 100 percent of primary tank). Furnish a zinc-plated emergency pressure relief vent cap. The vent shall be spring-pressure operated. Opening pressure shall be 0.5 psig; full opening pressure shall be 2.5 psig. Limits shall be marked on top of each vent. A second emergency vent fitting shall be provided for the secondary containment portion of the tank if applicable.
7. Testing.
   a. Pressurize primary tank sections at 3-5 psi and leak-check to ensure integrity of sub base weld seams per UL-142 standards. Containment basin shall be leak-checked by means of weld penetrant and ultraviolet light.
   b. Provide and install all fuel piping and vent piping as shown on the drawings and in accordance with applicable divisions of these specifications.
   c. State of Wisconsin licensed installer shall install tank and arrange for all required permitting and inspections.

2.08 OUTDOOR WEATHER-PROTECTIVE HOUSING

A. The generator set shall be provided with a [Level 2 Sound-Attenuating] housing which allows the generator set to operate at full rated load in the ambient conditions previously specified. Housing configuration and materials used may be of any suitable design which meets application needs. Do not use foam materials unless demonstrated to have the same durability and life as fiberglass.
   1. Sound pressure shall be 71 dBA or less as measured at 23 feet from enclosure at full load.

B. The enclosure shall include hinged doors for access to both sides of the engine and alternator, and the control equipment. Provide key-locking and pad-lockable door latches for all doors. Door hinges shall be stainless steel.

C. All enclosure accessories shall be protected with lockable vandal resistant guards and all access doors shall be lockable.

D. Any openings in the generator enclosure shall be sealed with rodent resistant screens.

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E. Provide generator set housing factory-assembled to generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions previously specified. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturers standard color using a two step electro-coating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. The painting process shall result in a coating which meets the following requirements:
   1. Primer thickness, 0.5-2.0 mils. Topcoat thickness, 0.8-1.2 mils.
   2. Gloss, per ASTM D523-89, 80+/-5 percent. Gloss retention after one year shall exceed 50 percent.
   3. Crosshatch adhesion, per ASTM D3359-93, 4B-5B.
   4. Impact resistance, per ASTM D2794-93, 120-160 inch-pounds.
   5. Salt Spray, per ASTM B117-90, 4000+ hours.
   6. Humidity, per ASTM D2247-92, 1000+ hours.
   7. Water Soak, per ASTM D2247-92, 1000+ hours.

F. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.

G. Louvers shall be provided for cooling air inlet and discharge. They shall be stormproof and drainable to prevent entry of rain and snow. The louvers shall be automatic for the cooling-air inlet and discharge. The dampers shall be closed to reduce enclosure heat loss and maintain 40 degree Fahrenheit in the enclosure in cold weather when the unit is not operating. Provide 120-volt, 20 amp circuit for these louvers.

H. Provide supplemental heater in enclosure to maintain 40 degrees Fahrenheit in enclosure during cold weather period of the year.

I. Provide the basic electrical package enclosure with the following equipment:
   1. Three-phase 80 amp load center 120/208 volt 3-phase or as required for all electrical loads in Generator enclosure. This includes internal lighting, three-way switching and GFI receptacle. All Auxilary circuits shall be prewired at the factory to the load center.
   2. Single-phase block heater.
   3. Battery charger.
      a. The battery charger shall be a float type charger rated 6 amps minimum. Display supply power failed indication on the genset and on the remote annunciator panel.

2.09 EMERGENCY STOP PUSHBUTTON

A. Provide a weatherproof emergency stop pushbutton meeting NFPA requirements.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for standby power system equipment. Identify deficiencies prior to beginning installation.

3.02 DELIVERY, STORAGE, AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all standby power system equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. Exercise due diligence in storing, protecting, and moving standby power system equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

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3.03 INSTALLATION

A. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

B. Completely test installation prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

C. The contractor shall install equipment in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

D. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

E. Installation of equipment shall include furnishing and installing all fuel piping, vent piping, and appurtenances as required. The tank installer shall perform this work under the supervision of the equipment supplier.

F. Installation of equipment shall include furnishing and installing all exhaust piping and and appurtenances as required. The contractor shall perform this work under the supervision of the equipment supplier.

G. Install equipment on concrete housekeeping pads. Permanently fasten equipment to the pad in accordance with manufacturer's instructions and seismic requirements of the site.

H. Contractor shall provide Winter Blended diesel fuel required for testing and start-up services.

I. Representatives of the manufacturer shall be initially start and operate equipment.

J. Physically inspect all equipment for damage. Repair scratches and other installation damage prior to final system testing. Thoroughly clean equipment and remove all dirt and construction debris prior to final testing of the system.

K. Contractor shall provide Winter Blend fuel necessary for full fuel tank after all testing and start-up services have been performed.

3.04 TESTING AND START-UP SERVICES

A. Standby power system supplier shall provide installation and start-up services required to place the complete system into operation.

B. Test the complete installation for compliance with the specifications following completion of all site work. Representatives of the manufacturer shall conduct testing, with required fuel supplied by Contractor. Notify the Engineer in advance of the tests to allow the option of witnessed tests.

C. Installation acceptance tests to be conducted onsite shall include a "cold start" test, a two-hour full load test, and a one step rated load pickup test in accordance with NFPA 110. Provide a resistive load bank and make temporary connections for full load test. Provide all required cables and make accommodations for routing of cables to allow load bank to be located outside of the building.

D. Perform a power failure test on the entire installed system. Conduct test by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

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E. Test alarm and shutdown circuits by simulating conditions.

F. Adjust output voltage and engine speed.

G. Record kW, Amps, Volts, Frequency, oil pressure, coolant temperature, and room temperature at twenty-minute intervals during the test and report findings to Engineer in writing.

H. Verify operation of room ventilation system including interlocks with generator equipment.

I. Verify fuel system installation and capacity.

3.05 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided. The training program shall be not less than 4 hours in duration and the class size shall be limited to 5 persons. Training date shall be coordinated with the facility owner.

B. Describe the loads connected to the standby power system along with restrictions for future use. Coordinate this discussion with the process instrumentation control system integrator and include automatic step start control and load control.

C. Provide for one technician follow up visit to installation site one month after commissioning to consult with Owner, verify correct operation of standby system, and make any required corrections, adjustments, repairs, etc.

D. Identify record-keeping and reporting requirements for emissions regulations.

END OF SECTION

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SECTION 26 36 00
TRANSFER SWITCHES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Identification for Transfer Switches.
1. Identification for Transfer Switches shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Identification for Transfer Switches, Lump Sum. When so provided, payment for Identification for Transfer Switches shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Identification for Transfer Switches, Inclusive. When no quantity is provided, Identification for Transfer Switches shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA20 - Fire Pumps. Transfer switches serving fire pumps shall be specifically listed and labeled for that application.
b. NFPA70 - National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
c. NFPA99 - Essential Electrical Systems for Health Care Facilities.
d. NFPA110 - Emergency and Standby Power Systems. The transfer switch shall meet all requirements for Level 1 systems.
2. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA C22.2, No. 14 - M91 Industrial Control Equipment.
b. CSA 282, 1989 Emergency Electrical Power Supply for Buildings.
3. European Committee for Electrotechnical Standardization (CENELEC), Specifications and Standards, current edition:
a. EN55011, Class B Radiated Emissions.
b. EN55011, Class B Conducted Emissions.
4. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
a. IEC 1000-4-2 (EN 61000-4-2) Electrostatic Discharge Immunity.
b. IEC 1000-4-3 (EN 61000-4-3) Radiated Field Immunity.
c. IEC 1000-4-4 (EN 61000-4-4) Fast Transients Immunity.
d. IEC 1000-4-5 (EN 61000-4-5); AC Surge Immunity. Similar waveforms are described in ANSI/IEEE 62.41-1991.
e. IEC 1000-4-6 Conducted Field Immunity.
f. IEC 1000-4-11 Voltage Dip Immunity.
5. Institute of Electrical and Electronics Engineers, Specifications and Standards, current edition:
a. IEEE446 - Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.

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6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
   a. NEMA ICS10-1993 - AC Automatic Transfer Switches.
7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL1008. The transfer switch shall be UL listed and labeled.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated stand-by power system, the work specified herein shall be included under the scope of:
   1. Section 26 32 10 - Engine Generators.

B. Provide complete factory assembled power transfer equipment with field programmable digital electronic controls designed for fully automatic operation and including: surge voltage isolation, voltage sensors on all phases of both sources, linear operator, permanently attached manual handles internal to transfer switch enclosure, positive mechanical and electrical interlocking, and mechanically held contacts for both sources.

C. Provide factory test, startup by a supplier authorized by the manufacturer, and on-site testing of the system. Technicians specifically trained to support the product and employed by the generator set supplier shall service the transfer switches.

D. The generator set manufacturer shall warrant transfer switches to provide a single source of responsibility for all the products provided.

E. The automatic transfer switch specified herein shall be equipped with a time delay in the neutral position (programmed transition). Alternative methods for transfer control are not acceptable.

F. Transfer Switch shall be furnished and installed in a factory NEMA 1 steel enclosure suitable for interior mounting. Enclosure shall be lockable and completely secure all control operators.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the stand-by power system and in accordance with the requirements specified under Section 26 32 10 - Engine Generators.

C. Submit the following information specifically for transfer switches:
   1. Manufacturer's product literature and performance data, sufficient to verify compliance to specification requirements.
   2. A paragraph-by-paragraph specification compliance statement, describing the differences between the specified and the proposed equipment.
   3. Manufacturers published warranty documents.
   4. Shop drawings showing plan and elevation views with certified overall dimensions, as well as wiring interconnection details.
   5. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
   6. Manufacturer's installation instructions.

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1.06 FACTORY TESTING

A. The generator set supplier shall perform a complete operational test on the automatic transfer switch prior to shipping from the factory. A certified test report shall be provided. Equipment supplied shall be fully tested at the factory for function and performance.

B. Test process shall include calibration of voltage sensors.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the stand-by power system and in accordance with the requirements specified under Section 26 32 10 - Engine Generators.

C. Submit the following information specifically for transfer switches:
   1. Submit final revised shop drawings incorporating any modifications made as a result of installation, start-up, operational testing, or for any other cause. Submit results of all field-testing and corrective actions taken for all operational parameters.
   2. Submit manufacturers standard operation & maintenance information including installation manuals and safety instructions.
   3. Submit contact list identifying names, addresses, telephone numbers, and any additional contact information for each equipment service organization involved with the Standby Engine/Generator Set.
   4. Submit detailed operation and maintenance procedures for each major equipment item; include description of operation for all modes of operation, routine maintenance procedures, and trouble-shooting guide.
   5. Submit listing spare parts provided under this contract and of recommended additional spare parts not provided under this contract along with costs.

1.08 QUALITY ASSURANCE

A. The Automatic Transfer Switch manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality assurance in design/development, production, installation, and service, in accordance with ISO 9001.

B. All materials, equipment, and parts shall be new and unused of current manufacture.

C. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

D. The Automatic Transfer Switch manufacturer shall have been engaged in the manufacture of generator sets for a minimum of ten years and shall have a factory trained service and parts organization located within 100 miles of the jobsite.

E. All control equipment shall be the standard product of the engine/generator set manufacturer. Controls systems that are supplied by a subcontractor of the manufacturer and which are not incorporated into the standard documentation of the manufacturer will not be acceptable.

1.09 WARRANTY

A. The generator set and associated equipment shall be warranted for a period of not less than five years from the date of start-up against defects in materials and workmanship.

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B. The warranty shall be comprehensive. No deductibles shall be allowed for travel time, service hours, repair parts cost, etc.

C. The manufacturer of the transfer switch shall maintain service parts inventory at a central location that is accessible to the service location twenty-four hours per day, three hundred sixty-five days per year.

D. The ATS shall be serviced by a local service organization that is trained and factory certified in generator set service. The supplier shall maintain an inventory of critical replacement parts at the local service organization, and in service vehicles. The service organization shall be on call twenty-four hours per day, three hundred sixty-five days per year.

E. The manufacturer shall maintain model and serial number records of each transfer switch provided for at least twenty years.

1.10 EXTRA MATERIALS - NOT USED

PART 2 PRODUCTS

2.01 MANUFACTURER

A. The automatic transfer switch shall be provided as part of a complete, integrated standby power system. As such, the manufacturer of the Standby Engine/Generator Set shall provide it.

2.02 POWER TRANSFER SWITCH

A. Ratings.
1. Refer to the project drawings for specifications on the sizes and types of transfer switch equipment, withstand and closing ratings, number of poles, voltage and ampere ratings, enclosure type, and accessories.
2. Main contacts shall be rated for 600 Volts AC, minimum.
3. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure supplied, in ambient temperatures of -40 to +60 degrees C, relative humidity up to 95 percent (non-condensing), and altitudes up to 10,000 feet (3000M).
4. Transfer switch equipment shall have withstand and closing ratings (WCR) in RMS symmetrical amperes greater than the available fault currents shown on the drawings and at the specified voltage. The transfer switch and its upstream protection shall be coordinated. The transfer switch shall be third party listed and labeled for use with the specific protective device(s) installed in the application.

B. Construction.
1. Transfer switches shall be double-throw, electrically and mechanically interlocked, and mechanically held in the source 1 and source 2 positions. The transfer switch shall be specifically designed to transfer to the best available source if it inadvertently stops in a neutral position.
2. All ATS's shall have manual operators for service use only de-energized. Provide keyed switch, AUTO-MANUAL-TRANSFER to allow for manual operation while door remains closed.
3. Main switch contacts shall be high-pressure silver alloy. Contact assemblies shall have arc chutes for positive arc extinguishing. Arc chutes shall have insulating covers to prevent inter-phase flashover.
4. Transfer switch internal wiring shall be composed of pre-manufactured harnesses that are permanently marked for source and destination. Harnesses shall be connected to the control system by means of locking disconnect plug(s), to allow the control system to be easily disconnected and serviced without disconnecting power from the transfer switch mechanism.
5. Transfer switches designated as 4-pole switches on the drawings shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the

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phase poles. All poles shall be switched simultaneously using a common crossbar. Substitute equipment using overlapping neutral contacts is not acceptable.

6. Transfer switches designated as 3-pole switches on the drawings shall be provided with a neutral bus and lugs. The neutral bus shall be sized to carry 100 percent of the current designated on the switch rating.

C. Connections.

1. Field control connections shall be made on a common terminal block that is clearly and permanently labeled.
2. Transfer switch shall be provided with AL/CU mechanical lugs sized to accept the full output rating of the switch. Lugs shall be suitable for the number and size of conductors shown on the drawings.

2.03 TRANSFER SWITCH CONTROL

A. Operator Panel. Each transfer switch shall be provided with a control panel to allow the operator to view the status and control operation of the transfer switch. The operator panel shall be a sealed membrane panel rated NEMA 3R/IP53 or better (regardless of enclosure rating) that is permanently labeled for switch and control functions.

B. Operator panel and features and capabilities shall include:

1. High intensity LED lamps to indicate the source that the load is connected to (source 1 or source 2); and which source(s) are available. Source available LED indicators shall operate from the control microprocessor to indicate the true condition of the sources as sensed by the control.
2. High intensity LED lamps to indicate that the transfer switch is “not in auto” (due to control being disabled or due to bypass switch (when used) enabled or in operation) and “Test/Exercise Active” to indicate that the control system is testing or exercising the generator set.
3. “OVERRIDE” pushbutton to cause the transfer switch to bypass any active time delays for start, transfer, and retransfer and immediately proceed with its next logical operation.
4. “TEST” pushbutton to initiate a preprogrammed test sequence for the generator set and transfer switch. The transfer switch shall be programmable for test with load or test without load.
5. “RESET/LAMP TEST” pushbutton that will clear any faults present in the control, or simultaneously test all lamps on the panel by lighting them.
6. The control system shall continuously log information on the number of hours each source has been connected to the load, the number of times transferred, and the total number of times each source has failed. This information shall be available via a PC-based service tool or an operator display panel.
7. Vacuum fluorescent alphanumeric display panel with push-button navigation switches. The display shall be clearly visible in both bright (sunlight) and no light conditions. It shall be visible over an angle of at least 120 degrees. The Alphanumeric display panel shall be capable of providing the following functions and capabilities:
    a. Display source condition information, including AC voltage for each phase of normal and emergency source, frequency of each source. Voltage for all three phases shall be displayed on a single screen for easy viewing of voltage balance.
    b. Display source status, to indicate source is connected or not connected.
    c. The display panel shall allow the operator to view and make the following adjustments in the control system, after entering an access code:
        1) Calibrate ATS to match utility nominal voltage and frequency for the transfer switch.
        2) Adjust voltage and frequency sensor operation set points.
        3) Set up time clock functions.
        4) Set up load sequence functions.
        5) Enable or disable control functions in the transfer switch, including program transition.
        6) Set up exercise and load test operation conditions, as well as normal system time delays for transfer time, time delay start, stop, transfer, and retransfer.

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d. Display Real time Clock data, including date, and time in hours, minutes, and seconds. The real time clock shall incorporate provisions for automatic daylight savings time and leap year adjustments. The control shall also log total operating hours for the control system.
e. Display service history for the transfer switch. Display source connected hours, to indicate the total number of hours connected to each source. Display number of times transferred, and total number of times each source has failed.
f. Display fault history on the transfer switch, including condition, and date and time of fault. Faults to include controller checksum error, low controller DC voltage, ATS fail to close on transfer, ATS fail to close on retransfer, network communications error.

C. Internal Controls.
1. The transfer switch control system shall be field-configurable for any operating voltage level up to 600VAC. Provide RMS voltage sensing and metering that is accurate to within +/-1 percent of nominal voltage level. Frequency sensing shall be accurate to within +/-0.2 percent. Voltage sensing shall be monitored based on the normal voltage at the site. Systems that utilize voltage monitoring based on standard voltage conditions that are not field-configurable are not acceptable.
2. Transfer switch voltage sensors shall be close differential type, providing source availability information to the control system based on the following functions:
   a. Monitoring all phases of the normal service (source 1) for under voltage conditions (adjustable for pickup in a range of 85 to 98 percent of the normal voltage level and dropout in a range of 75 to 98 percent of normal voltage level).
   b. Monitoring all phases of the emergency service (source 2) for under voltage conditions (adjustable for pickup in a range of 85 to 98 percent of the normal voltage level and dropout in a range of 75 to 98 percent of pickup voltage level).
3. All transfer switch sensing shall be configurable from a Microsoft Windows PC-based service tool, to allow setting of levels, and enabling or disabling of features and functions. Selected functions including voltage sensing levels and time delays shall be configurable using the operator panel. Designs utilizing DIP switches or other electromechanical devices are not acceptable. The transfer control shall incorporate a series of diagnostic LED lamps.
4. The transfer switch shall be configurable to control the operation time from source to source (program transition operation). The control system shall be capable of enabling or disabling this feature, and adjusting the time period to a specific value. A phase band monitor or similar device is not an acceptable alternate for this feature.
5. The transfer switch shall incorporate adjustable time delays for generator set start (adjustable in a range from 0-15 seconds); transfer (adjustable in a range from 0-120 seconds); retransfer (adjustable in a range from 0-30 minutes); and generator stop (cool down) (adjustable in a range of 0-30 minutes).
6. The transfer switch shall be configurable to accept a relay contact signal and a network signal from an external device to prevent transfer to the generator service.
7. The control system shall be designed and prototype tested for operation in ambient temperatures from -40C to +70C. It shall be designed and tested to comply with the requirements of the noted voltage and RFI/EMI standards.
8. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs, to provide optimum protection from line voltage surges, RFI and EMI.

D. Control Interface.
1. The transfer switch will provide an isolated relay contact for starting of a generator set. The relay shall be normally held open, and close to start the generator set. Output contacts shall be form C, for compatibility with any generator set.
2. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.
3. One set of contacts rated 2A/30VDC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90 percent of rated condition.
4. The transfer switch shall provide relay contacts to indicate the following conditions: source 1 available, load connected to source 1, source 2 available, source 2 connected to load.

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2.04 ENCLOSURE

A. Enclosures shall be UL listed. The enclosure shall provide wire bend space in compliance to the latest version of NFPA70. The cabinet door shall include permanently mounted key type latches.

B. Transfer Switch shall be furnished and installed in a factory NEMA 1 steel enclosure suitable for interior mounting. Enclosure shall be lockable and completely secure all control operators.

C. Where provided manual operating handles and all control switches shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or control switches located on outside of cabinet do not meet this specification and are not acceptable.

2.05 OPERATION

A. Sequence of Operation.
   1. Transfer switch normally connects an energized utility power source (source 1) to loads and a generator set (source 2) to the loads when normal source fails. The normal position of the transfer switch is source 1 (connected to the utility), and no start signal is supplied to the genset.
   2. Generator Set Exercise (Test) With Load Mode. The control system shall be configurable to test the generator set under load. In this mode, the transfer switch shall control the generator set in the following sequence:
      a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
      b. The transfer switch shall issue a compatible start command to the generator set.
      c. When the control systems senses the generator set at rated voltage and frequency, it shall operate to connect the loads to the generator set by opening the normal source contacts, and closing the alternate source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
      d. The generator set shall operate connected to the load for the duration of the exercise period. If the generator set fails during this period, the transfer switch shall automatically reconnect the load to the normal service.
      e. On completion of the exercise period, the transfer switch shall operate to connect the loads to the normal source by opening the alternate source contacts, and closing the normal source contacts a predetermined time period later. The timing sequence for the contact operation shall be programmable in the controller.
      f. The transfer switch shall operate the generator set unloaded for a cool down period, and then remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.
   3. Generator Set Exercise (Test) Without Load Mode. The control system shall be configurable to test the generator set without transfer switch load connected. In this mode, the transfer switch shall control the generator set in the following sequence:
      a. Transfer switch shall initiate the exercise sequence at a time indicated in the exercise timer program, or when manually initiated by the operator.
      b. The transfer switch shall issue a compatible start command to the generator set and cause the generator set to start and accelerate to rated voltage and frequency.
      c. When the control systems senses the generator set at rated voltage and frequency, it shall operate the generator set unloaded for the duration of the exercise period.
      d. At the completion of the exercise period, the transfer switch shall remove the start signal from the generator set. If the normal power fails at any time when the generator set is running, the transfer switch shall immediately connect the system loads to the generator set.

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PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for standby power system equipment. Identify deficiencies prior to beginning installation.

3.02 DELIVERY, STORAGE, AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all standby power system equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. Exercise due diligence in storing, protecting, and moving standby power system equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.03 INSTALLATION

A. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

B. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

C. The contractor shall install the equipment in accordance with final submittals and contract documents. Installation shall comply with applicable state and local codes as required by the authority having jurisdiction. Install equipment in accordance with manufacturer's instructions and instructions included in the listing or labeling of UL listed products.

D. Installation of equipment shall include furnishing and installing all interconnecting wiring between all major equipment provided for the on-site power system. The contractor shall also perform interconnecting wiring between equipment sections (when required), under the supervision of the equipment supplier.

E. Equipment shall be initially started and operated by representatives of the manufacturer.

F. All equipment shall be physically inspected for damage. Scratches and other installation damage shall be repaired prior to final system testing. Equipment shall be thoroughly cleaned to remove all dirt and construction debris prior to final testing of the system.

3.04 TESTING AND START-UP SERVICES

A. Standby power system supplier shall provide installation and start-up services required to place the complete system into operation.

B. The complete installation shall be tested for compliance with the specification following completion of all site work. Representatives of the manufacturer shall conduct testing, with required fuel supplied by Contractor. The Engineer shall be notified in advance and shall have the option to witness the tests.

C. Installation acceptance tests to be conducted on-site shall include a "cold start" test, a two-hour full load test, and a one step rated load pickup test in accordance with NFPA 110.

D. Perform a power failure test on the entire installed system. This test shall be conducted by opening the power supply from the utility service, and observing proper operation of the system for at least 2 hours. Coordinate timing and obtain approval for start of test with site personnel.

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E. Test all control functions by simulating conditions.

F. Provide for one technician follow-up visit to installation site one month after commissioning to consult with Owner, verify correct operation of standby system, and make any required corrections, adjustments, repairs, etc.

3.05 TRAINING

A. The equipment supplier shall provide training for the facility operating personnel covering operation and maintenance of the equipment provided as part of the owner training session specified under Standby Engine Generator Set.

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SECTION 26 43 00
SURGE PROTECTION DEVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. SURGE PROTECTION DEVICES.
1. Surge Protection Devices shall be paid for at the bid price in accordance with one of the following methonds, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Surge Protection Devices, Lump Sum. When so provided, payment for Surge Protection Devices shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Surge Protection Devices, Inclusive. When no quantity is provided, Surge Protection Devices shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. NFPA 70 - National Electrical Code.
2. National Electrical Contractors Association (NECA), current edition.
a. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting.

1.04 DESCRIPTION OF WORK

A. The Surge Protective Device (SPD) covered under this section includes all service entrance type surge protective devices suitable for use as Type 1 or Type 2 devices per UL1449 4th Edition, applied to the line or load side of the utility feed inside the facility.

B. A SPD located at Distribution Panel.

C. Contractor shall provide all labor, materials, equipment and incidentals as shown, specified and required to finish and install surge protection devises.

D. Provide UL 1449 Type 1 Listed Surge Protective Devices (SPD) for the protection of AC electrical circuits formerly known as Transient Voltage Surge Suppression (TVSS) System. Provide high energy surge current diversion and be suitable for application in Type 1 environments.

E. Modes of Protection:
1. Line to Ground, Line to Neutral and Neutral to Ground for services with a neutral.
2. For Services without a neutral, Line to Line and Line to Ground.

F. Provide common and normal modes of protection.

1.05 SUBMITTALS

A. Submit Shop Drawings for equipment provided under this Section.

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B. Submit shop drawings and product information for approval and final documentation in quantities listed according to Conditions of the Contract. Identify customer name, customer location, and customer order number.

C. Submit ANSI/UL 1449 Listing documentation to indicate the following:
   1. Short Circuit Current Rating (SCCR).
   2. Voltage Protection Ratings (VPRs) for all modes.
   3. Maximum Continuous Operating Voltage rating (MCOV).
   4. Nominal Discharge Current rating (I-n).
   5. Type 1 device.
   6. VPR, MCOV, I-n, and Type 1 information is posted at www.UL.com under Certifications; search using UL Category Code: VZCA. SCCRs are posted in manufacturer's published documentation.
   7. UL data and visual inspection takes precedence over manufacturer's published documentation.
   8. Independent Lab, 3rd party single surgetest reports validating published single and repetitive surge current ratings. Standard Factory test reports are not acceptable. Calculated surge ratings are not acceptable.

D. Provide shop drawings including manufacturer installation instruction manual and line drawings detailing dimensions and weight of enclosure, internal wiring diagram illustrating all modes of protection in each type of SPD required, wiring diagram showing field connections, and manufacturer's recommended wire and breaker sizes (if required).
   1. Prior to approval to bid, modules using encapsulation shall be presented without encapsulation for visual inspection and construction review, proprietary technology included. MOV type and quantity shall reflect kA ratings on cutsheets, verification of diagnostic monitoring, thermal and overcurrent protection, etc.

1.06 QUALITY ASSURANCE

A. Reference Standard: Comply with the latest edition of the applicable provisions and recommendations of the following, except as otherwise stated in this document:
   1. UL 1449 4th Edition 2014 Revision (effective 3/26/2016).
   2. UL 1283.
   3. ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
   4. ANSI/IEEE C62.45, Guide for Surge Testing for equipment connected to Low-Voltage AC Power Circuits.
   5. UL96A.
   6. IEEE 1100 Emerald Book.
   7. National Fire Protection Association (NFPA 70: National Electrical Code).

1.07 RELATED REQUIREMENTS

A. Section 26 05 26 - Grounding and Bonding for Electrical Systems.

B. Section 26 24 16 - Panelboards.

1.08 ABBREVIATIONS AND ACRONYMS

A. EMI/RFI: Electromagnetic Interference/Radio Frequency Interference.

B. SPD: Surge Protective Device.

1.09 REFERENCE STANDARDS

A. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.

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B. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

C. UL 1449 - Standard for Surge Protective Devices; Current Edition, Including All Revisions.

D. ANSI/UL 1449 Surge Protective Devices Fourth Edition or Newer.

E. IEEE 587.

F. FIPS PUB 94.

G. IEEE C62.11 - Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits (> 1 kV).

H. IEEE C62.41.1 Guide on the Surges Environment in Low-Voltage (1000 V and Less) AC Power Circuits.

I. IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.

J. IEEE C62.45 IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and less) AC Power Circuits.

K. IEEE C62.62 IEEE Standard Test Specifications for Surge Protective Devices (SPDs) for Use on the Load Side of the Service Equipment in Low Voltage (1000V and less) AC Power Circuits.

L. National Electrical Code - Article 285.

M. National Fire Protection Association - NFPA 20, 70, 75, and 780.

N. UL 96A Installation Requirements for Lightning Protection Systems.

1.10 WARRANTY

A. Warranty on defective material and workmanship shall be for 15 years.

B. Copy of warranty to be sent with submittal.

C. See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Current Technology - Transguard3 or TG3 Series 150kA per mode surge rating approved equivalent.

B. Eaton SPD Series. 300kA C.

2.02 SURGE PROTECTIVE DEVICES - GENERAL REQUIREMENTS

A. Description: Factory-assembled surge protective devices (SPDs) for 60 Hz service; listed, classified, and labeled as suitable for the purpose intended; system voltage as indicated [on the drawings].

B. Unless otherwise indicated, provide [field-installed, externally-mounted or factory-installed, internally-mounted] SPDs.

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C. List and label as complying with UL 1449, Type 1 when connected on line side of service disconnect overcurrent device and Type 1 or 2 when connected on load side of service disconnect overcurrent device.

D. Protected Modes:
   1. Wye Systems: L-N, L-G, N-G, L-L.
   2. Delta Systems: L-G, L-L.
   3. Single Split Phase Systems: L-N, L-G, N-G, L-L.
   4. High Leg Delta Systems: L-N, L-G, N-G, L-L.

E. Protection Modes UL1449 4th Edition VPR (6kV, 3kA) for grounded WYE/delta and High Leg Delta circuits with voltages of (480Y/277). 3-Phase, 4 wire circuits, (120/240) split phase shall be as follows and comply with test procedures outlined in UL1449 section 37.6: UL 1449 Voltage Protection Ratings (VPRs):

F. Electrical Noise Filter: each unit shall include a high performance EMI/RFI noise rejection filter with a maximum attenuation of 54dB per MIL-STD-220B.
   1. SPD shall include a EMI/RFI noise rejection filter for all L-N modes as well as a removable filter in the N-G mode.

G. The UL1449 Voltage Protective Rating (VPR) shall be permanently affixed to the SPD unit.

H. The UL1449 Nominal Discharge Surge Current Rating shall be 20kA.

I. The SCCR rating of the SPD shall be 150kA without the need for upstream over current protection.

J. The SPD shall be listed as Type1 SPD, suitable for use in Type1 or Type2 applications.

K. The SPD shall have the following monitoring options - Option M2.
   1. Smart switching tri-color/LED/phase, audible alarm and dry relay contacts.
   2. Time Date stamp, duration and magnitude for the following power quality events (sags, swells, surges, dropouts, outages, THD, frequency, Volts RMS per phase).
   3. SPD monitoring shall track surge protection and display it as a percentage.
   4. SPD shall provide a surge counter with three categories to be defined as Low Level surge (100A-500A), Medium Level surge (500A-3,000A), High Level surge (>3,000A).

L. SPD shall be wired between power source and SPD with manufacture provided HPI cable.

2.03 SPD FABRICATION

A. SPD Modules:
   1. UL Listed as Type 1 (verifiable at www.UL.com), intended for use without need for external or supplemental overcurrent controls. Protect suppression component of every mode, including N-G, by internal overcurrent and thermal overtemperature controls. SPDs relying on external or supplementary installed safety disconnects do not meet intent of specification.
   2. UL Labeled with 20kA I-nominal (I-n) (verifiable at UL.com) for compliance to UL 96A Lightning Protection Mater label and NFPA 780.
   3. Suppression components: Heavy-duty MOVs, selenium cells, or combination of both.
   4. Provide surge current diversion paths for all modes of protection: L-N, L- G, N-G in WYE systems, and L-L, L-G in DELTA systems.
   5. Provide service entrance SPD audible diagnostic monitoring by way of audible alarm.
   6. Provide service entrance SPD with 1 set of NO/NC dry contacts for alarm conditions.
   7. Provide SPD with status indicator lights with visual indication of degradation in performance such that 70-100% green, 40-70% amber, 0- 40% red.
   8. SPD components or entire module shall be replaceable at 70% or below of visual indication.

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9. If a dedicated breaker for the SPD is not provided in the switchgear, switchboard, or panelboard provide a separately mounted non-fused disconnect switch. Dedicated breaker to serve as a means of disconnect for distribution SPDs.
10. Meet or exceed the following criteria:
    a. ANSI/UL 1449 Listed Voltage Protection Ratings (VPRs) for 6kV 3000A testing as follows:
11. ANSI/UL 1449 Listed Maximum Continuous Operating Voltage (MCOV) (verifiable at UL.com):
12. Provide warranty for a period of 15 yrs, incorporating unlimited replacements of suppressor parts if they are destroyed by transients during the warranty period at no additional replacement cost to the end-user or if visual indication of status LED's turns to amber or red (installation not included).
    a. Service Entrance:
        1) Install 1 primary suppressor external to the service entrance in accordance with manufacturer instructions.
        2) Install SPD on line or load side.
        3) Bond SPD ground to service entrance ground.
    b. Distribution Panelboards.
        1) Install 1 suppressor external to each designated distribution panelboard.
        2) Install surge suppression device in accordance with manufacturer instructions.

2.04 SURGE PROTECTION DEVICES

A. Install surge suppression device in accordance with manufacturer instructions.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for control system equipment. Identify deficiencies prior to beginning installation.

B. Where ranges are indicated on the contract documents, they are to be considered preliminary. Field verify the exact ranges required based on field conditions.

3.02 DELIVERY STORAGE AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all process instrumentation and control equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. Exercise due diligence in storing, protecting, and moving process instrumentation and control equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.03 INSTALLATION

A. Install SPD within 3 feet of the line side of power source.

B. Provide HPI cable between line side of power and external power disconnect, and between external power disconnect and SPD.

C. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

D. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

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3.04 TESTING AND START-UP SERVICES

A. System Integrator shall provide installation and start-up services required to place the complete system into operation.

B. Each signal and function shall be fully tested. These tests shall be based on actual operation of primary elements and verification of proper control system response. Submit test results as part of Operations and Maintenance Manual.

C. Record calibrations of all analog devices.

D. Demonstrate proper operation of the process and instrumentation control system to the Owner and in the presence of the Engineer.

3.05 TRAINING

A. Training shall be suitable for plant operations personnel with limited knowledge of electrical components.

B. Provide two instructor days of operator training at the job site. Training shall consist of operations instruction and maintenance/trouble-shooting instruction.
   1. Operations instruction shall identify all control loops with description of all interlocks, interface with other loops, and operational input requirements. Describe procedures for re-starting the system.
   2. Maintenance instruction shall identify periodic maintenance that can be performed by the operator. Provide description of procedures and locations for replacement of consumable devices such as fuses and for checking the calibration or operation of devices.
   3. Trouble-shooting instruction shall identify simple procedures and methods for identifying potential causes in the event of failures. For example, instruct operator on correlation of input signals and PLC I/O module indicator lights.

3.06 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.

C. The SPD manufacturer’s technician shall perform a system checkout and start-up in the field to assure proper installation, operation and to initiate the warranty of the system. The technician will be required to do the following:
   1. Verify voltage clamping levels utilizing a diagnostic test kit, comparing factory readings to installed readings.
   2. Verify N-G connection.
   3. Record information to a product signature card for each product installed.

D. Do not energize SPD until bonding of neutral and ground for service entrance and separately derived systems is complete in accordance with Section 26 05 26 where applicable. Replace SPDs damaged by improper or missing neutral-ground bond.

END OF SECTION

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SECTION 26 90 00
PROCESS INSTRUMENTATION & CONTROL

PART 1 GENERAL

1.01 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
      a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
      b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
      c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
      d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
      e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.
   2. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
      a. NFPA 70 - National Electrical Code.
   3. CE - European Community, Applicable Directives.
      a. EN50005 - for Terminal Markings.
      b. EN50081-1- Generic Emission Standard.
      c. EN50082-1 - Generic Immunity Standard.
      d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
      e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
   4. Canadian Standards Association (CSA), Specifications and Standards, current edition:
      a. CSA C22.2, Industrial Control Equipment.
   5. CUL - Underwriter's Laboratories of Canada.
   6. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
      a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
   7. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
      a. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
      b. NEMA ICS 3 - Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.
   8. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
      a. UL508 - Industrial Control Equipment.
      b. UL508A - Industrial Control Panels.
      c. UL 913 - Intrinsically Safe Specification.
      d. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.02 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated Process Instrumentation and Control System, the following sections shall be included under the scope of this section:
   1. Section 26 24 19 - Motor Control Centers.
   2. Section 26 29 13 - Motor Controllers.
   3. Section 26 29 23 - Adjustable Frequency Motor Controllers.

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4. Section 26 90 10 - Control Panel Construction.
5. Section 26 90 11 - Control Panel Components.
6. Section 26 90 20 - Instrumentation Devices.
7. Section 26 90 30 - Programmable Logic Controllers.
8. Section 26 90 31 - Human-Machine Interface Equipment.
9. Section 26 90 50 - SCADA System Hardware.
10. Section 26 90 51 - SCADA System Software.
11. Section 26 90 53 - Hardware Alarm Notification System.
12. Section 26 90 60 - Ethernet Networking Equipment.

B. The work specified herein shall include the furnishing of all materials, equipment, labor, and supervision necessary to fabricate, install, start-up, and test a complete and operable Process Instrumentation and Control System.

C. The labor specified herein includes but is not limited to engineering, software development, panel fabrication, equipment calibration and adjustment, testing, training, and documentation.

D. This section identifies the overall functional requirements for the Process Instrumentation and Control System.

E. This section includes coordination with the work of other sections. This work includes identification of exact interface requirements with motors, control panels, and field instrumentation provided under other portions of this specification. It shall be the responsibility of the system integrator specified under this section to execute this coordination during the shop drawing submittal phase of the work. Additional costs due to inadequate coordination as required herein shall be borne solely by this contractor.

F. This section includes coordination with electrical contractor to ensure that the proper number of raceways and conductors are installed. It shall be the responsibility of the system integrator to coordinate this work with the installing electrician. Additional costs due to inadequate coordination as required herein shall be borne solely by this contractor.

1.03 SUBMITTALS

A. Submit the following information specifically for process instrumentation and control system:
   1. General requirements specific to this section include:
      a. Submit complete and integrated document containing all equipment included under the scope of this section.
      b. Submittal shall be complete, neat, orderly, and indexed with tabbed dividers. Partial submittals will not be accepted.
      c. Include a complete list of proposed exceptions to and deviations from these specifications.
      d. Clarity and completeness are of prime importance. Acceptability of submittal drawings shall be at the sole discretion of the Engineer in regards to this requirement.
      e. Additional requirements for the various subsystems are specified in the corresponding sections.
   2. Submit the following information:
      a. Bill of Materials:
         1) Complete listing of all components identifying exact make and model, quantity, and description.
      b. Component Data Sheets:
         1) Detailed listing for each type of device, identifying Engineer's tag number, manufacturer, model, options, ranges, and other information necessary to supplement component catalog cut sheets and clearly show compliance with these specifications.
      c. Component Catalog Cut sheets:
         1) Manufacturer's standard catalog information.

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d. Control Panel Construction Drawings:
   1) Scaled drawings of all control panels and enclosures.
   2) Front panel elevation complete with nameplate legend.
   3) Back panel elevation complete with schedule of devices.
e. Control Panel Schematic Wiring Diagrams:
   1) Ladder type schematic diagrams.
   2) Show all devices requiring electrical connections.
   3) Identify all wire and terminal numbers.
   4) Identify PLC I/O addresses.
   5) Reference Engineer's tag number where assigned.
   6) Cross-reference all relay contacts and coils.
   7) Identify switching action on all switching devices.
   8) Common diagrams will not be accepted.
f. Analog Loop Diagrams:
   1) Show all devices requiring electrical connections.
   2) Identify all wire and terminal numbers.
   3) Identify PLC I/O addresses.
   4) Identify location of loop power supply.
   5) Identify field devices, back-of-panel devices, and front-of panel devices.
   6) Show tabular summary of transmitter output capability, input impedance of each receiver, total loop impedance, and reserve output capacity.
   7) Reference Engineer's tag number where assigned.
   8) Common diagrams will not be accepted.
g. Control Panel Plumbing Diagrams:
   1) Show all devices requiring plumbing connections (air or liquid).
   2) Show pipe/tube sizing.
   3) Show all control devices (valves, regulators, filters, etc.).
h. Control Panel Power and Environmental Requirements:
   1) Identify voltage and ampacity requirements.
   2) Show sizing calculations for environmental controls (ventilation, heat, air conditioning).
i. Interconnecting Wiring Diagrams:
   1) Show all interconnections between control panels.
   2) Show all interconnections between control panels and motor control centers.
   3) Show all interconnections between control panels and field devices.
   4) Show all interconnections between motor control centers and field devices.
   5) Identify all wire and terminal numbers, including field terminal junction box terminals.
j. Control Device Installation Details:
   1) Supplement contract documents with additional details necessary for proper installation of control devices.
k. Configuration Documentation:
   1) Submit complete, documented configuration data for all configurable controllers.
   2) Additional requirements for PLC systems and PC based SCADA systems are identified in the individual subsystem sections.

1.04 FACTORY ACCEPTANCE TESTING, SYSTEM STRATUP, AND SUPPORT SERVICES

A. System Integrator shall assemble the SCADA System as a complete process monitoring and control system, including HMI Computers / Servers, SCADA Panels, MCC's, Drives, Telemetry Systems, and Alarming Systems where applicable. These Systems shall be demonstrated that the systems are operational before shipment to the project site. This testing shall be as an integrated assembly by simulating random specified I/O points and all specified Control Loops. This test shall be witnessed by Owner and/or Engineer. Schedule test date a minimum of two weeks in advance. All problems, errors, insufficiencies, and failures identified during testing shall be resolved before shipment.

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1.05 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit the following information specifically for process instrumentation and control system:
   1. Submit final revised shop drawings incorporating any modifications made as a result of factory test, installation, start-up, operational testing, or for any other cause. Submit results of all field-testing and corrective actions taken for all discrete control devices and for all analog control devices. Submit analog device calibration data sheets.
   2. Submit manufacturers standard operation & maintenance information including installation manuals and safety instructions.
   3. Submit contact list identifying names, addresses, telephone numbers, and any additional contact information for each equipment service organization involved with the Process Instrumentation and Control System.
   4. Submit detailed operation and maintenance procedures for each major equipment item; include description of operation for all modes of operation, routine maintenance procedures, and trouble-shooting guide.
   5. Submit listing spare parts provided under this contract and of recommended additional spare parts not provided under this contract along with costs.

B. Submit the following information specifically for the SCADA system on a jump drive or portable hard drive (not to be used for the back-up of the computers):
   1. A copy of all final PLC programs with documentation,
   2. A copy of all Panelview configuration files containing all windows / screens to allow for a complete recovery of the system,
   3. A copy of all HMI computer/ server images containing all windows / screens to allow for a complete recovery of the system from this image,
   4. A copy of all network switch configuration files,
   5. A list of all IP addresses, and passwords for all devices on the network.
   6. A list of all passwords for PLC code and blocks within PLC code.
   7. A copy of all Firewall configuration files.
   8. A copy of all VFD and solid state overload configuration files.

1.06 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.07 PRE-SUBMITTAL COORDINATION CONFERENCE

A. This project includes communication system interface between the work specified under this section and work specified under other sections. To facilitate the implementation of this interface a pre-submittal conference shall be held at the Owner’s Facility or the Engineer’s office, at which all parties will be present. The agenda of this conference shall include the following coordination items:
   1. Component standardization.
   2. PLC addressing.
   3. Control function requirements - functional description / control loop review.
   4. Operator interface requirements.
   5. Other interface/coordination issues.

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1.08 ADDITIONAL REQUIRMENTS

A. System Integrator shall provide an additional 24 hours of programming time to provide additional functionality to the system that is not specified herein.

1.09 WARRANTY

1.10 ADDITIONAL INFORMATION (NOT USED)

PART 2 PRODUCTS

2.01 SYSTEM INTEGRATOR

A. The system integrator shall be a firm specializing in the integration of control systems with documented experience in the detailed design, construction, configuration, and maintenance of PLC based control systems and motor control centers for the water/wastewater utility market. This experience must include a minimum of five projects similar in nature to this project during the last five years.

B. The system integrator shall have in-house capability to handle complete system engineering, control panel fabrication, instrument supply and calibration, commissioning, testing, and troubleshooting of the process instrumentation and control system.

C. The system integration firm shall employ an engineering staff of not less than five engineers and technicians with a combined experience of no less than 50 years designing, constructing, and configuring process control systems.

D. The system integration firm shall have an active $1,000,000 professional liability insurance policy.

E. The system integrator shall be factory authorized to commission Drives, PLC's and MCC's, and to be an authorized Rockwell Strategic Provider with full development software to modify and create new applications in the specified HMI software.

F. Acceptable system integrators include:
1. Energenecs, Contact Keith Kohn, 262-685-6506.
2. Integrated Process Solutions, contact Eric Fisher, telephone number (608) 849-4375.
3. Altronex Control Systems - a Division SJE Rhombus, contact Kurt Atwood, telephone number (608) 210-1455.
4. Substitutions will only be considered if they are submitted no less than two weeks prior to the bid date and meet the above listed criteria.

2.02 GENERAL FUNCTIONAL DESCRIPTION

A. Summary of System Improvements.
1. PLC based control systems and/or SCADA system HMI workstations shall be provided at the following locations:
a. STR-95 – Well No.9:
1) Provide a new local control panel, 95-LCP-001, which shall consist of an Allen-Bradley Ethernet processor, associated chassis, power supply, and I/O modules as scheduled on the drawings along with an Ethernet switch, BACnet gateway module, and 120VAC UPS.
2) Panel shall also include a new front of panel mounted PanelView Plus 7 – Performance 12” touchscreen for local operator control.
3) Provide shelf within 95-105 Electrical Room for mounting of network firewall.
4) This control panel shall be responsible for communicating with vendor provided

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control panel 95-LCP-002, future vendor provided control panel 100-LCP-002, 95-MCC-1 and the primary SCADA computer at the City Shop.

b. STR-10 – City Shop HMI Workstation / SCADA System PC:
   1) The new SCADA system computer will be provided to execute all SCADA system software control functions, historical data functions, and reporting functions. All computer hardware for computer and HMI shall be provided by the System Integrator and the software development for this system shall be by the System Integrator. The SCADA system computer shall also be responsible for software alarm notification systems and remote access and authentication. The SCADA system computer shall be configured to allow remote access, via secure internet connection, by staff for remote monitoring.
   2) The current SCADA system is a Wonderware system. This system shall be removed in its entirety with preservation of historical data and replaced with a VT SCADA system.
   3) The current SCADA system is also responsible for communicating with the existing Wells 4, 6, & 8 and the North, South, and Industrial Park Elevated Towers.

c. STR-40 – Well No. 4:
   1) WS3-LCP-1 is an existing control panel that shall be modified under this contract.
      a) Provide new PanelView Plus 7 – Performance 12" front of panel mounted touchscreen for local operator control.

d. STR-60 – Well No. 6:
   1) WS5-LCP-1 is an existing control panel that shall be modified under this contract.
      a) Provide a new panel mounted computer and 15" display. This computer shall be a fully redundant SCADA system to the computer located in the City Shop.
   2) Existing abandoned control panel adjacent to WS5-LCP-1 shall house new Raco Verbatim Gen 2 cellular alarm dialer.

e. STR-80 – Well No. 8:
   1) WS2-LCP-1 is an existing control panel that shall be modified under this contract.
      a) Provide new PanelView Plus 7 – Performance 12" front of panel mounted touchscreen for local operator control.

B. General Requirements:
   1. The process instrumentation and control system consists of the following functional divisions which will be defined in detail for each loop under Detailed Functional Description:
      a. General: includes brief description of system purpose.
      b. Local Control Functions: includes local control stations, pilot control devices, instruments, sensors and manufacturer's control panels.
      c. Motor Control Center Functions: includes hardwired MCCs and pilot control devices located within these MCCs.
      d. SCADA System Control Functions: includes PLC hardware, interface devices, and PLC logic.
      e. SCADA System Monitoring Functions: includes graphical user interface hardware and configuration, event monitoring and logging functions, analog parameter trending, and alarm handling.
      f. SCADA System Alarms: includes alarms to be monitored and generated by SCADA.
      g. SCADA System Historical Data Functions: includes data calculations, display of corresponding values to HMI, and storage of those values to historical database for use in preparing reports.

C. Typical Motor Control Functions:
   1. General:
      a. Several standard motor control strategies are incorporated into this design and are described herein. Operator interface screens, configuration, and pilot device circuitry shall be similar for all motors of each type.

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b. Type I Motor Control - Full-Voltage, Non-Reversing.
c. Type III Motor Control - Ethernet capable adjustable frequency drive.

2. Type I Motor Control - Full-Voltage, Non-Reversing.
   a. Local Control Functions:
      1) LOCAL HAND-OFF-AUTO selector switch located at the motor shall control motor operation.
         a) HAND Position: motor shall run continuously unless MCC HOA switch is in the OFF position.
         b) OFF Position: motor shall not run.
         c) AUTO Position: control by MCC HAND-OFF-AUTO selector switch shall be enabled.
      2) Any additional sensors or functions are specified in the detailed functional description.
   b. Motor Control Center Functions:
      1) MCC HAND-OFF-AUTO selector switch shall control motor operation only when LOCAL HAND-OFF-AUTO selector switch is in AUTO position.
         a) HAND Position: motor shall run continuously unless LOCAL HOA switch is in the OFF position.
         b) OFF Position: motor shall not run.
         c) AUTO Position: start and stop in response to the SCADA System REQUIRED signal.
      2) In the event of a power outage a motor operating in HAND position shall automatically restart while a motor operating in the AUTO position shall automatically restart after power is restored if the SCADA System REQUIRED signal is present.
      3) Type 2 solid-state overload device shall provide motor protection. MOTOR OVERLOAD condition, detected by overload device, shall activate corresponding MCC pilot light and prevent motor operation.
      4) MOTOR RUN condition, detected by motor starter auxiliary contact, shall activate corresponding MCC pilot light.
      5) Provide monitoring of the following conditions: SCADA SYSTEM CONTROL AVAILABLE, MOTOR OVERLOAD, and MOTOR RUN.
      6) Provide additional functions as specified in the detailed functional description.
   c. SCADA System Control Functions:
      1) Graphical display HAND-OFF-AUTO selector (unless specified otherwise) shall control the REQUIRED signal.
         a) HAND Position: the signal shall be active.
         b) OFF Position: the signal shall be inactive.
         c) AUTO Position: the signal shall be controlled by the automatic control strategy specified in the detailed functional description.
      2) Generate CALL-TO-RUN (CTR) FAIL alarm based on a discrepancy between MOTOR RUN and REQUIRED signals after an adjustable FAIL DELAY time has elapsed. CALL-TO-RUN FAIL condition shall prevent motor operation from the SCADA system until cleared and reset. CALL-TO-RUN FAIL shall only activate when SCADA SYSTEM CONTROL AVAILABLE is active.
      3) Provide additional functions as specified in the detailed functional description.
   d. SCADA System Monitoring Functions:
      1) Display the following status conditions: SCADA SYSTEM CONTROL AVAILABLE, REQUIRED, RUN, and MOTOR OVERLOAD.
      2) Display, trend, and record the following parameters: None.
      3) Incorporate into the alarm notification system and display the following alarm conditions: CALL-TO-RUN FAIL.
      4) Provide additional functions as specified in the detailed functional description.
   e. SCADA System Historical Data Functions:
      1) Display non-resettable runtime total.

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2) Calculate, display, and record daily runtime total.
3) Calculate, display, and record number of daily starts.
4) Provide additional functions as specified in the detailed functional description.

3. Type III Motor Control - Ethernet capable, adjustable frequency drive.
   a. Local Control Functions:
      1) LOCAL HAND-OFF-AUTO selector switch located at the motor shall control motor operation.
         a) HAND Position: motor shall run continuously at speed preset on AFD unless MCC HOA switch is in the OFF position.
         b) OFF Position: motor shall not run.
         c) AUTO Position: control by MCC HAND-OFF-AUTO selector switch shall be enabled.
      2) Any additional sensors or functions are specified in the detailed functional description.
   b. Motor Control Center Functions:
      1) MCC HAND-OFF-AUTO selector switch shall control motor operation only when LOCAL HAND-OFF-AUTO selector switch is in AUTO position.
         a) HAND Position: motor shall run continuously at speed preset on AFD unless LOCAL HOA switch is in the OFF position.
         b) OFF Position: motor shall not run.
         c) AUTO Position: start and stop in response to the REQUIRED and Ethernet speed command signals.
      2) Pilot control circuitry shall be designed such that HAND position control and any additional interlock circuitry identified in the detailed functional descriptions will be functional regardless of the status of the Ethernet network.
      3) In the event of a power outage a motor operating in HAND position shall automatically restart while a motor operating in the AUTO position shall automatically restart after power is restored if the REQUIRED signal is present.
      4) AFD RUN condition shall activate MCC RUN pilot light.
      5) Provide monitoring of the following conditions: SCADA SYSTEM CONTROL AVAILABLE, MOTOR RUN, AFD FAIL, and COOLING FAN FAIL.
      6) AFD shall be configured with a starting ramp.
      7) Adjustable frequency drive shall provide motor protection and shall provide monitoring the following motor data functions via the Ethernet network: AFD READY, AFD ALARM, AFD FAULT, MOTOR OVERLOAD, AVERAGE CURRENT, and PERCENT SPEED.
      8) Provide additional functions as specified in the detailed functional description.
   c. SCADA System Control Functions:
      1) Graphical display HAND-OFF-AUTO selector (unless specified otherwise) shall control the REQUIRED signal.
         a) HAND Position: the signal shall be active and the SPEED COMMAND shall be manually input.
         b) OFF Position the signal shall be inactive.
         c) AUTO Position: the signal and the SPEED COMMAND shall be controlled by the automatic control strategy specified in the detailed functional description.
      2) Generate CALL-TO-RUN (CTR) FAIL alarm based on a discrepancy between MOTOR RUN and REQUIRED signals after an adjustable FAIL DELAY time has elapsed. CALL-TO-RUN FAIL condition shall prevent motor operation from the SCADA system until cleared and reset. CALL-TO-RUN FAIL shall only activate when SCADA SYSTEM CONTROL AVAILABLE is active.
      3) Generate ABNORMAL CURRENT signal when motor average current falls below or rises above adjustable MINIMUM/MAXIMUM set points.
      4) Generate COMMUNICATION FAIL alarm based upon a loss of communication with the motor AFD.

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5) Provide additional functions as specified in the detailed functional description.

d. SCADA System Monitoring Functions:
   1) Display the following status conditions: SCADA SYSTEM CONTROL AVAILABLE, REQUIRED, MOTOR RUN, AFD READY, AFD ALARM, AFD FAULT, AFD FAIL, COOLING FAN FAIL, ABNORMAL CURRENT, and MOTOR OVERLOAD.
   2) Display, trend, and record the following parameters: AVERAGE CURRENT and PERCENT SPEED.
   3) Incorporate into the alarm notification system and display the following alarm conditions: CALL-TO-RUN FAIL and COMMUNICATION FAIL.
   4) Provide additional functions as specified in the detailed functional description.

e. SCADA System Historical Data Functions:
   1) Display non-resettable runtime total.
   2) Calculate, display, and record daily runtime total.
   3) Calculate, display, and record number of daily starts.
   4) Provide additional functions as specified in the detailed functional description.

2.03 UNIT PROCESS 95: WELL NO.9 WATER TREATMENT FACILITY

A. Loop 95-1: Raw Water Pumping.
   1. General, Motor Control Scheme:
      a. Provide Type III motor control.
   2. Local Control Functions:
      a. Flow switch specified under Division 26 shall detect positive flow in well discharge piping.
      b. Flow meter/transmitter specified under Division 26 provides analog flow rate and pulse totalizer to SCADA.
      c. Pace the Potassium Permanganate Chemical Pump provided under Phase 2 contract and Chlorine Gas Feed System with analog flow rate from flow meter/transmitter.
      d. Interlock Potassium Permanganate Chemical Pump provided under Phase 2 contract and Chlorine Gas Feed System with well run and positive flow signals. Generate FLOW FAIL alarm based on discrepancy between WELL RUN and POSITIVE FLOW signals after an adjustable time delay.
   3. Motor Control Center Functions:
      a. None.
   4. SCADA System Control Functions.
      a. Well speed shall be controlled based upon operator settable flow setpoint. Well shall be called to run based on operator settable DETENTION TANK level setpoint.
      b. Interlock flow signal with chemical feed and dosing controls.
   5. SCADA System Monitoring Functions.
      a. Display, trend, and record the following parameters:
         1) WELL NO.9 FLOW RATE
         2) WELL NO.9 TODAYS TOTAL
         3) WELL NO.9 YESTERDAYS TOTAL
         4) Display the instantaneous flow rate
   6. SCADA System Alarming.
      a. WELL NO.9 LOW FLOW.
      b. WELL NO.9 FLOW SWITCH ALARM.
   7. SCADA System Historical Data Functions.
      a. Calculate, display, and trend WELL NO.9 FLOW RATE, YESTERDAYS TOTAL

B. Loop 95 & 100-2: Aeration.
   1. General, Motor Control Scheme:
      a. Provide Type I motor control. Process equipment to be provided under Phase 2 and Future contract.
   2. Local Control Functions:
      a. Provided under Phase 2 and Future contract.

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3. Motor Control Center Functions:
    a. None.
4. SCADA System Control Functions.
    a. None additional.
5. SCADA System Monitoring Functions.
    a. None additional.
6. SCADA System Alarming.
    a. None additional.
7. SCADA System Historical Data Functions.
    a. None additional.

C. Loop 95 & 100-3: High Lift Pumping.
1. General, Motor Scheme:
    a. Provide Type III motor control for Phase 1 pumps as shown on the drawings.
2. Local Control Functions:
    a. Flow switch specified under Division 26 shall detect positive flow in high lift discharge piping.
    b. Submersible level transducer specified under Division 26 shall sense detention tanks level and provide an analog signal to SCADA. System shall be designed to allow for Detention Tank No.1 and No.2 to be ran independently of each other to allow for tank cleaning.
    c. Float switches specified under Division 26 shall sense detention tanks levels and provide discrete signals to SCADA. System shall be designed to allow for Detention Tank No.1 and No.2 to be ran independently of each other to allow for tank cleaning.
    d. Flow meter/transmitter specified under Division 26 provides analog flow rate and pulse totalizer to SCADA.
    e. Interlock Horizontal Filter System with high lift run and positive flow signals. Generate FLOW FAIL alarm based on discrepancy between HIGH LIFT RUN and POSITIVE FLOW signals after an adjustable time delay.
    f. Pressure transmitter provided under Phase 2 contract shall detect local distribution system pressure.
    g. Three way switch on 95-LCP-001 shall change the control method of the Raw Water Pump in Well No.9 between Level / Pressure / Auto.
    h. For PRESSURE CONTROL – Provide Operator Settable Pressure Setpoint for operator of Well No.9 in the event of the failures of fiber optic communications, Master PLC WS5-LCP-1, or level transmitter failure.
        1) Provide High Lift Pump On Setpoint.
        2) Provide High Lift Pump Off Setpoint.
        3) High Lift AFD shall run at a pre-set speed on the AFD if running in PRESSURE control. This speed shall be adjustable from the drive interface unit.
        4) Automatic alternation in PRESSURE CONTROL mode is not required.
3. Motor Control Center Functions:
    a. None.
4. SCADA System Control Functions.
    a. High lift pumps speed shall be controlled based upon operator settable flow setpoint. High lift pumps shall be called to run based on operator settable TOWER level setpoint.
    b. Utilize WELL NO.9 SYSTEM PRESSURE in System Pressure Control Strategy.
    c. As a backup method of system control, utilize the Distribution Pressure to determine tower level (Referred to LEVEL control in this write-up). Provide a Level / Pressure / Auto Control switch to transfer control between each method of control.
        1) In Auto, the method of control shall automatically switch from Level control to Pressure Control at each well if there is a loss of communication between the fiber optic network or if there is a PLC failure at WS5-LCP-1.
        2) Pressure Control at the well shall allow for a step increase in pressure if the well is running. This offset shall be operator settable. Provide a matrix of LEVEL

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setpoints for Lead Pump Required, Lag Pump Required, Lead Pump Off, and Lag Pump Off.

5. SCADA System Monitoring Functions.
   a. Display, trend, and record the following parameters:
      1) HIGH LIFT PUMPS FLOW RATE
      2) HIGH LIFT PUMPS TODAYS TOTAL
      3) HIGH LIFT PUMPS YESTERDAYS TOTAL
      4) Display the instantaneous flow rate.
      5) WELL NO.9 SYSTEM PRESSURE
6. SCADA System Alarming.
   a. HIGH LIFT PUMP 1A LOW FLOW.
   b. HIGH LIFT PUMP 2A LOW FLOW.
   c. HIGH LIFT PUMP 1A FLOW SWITCH ALARM.
   d. HIGH LIFT PUMP 2A FLOW SWITCH ALARM.
   e. WELL NO.9 SYSTEM HIGH PRESSURE.
   f. WELL NO.9 SYSTE LOW PRESSURE.
7. SCADA System Historical Data Functions.
   a. Calculate, display, and trend HIGH LIFT PUMPS FLOW RATE, YESTERDAYS TOTAL

D. Loop 95 & 100-4 through 95 & 100-11: Horizontal Filter.
1. General:
   a. Equipment to be provided under Phase 2 and Future contract.
2. Local Control Functions:
   a. None.
3. Motor Control Center Functions:
   a. None.
4. SCADA System Control Functions.
   a. None.
5. SCADA System Monitoring Functions.
   a. None.
6. SCADA System Alarming.
   a. None.
7. SCADA System Historical Data Functions.
   a. None.

E. Loop 95 & 100-12: Fluoride Chemical Feed.
1. General, Motor Control Scheme.
   a. Equipment provided under Phase 2 and Future Contract.
2. Local Control Functions:
   a. None.
3. Motor Control Center Functions:
   a. None.
4. SCADA System Control Functions.
   a. None.
5. SCADA System Monitoring Functions.
   a. None.
6. SCADA System Alarming.
   a. None.
7. SCADA System Historical Data Functions.
   a. None.

F. Loop 95 & 100-13: Potassium Permanganate Chemical Feed.
1. General, Motor Control Scheme:
   a. Equipment provided under Phase 2 and Future Contract.
2. Local Control Functions:

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a. None.

3. Motor Control Center Functions:
   a. None.
4. SCADA System Control Functions.
   a. None.
5. SCADA System Monitoring Functions.
   a. None.
6. SCADA System Alarming.
   a. None.
7. SCADA System Historical Data Functions.
   a. None.

G. Loop 95 & 100-14: Chlorination.
1. General, Motor Control Scheme.
   a. Provide Type I motor control.
   b. Cylinder scales and transmitters are to be provided under another Division.
   c. Chlorination controllers are to be provided under another Division.
2. Local Control Functions:
   a. None.
3. Motor Control Center Functions:
   a. None additional.
4. SCADA System Control Functions.
   a. Provide an Operator settable Dosage setpoint as a PPM setpoint.
   b. Provide a flow pace signal from the well flow meter to pace the chlorinator valves for Post Aeration feed.
   c. Provide a flow pace signal from the filter effluent flow meter to pace the chlorinator valves prior to distribution. Phase 2 Tonka control panel shall initiate Chlorination Booster Pump call to run.
   d. Monitor cylinder weight. Provide a weight for each cylinder and calculate the dosage of CL2 from weight used over water through the flow meter.
   e. Generate an excess usage alarm if the CL2 weight decreases too quickly based off of an operator settable Excess Use alarm in #'s per hour.
   f. Provide a toggle on SCADA that allows the operator to switch out a cylinder or set of cylinders to continue to capture the CL2 use but to account for the new cylinder weight.
5. SCADA System Monitoring Functions.
   a. Monitor the following signals:
      1) CL2 CYLINDER WIEGHTS
      2) CL2 DOSAGE SETPOINT
      3) FLOW PACE SIGNAL
      4) CHLORINATION VALVE POSITION
      5) CL2 USAGE PPM – TODAY
      6) CL2 USAGE PPM – YESTERDAY
      7) CL2 USAGE TOTAL POUNDS – TODAY
      8) CL2 USAGE TOTAL POUNDS - YESTERDAY
6. SCADA System Alarming.
   a. Alarm on EXCESS CL2 USAGE
7. SCADA System Historical Data Functions.
   a. Calculate, display, and trend CL2 USAGE PPM; TODAYS TOTAL, YESTERDAYS TOTAL and CL2 USAGE POUNDS; TODAYS TOTAL, YESTERDAYS TOTAL

H. Loop 95 & 100-15: Horizontal Filter Backwash Blower.
1. General, Motor Scheme.
   a. Provide Type I motor control. Process equipment to be provided under Phase 2 and Future contract.
2. Local Control Functions:

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a. Provided under Phase 2 and Future contract.

3. Motor Control Center Functions:
   a. None.
4. SCADA System Control Functions.
   a. None additional.
5. SCADA System Monitoring Functions.
   a. None additional.
6. SCADA System Alarming.
   a. None additional.
7. SCADA System Historical Data Functions.
   a. None additional.

I. Loop 95-16: Power System Monitoring, Standby Power Monitoring and Load Shedding Control.
   1. Local Control Functions:
      a. Standby generator control panel specified under Division 26 shall detect generator RUN an FAIL conditions.
      b. Automatic transfer switch specified under Division 26 shall detect generator EXERCISE and ATS IN STANDBY conditions.
   2. Motor Controller Functions (Local Panel):
      a. Power monitor provided under Division 26 shall detect power usage at 95-PDP-001 and provide instantaneous KW LOAD DEMAND and KWH signals to SCADA system.
   3. SCADA System Control Functions.
      a. Provide for monitoring of ATS IN STANDBY POSITION and generator RUN, FAIL and EXERCISE conditions.
      b. Utilize facility demand and power usage data for automatic load shedding control when facility is operating on standby power. When facility is operating on standby power, the PLC shall automatically allow critical loads and non-critical loads to operate without overloading the standby generator.
         1) This shall be accomplished through the use of an operator adjustable load profile/priority table that the PLC shall consult when a request is made to operate a motor. If, according to the power monitor there is sufficient capacity to start and run the motor, then the motor shall be allowed to start. If, according to the power monitor there is insufficient capacity to start and run the motor, then the PLC shall attempt to shutdown lower priority motors until there is sufficient capacity.
         2) If sufficient capacity cannot be created by shutting down lower priority motors then the load will not be allowed to start and manual intervention will be required.
         3) Coordinate with owner and process engineer to identify all other critical loads and corresponding priority levels for the facility.
      c. Provide for control panel 95-LCP-001 Ethernet communication with power monitor.
      d. Utilize total power usage in Load Shedding Control Strategy, as stated above.
      e. Provide adjustable HIGH INSTANTANEOUS KW DEMAND alarm setpoint.
   4. SCADA System Monitoring Functions.
      a. Incorporate into the alarm notification system and display the following alarm conditions: STANDBY GENERATOR RUN, STANDBY GENERATOR FAIL, STANDBY GENERATOR EXERCISE and ATS IN STANDBY POSITION (UTILITY FAIL).
      b. Display the following status conditions: INSTANTANEOUS KW DEMAND.
      c. Display, trend, and record the following parameters: facility POWER USAGE under utility power and generator power.
      d. Incorporate into the alarm notification system and display the following alarm conditions: HIGH INSTANTANEOUS KW DEMAND.
   5. SCADA System Alarming.
      a. No additional functions.
   6. SCADA System Historical Data Functions.
      a. Display non-resettable generator runtime total.
      b. Calculate, display, and record daily runtime total.

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c. Calculate, display, and record number of daily starts.
d. Log daily Minimum and Maximum KW demand.
e. Calculate, display, and record daily KWH TOTALS.

J. Loop 95-17: Control Power, UPS, PLC Health and Communications Monitoring.
1. Local Control Functions:
a. None.
2. Motor Controller Functions (Local Panel):
a. None.
3. SCADA System Control Functions.
a. Control panel mounted power fail relay shall detect CONTROL POWER FAIL condition and activate corresponding pilot light when 120VAC control power circuit fails.
b. Provide monitoring of control power fail condition.
c. Provide monitoring of UPS fail condition.
d. UPS, located in an auxiliary enclosure shall provide uninterruptible power to the control panel and shall be equipped with a relay output to detect UPS FAIL condition.
e. Provide for monitoring of PLC activity.
f. PLC SCAN FAIL logic and hardwired timer shall detect PLC failure and activate corresponding pilot light.
g. Generate network communication failure condition at SCADA system control panel WS5-LCP-1 based upon loss of network communication link with control panel 95-LCP-001. Provide adjustable time delay after loss of PLC communication prior to activation of communication fail condition.
4. SCADA System Monitoring Functions.
a. Incorporate into the existing alarm notification system and display the following alarm conditions: CONTROL POWER FAIL.
b. Incorporate into the existing alarm notification system and display the following alarm conditions: UPS FAULT.
c. Constantly monitor internal PLC scan activity.
d. Display the following status conditions: NETWORK COMMUNICATION.
e. Incorporate into the alarm notification system and display the following alarm conditions: NETWORK COMMUNICATION FAIL.
5. SCADA System Alarming.
a. No additional functions.
6. SCADA System Historical Data Functions.
a. No additional functions.

K. Loop 95-18: CL2 Gas Detection.
1. Local Control Functions:
a. Sensors specified under Division 26 shall detect CHLORINE GAS CONCENTRATION.
b. Hazardous gas transmitters specified under Division 26 shall provide CHLORINE GAS CONECNTRATION level signals to SCADA.
c. Exterior alarm beacon specified under Division 26 shall locally display a gas alarm condition.
2. Motor Controller Functions (Local Panel):
a. None.
3. SCADA System Control Functions.
a. Provide monitoring of CHLORINE GAS CONCENTRATION level signal.
b. Provide fan required signals based on operator adjustable hazardous gas levels per HVAC sequence and P&ID.
4. SCADA System Monitoring Functions.
a. Display, trend, and record the following parameters: CHLORINE GAS CONCENTRATION LEVEL.
b. Incorporate in the alarm notification system and display the following alarm conditions: HAZARDOUS GAS ALARM.
5. SCADA System Alarming.

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a. Alarm on Fan Fail to Run.

6. SCADA System Historical Data Functions.
   a. No additional functions.

L. Loop 95-19: RESERVED FOR FUTURE USE

M. Loop 95-20: Temperature Monitoring and HVAC Control.
1. General.
   a. Provide SCADA control utilizing load relays for 120V fans and associate dampers.
   b. Provide all motor control per HVAC requirements.
2. Local Control Functions:
   a. Thermostats specified under Division 23 shall detect LOW TEMPERATURE and HIGH TEMPERATURE conditions.
   b. Temperature transmitters provided under Division 26 shall detect room temperatures and provide analog signals to SCADA.
   c. Local control station shall have HAND-OFF-AUTO selector switch and RUN light.
      1) Fan RUN condition shall illuminate local RUN light.
   d. Local light switch shall provide OCCUPANCY signal for 95-EF-2 to run Fan while room is occupied.
3. Motor Control Center Functions:
   a. None.
4. SCADA System Control Functions.
   a. Control panel mounted current switch specified under Division 26 shall detect 120V fan RUN condition.
   b. Provide for monitoring of 120V fan RUN signal from current switch.
   c. Provide fan required signals based on temperature inputs from thermostats and PLC timers per HVAC sequence and P&ID.
5. SCADA System Monitoring Functions.
   a. Display the following status conditions: 120V FAN REQUIRED and RUN.
   b. Incorporate into the alarm notification system and display the following alarm conditions: CALL-TO-RUN FAIL.
6. SCADA System Alarming.
   a. No additional functions.
7. SCADA System Historical Data Functions.
   a. No additional functions.

N. Loop 95-21: Fire Suppression System.
1. General.
   a. Fire Suppression System Control Panel is provided under another Division.
2. Local Control Functions:
   a. Operation of the Fire Suppression System shall be through the vendor supplied control panel.
   b. Smoke detectors and manual pull stations provided under another Division shall detect all monitoring.
3. Motor Control Center Functions:
   a. None.
4. SCADA System Control Functions.
   a. Upon FIRE DETECTION the Fire Suppression System Control Panel shall send a signal to SCADA notifying FIRE and to 95-ATS-16-1 to prevent STANDBY GENERATOR REQUIRED signal.
5. SCADA System Monitoring Functions.
   a. Monitor the following signals: FIRE DETECTED.
6. SCADA System Alarming.
   a. No additional functions.
7. SCADA System Historical Data Functions.

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a. No additional functions.

O. Loop 95-22: Intrusion.
1. Local Control Functions:
a. Intrusion switches provided under Division 26 shall detect if there is any entry to Well No. 9 and shall provide intrusion signal to SCADA.
2. SCADA System Control Functions.
a. Provide intrusion monitoring per P& ID and as follows:
1) Provide unlabeled front of panel lighted switch. The switch shall be lit when system is armed. The SCADA system shall alarm after a pre-set time if the enable/disable button is not depressed.
2) Provide SCADA intrusion alarm on door operation after operator adjusted period.
3) Defeat intrusion alarm for operator adjustable period and turn off light when lighted push button is pressed.
4) Automatically re-arm system after operator adjustable period.
3. SCADA System Monitoring Functions.
a. Display and record the following parameters:
1) Monitor WELL NO.9 INTRUSION signals.
4. SCADA System Alarming.
a. Generate alarm on WELL NO. INTRUSION.
5. SCADA System Historical Data Functions.
a. No additional functions.

P. Loop 95-23: Primary and Backup Alarm Management.
1. Local Control Functions:
a. 20-channel hardware alarm dialer specified under Division 26 shall provide backup alarm handling.
2. SCADA System Control Functions.
a. When alarms are generated by the SCADA system, initiate alarm and activate callout.
b. Provide operator entry fields for selection of alarms to be sent to each alarm dialer channel. Each alarm shall be capable of being enabled or disabled through the touchscreen.
3. SCADA System Monitoring Functions.
a. SCADA system alarming as per requirements contained herein and shown on P&IDs.
4. SCADA System Alarming.
a. No additional functions.
5. SCADA System Historical Data Functions.
a. Retain a searchable log of alarm events which can be filtered/sorted by date and Tag.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Field verify with exact measurements, the available mounting space for control system equipment. Identify deficiencies prior to beginning installation.

B. Where ranges are indicated on the contract documents, they are to be considered preliminary. Field verify the exact ranges required based on field conditions.

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3.02 DELIVERY STORAGE AND HANDLING

A. It shall be the responsibility of the installing contractor to receive all process instrumentation and control equipment at the job site. Carefully inspect all equipment for damage prior to accepting from the shipping agency. Do not accept shipment if damage is evident.

B. Exercise due diligence in storing, protecting, and moving process instrumentation and control equipment. Damaged or worn equipment will not be accepted and will be replaced at no additional cost to the Owner.

3.03 INSTALLATION

A. Install equipment in locations as indicated on the contract documents. Adjust locations as needed to ensure operability, serviceability, and compliance with all applicable codes and standards.

B. Installation shall be completely tested prior to start-up. This work includes verification of all field wiring continuity and proper termination of wiring.

3.04 TESTING AND START-UP SERVICES

A. System Integrator shall provide installation and start-up services required to place the complete system into operation.

B. Each signal and function shall be fully tested. These tests shall be based on actual operation of primary elements and verification of proper control system response. Submit test results as part of Operations and Maintenance Manual.

C. Record calibrations of all analog devices.

D. Demonstrate proper operation of the process and instrumentation control system to the Owner and in the presence of the Engineer.

3.05 TRAINING

A. Training shall be suitable for plant operations personnel with limited knowledge of electrical components.

B. Provide two instructor days of operator training at the job site. Training shall consist of operations instruction and maintenance/trouble-shooting instruction.
   1. Operations instruction shall identify all control loops with description of all interlocks, interface with other loops, and operational input requirements. Describe procedures for re-starting the system.
   2. Maintenance instruction shall identify periodic maintenance that can be performed by the operator. Provide description of procedures and locations for replacement of consumable devices such as fuses and for checking the calibration or operation of devices.
   3. Trouble-shooting instruction shall identify simple procedures and methods for identifying potential causes in the event of failures. For example, instruct operator on correlation of input signals and PLC I/O module indicator lights.

END OF SECTION

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SECTION 26 90 10
CONTROL PANEL CONSTRUCTION

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Control Panel Construction.
1. Control Panel Construction shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Control Panel Construction, Lump Sum. When so provided, payment for Control Panel Construction shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Control Panel Construction, Inclusive. When no quantity is provided, Control Panel Construction shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards:
a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
b. ANSI/NFPA 79 - Electrical Standard for Industrial Machinery.
2. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition.
3. Canadian Standards Associates (CSA), Specifications and Standards, Current Edition.
a. CSA Standard C22.2 No. 0 - General Requirements - Canadian Electrical Code, Part II.
b. CSA Standard C22.2 No. 0.4 - Bonding and Grounding of Electrical Equipment (Protective Equipment).
c. CSA Standard C22.2 No. 14 - Industrial Control Equipment for Use in Ordinary (Non-Hazardous) Locations.
d. CSA Standard C22.2 No. 40 - Cutout, Junction, and Pull boxes.
e. CSA Standard C22.2 No. 94 - Special Purpose Enclosures.
4. Electrical and Electronic Manufacturers Association Canada (EEMAC), Specifications and Standards, Current Edition.
5. International Electrotechnical Association (IEC), Specifications and Standards, Current Edition.
a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
b. IEC 60204 - Safety of Machinery - Electrical Equipment of Machines.
c. IEC 60079 - Electrical Apparatus for Explosive Gas Atmospheres.
6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, Current Edition.
a. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
b. NEMA ICS6 - Enclosures for Industrial Controls and Systems.
7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, Current Edition.
a. UL50 - Cabinets and Boxes.
b. UL508 - Industrial Control Equipment.
c. UL508A - Industrial Control Panels.

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d. UL 698A - Industrial Control Panels - with Intrinsically Safe Circuits entering Hazardous Areas.
e. UL94 - Flammability of Plastic Materials.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. All control panels shall be constructed in accordance with UL 508 standards and shall bear the UL 508 listing.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. Provide one spare vapor phase corrosion inhibiting capsule for each control panel.

C. Provide twenty percent of the total number of terminals as installed spares in each control panel.

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1.11 DESIGN REQUIREMENTS

CONTROL PANEL CONSTRUCTION REQUIREMENTS					
TAG NUMBER	DESCRIPTION	TYPE	SIZE	UPS	NOTES
95-LCP-001	Well #9 Local Control Panel	A	36"Wx48"Hx16"D	X	1

Notes:

1. 120VAC UPS required

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Fabricate, install instruments, plumb and wire in factory.

B. Test wiring and plumbing prior to shipment.

C. Make external connections by way of numbered terminal blocks.

D. Separate electrical components from pneumatic and hydraulic components by metal barriers.

E. Conform to ISA standards.

2.02 TYPE A - CONTROL PANEL ENCLOSURE, WALL-MOUNTED

A. Manufacturer:
1. Hoffman Enclosures, Inc. Concept Wall-Mount Enclosure.
2. Saginaw Enclosures.
3. WestTool Enclosures.
4. or equal.

B. Environmental Rating:
1. NEMA Type 1.

C. Construction:
1. 16 gauge or 14 gauge steel.
2. Seams continuously welded and ground smooth.
3. Minimum width body flange trough excludes liquids and contaminants Integral body grounding stud.
4. Panel mounting studs.
5. Mounting holes in back of body for direct mounting Hidden hinges for clean aesthetic appearance Standard full access 170 degree door opening.
6. Doors are interchangeable and easily removable by pulling captive hinge pins.
7. Door bar on hinge side for wire management and grounding Additional door bar and stiffener on larger enclosures for extra rigidity High-impact thermoplastic data pocket.
8. Seamless foam-in-place one-piece gasket provides oil-tight and dust-tight seal against contaminants.
9. Self-grounding latch system with double seal provides maximum protection against leakage.

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10. Quarter-turn door latching system installed on door with a slotted insert Internal, switch operated fluorescent light.
11. Finish:
    a. Gray or textured light gray polyester powder coated inside and out.
    b. Steel sub-panels are painted white.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 CONTROL PANEL FABRICATION AND ENVIRONMENTAL PROTECTION REQUIREMENTS

A. Instrument Mounting:
1. Locate instruments designated for back-of-panel mounting in manner to allow for maintenance and adjustment.
2. Instrument mounting height shall not exceed 6 ft-6 in. Minimum height shall be 4 ft-0 in.
3. Panel cutouts for instruments and other devices, such as lights and switches, shall be cut, punched, or drilled and smoothly finished with rounded edges.
4. Provide steel angle stiffeners on back of panel face to prevent panel deflection under instrument loading or operation.
5. Provide internal structural steel framework for instrument support purposes and panel bracing. Internal framework shall permit lifting of panel without racking or distortion.

B. Equipment Mounting:
1. Provide shelf or bracket support for any equipment not secured to panel, such as a UPS, router, firewall, or Wi-Fi access point. Shelf placement shall allow for bending space for wiring entering panel.

C. Corrosion Protection:
1. Provide vapor phase corrosion inhibiting capsules in each control panel to protect all exposed metal surfaces for a period of at least two years. Corrosion inhibiting modules shall be Northern Instrument Corporation, Zerust vapor capsules Model VC-2-2 or Hoffman Engineering Corporation corrosion inhibitor Model A-HCI-5.
2. Provide thermostatically controlled condensation heater in panels located high humidity areas and in areas in which ambient temperature will vary. Heater shall be sized to prevent condensation within panel.

D. Heating, Ventilating, and Air Conditioning:
1. Provide heating equipment as specified under Part 2.
2. Provide filtered ventilation fan(s) where needed and sized to dissipate heat generated by components located within control panel.
3. Provide filtered air conditioning equipment and insulate panel where needed to maintain internal panel temperature within operating parameters of internal panel components.

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3.05 CONTROL PANEL ELECTRICAL REQUIREMENTS

A. Electric Service:
   1. Design control panel to operate on electrical supply indicated on the drawings.
      a. Three phase service:
         1) Provide main circuit breaker.
         2) Provide branch circuit breakers for distribution of three phase and single phase power at voltages above 120VAC.
         3) Control panel and internal components shall be rated to interrupt the available fault current.
         4) Main circuit breaker and branch circuit breakers shall be coordinated such that a fault in a branch circuit will trip only the branch circuit breaker and not the main circuit breaker.
         5) Separate 480VAC wiring from control voltage wiring.
         6) Provide appropriately sized control power transformer.
         7) Provide miniature circuit breakers for distribution of 120VAC control power in accordance with the following:
            a) No more than 20 devices on any single circuit.
            b) Where multiple units perform parallel operations, do not group all devices on the same branch circuit. The purpose is to prevent the failure of any single branch circuit from shutting down at entire operation.
            c) Do not exceed the ampacity of the branch circuit.
            d) Panel service outlet shall be protected by separate branch circuit breakers.
         8) Power supplies shall be protected by separate branch circuit breakers.
         9) Provide 20 amp, 120VAC service outlet circuit within back-of-panel area.
         10) Control power transformer fuses and branch circuit breakers shall be coordinated such that a fault in a branch circuit will trip only the branch circuit breaker and not the control power transformer fuses.
         11) Branch circuit breakers shall be rated for 15A and 250VAC.
         12) Fuses shall not be substituted for circuit breakers.
      b. Single phase service:
         1) Provide 20A main circuit breaker.
         2) Provide miniature circuit breakers for distribution of 120VAC control power in accordance with the following:
            a) No more than 20 devices on any single circuit.
            b) Where multiple units perform parallel operations, do not group all devices on the same branch circuit. The purpose is to prevent the failure of any single branch circuit from shutting down at entire operation.
            c) Do not exceed the ampacity of the branch circuit.
            d) Panel service outlet shall be protected by separatebranch circuit breakers.
            e) Power supplies shall be protected by separate branch circuit breakers.
         3) Provide 20A, 120VAC service outlet circuit within back-of-panel area - protected by a 15A breaker.
         4) Main circuit breaker and branch circuit breakers shall be coordinated such that a fault in a branch circuit will trip only the branch circuit breaker and not the main circuit breaker.
         5) Branch circuit breakers shall be rated for 15A and 250VAC.
         6) Fuses shall not be substituted for circuit breakers.
      c. Uninterruptible power supply:
         1) Where panel is equipped with an uniterruptible power supply, provide distribution of 120VAC power on the line and load sides of the UPS.
         2) Panel service outlet and other non-critical loads shall be powered from the line side of the UPS. Critical loads, including but not limited to all digital control equipment, shall be powered from the load side of the UPS.

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3) Provide UPS bypass circuitry for 24VDC UPS systems or for systems that do not have a double conversion type UPS installed.

d. Back-up control systems:

1) Where panel includes fail-safe back-up control circuitry, the back-up control circuits shall be fed with a separate circuit from a lighting panel or from a separate control power transformer.

B. Output Signal Fusing:

1. Provide appropriately sized fuses for all output signals to devices located external to the panel in accordance with the following requirements:
   a. Maximum fuse size: 5A.
   b. Separate fuse for each device.
   c. Fuses shall be installed in indicating type fuse holder terminal blocks.

C. Control Panel Wiring:

1. Wiring within panels, consoles, racks, and cabinets shall meet the following requirements:
   a. Wires for ac circuits shall be 300V or 600V, Type MTW stranded copper and shall be sized for the current to be carried but not smaller than No.16 AWG.
   b. Wires for analog signal circuits shall be 300V stranded copper and shall be twisted shielded pairs not smaller than No.18 AWG.
   c. Wires for other dc circuits shall be 300V, Type MTW stranded copper not smaller than No.18 AWG.
   d. Wiring for special signals such as communications, digital data, and multiplexed signals shall use manufacturers standard cables.
2. Terminal blocks for panels, consoles, racks, and cabinets shall meet the following requirements:
   a. Wire all spare or unused panel mounted elements, including PLC input/output points, to terminal blocks.
   b. Provide open construction terminal blocks for wiring that is entirely internal to the panel.
   c. Provide isolation switch terminal blocks for all wiring that is not entirely internal to the panel.
   d. Rail-mount individual terminals to create a complete assembly. Provide terminals constructed such that jumpers can be installed with no loss of space on terminal or rail.
   e. Size all terminal block components to allow insertion of all necessary wire sizes and types.
   f. Provide power distribution blocks for distribution of control panel power at voltages exceeding 120VAC.
3. Grounding:
   a. Panels, consoles, racks, and cabinets shall be provided with an isolated copper grounding bus for all signal and shield ground connections. This ground bus shall be grounded at a common single ground point. The signal grounding system shall meet National Electrical Code requirements.
   b. Each analog loop shall only be grounded at a single point for the loop. This single point shall be at the location of the dc power supply for the loop.

D. Power Supplies:

1. Provide dc power supplies as required to power instruments requiring external dc power, including two-wire transmitters and dc relays.
2. Power supplies shall be suitable for intrinsically safe circuits where two-wire transmitters are located in a hazardous area.

E. Electrical Transient Protection:

1. All electrical and electronic elements of the control system shall be protected against damage due to electrical transients induced in interconnecting lines from lighting discharges and nearby electrical systems.
2. Surge Suppressor Locations:
   a. As a minimum, provide surge suppressors at the following locations:

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1) Provide 480VAC, panel mounted surge suppressor on the load side of each 480VAC main circuit breaker in each panel.
2) Provide 120VAC, panel mounted surge suppressor on the load side of each 120VAC main circuit breaker in each panel.
3) Provide 24VDC, panel mounted surge suppressor at the panel connections of all analog signal circuits that have any portion of the circuit extending outside of a protecting building.
4) Provide 24VDC, field mounted surge suppressor at the field connection of each analog signal transmitter located outside of a protecting building.

3.06 STANDARD SIGNAL INTERFACES

A. Unless otherwise specified discrete input and output signals shall conform to the following:
1. Isolated unpowered (dry) contact closures.
2. Power contact from panel receiving signal or device receiving signal.

B. Unless otherwise specified input and output analog signals shall conform to following:
1. External to panel: isolated, 4-20 mADC.
2. Internal to panel: 1 to 5VDC signals.
3. For 2-wire transmitter provide isolated type and power with 24VDC from panel or device receiving signal.
4. Where isolation is required to interface with particular equipment or because of loop impedance, provide isoloated, DC-to-DC transmitter.

3.07 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.08 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 11
CONTROL PANEL COMPONENTS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Control Panel Components.
1. Control Panel Components shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Conditions - Division 1.
a. Control Panel Components, Lump Sum. When so provided, payment for Control Panel Components shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 1.
b. Control Panel Components, Inclusive. When no quantity is provided, Control Panel Components shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
b. ANSI/IEEE C37.90 - IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus.
c. ANSI/IEEE C62.11- IEEE Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits.
d. ANSI/IEEE C62.34 - IEEE Standard for Performance of Low-Voltage Surge-Protective Devices (Secondary Arresters).
e. ANSI/IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
2. CE - European Community, Applicable Directives.
a. EN50005 - for Terminal Markings.
b. EN50081-1- Generic Emission Standard.
c. EN50082-1 - Generic Immunity Standard.
d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
3. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA C22.2, Industrial Control Equipment.
4. CUL - Underwriter's Laboratories of Canada.
5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
a. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

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b. NEMA ICS 3 - Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.

7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL508 - Industrial Control Equipment.
   b. UL508A - Industrial Control Panels.
   c. UL 913 - Intrinsically Safe Specification.
   d. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

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B. Supply two spare lamps of each type supplied for this project.

C. Supply two spare relays of each type supplied for this project.

PART 2 PRODUCTS

2.01 CIRCUIT BREAKER - MINIATURE

A. Manufacturer:
   1. Square D QOU Unit Mount Class 720.
   2. Or equal.

B. Agency Approvals:
   1. UL Listed.

C. General:
   1. Surface, flush or DIN rail mounting in one-, two- and three-pole construction.
   2. Used for overcurrent protection and switching on both ac and dc systems.

D. Construction:
   1. Terminal lug wire size: 1- No.14 - No.2 AWG Cu or Al.
   2. Reversible line and load lugs for convenient flush or surface mount wiring.
   3. DIN mounted (symmetrical rail 35 x 7.5 DIN/EN 50 022).
   4. UL Listed as HACR type -- 15A to 70A.
   5. Field installable quick connectors.
   6. Single handle with internal common trip.
   7. UL Listed 48VDC (5,000 AIR).

2.02 CONTROL POWER TRANSFORMER

A. Manufacturer:
   1. Cutler Hammer, Type MTE.
   2. Square D.
   3. Or equal.

B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.

C. Construction:
   1. Epoxy encapsulated coils.
   2. High quality silicon steel laminations.
   3. Copper magnet wire.
   4. 55 degree C rise, Class 105 insulation system.
   5. Molded terminals.

D. Electrical:
   1. Capacity:
      a. Select transformer VA rating based upon connected load with an additional 25 percent spare capacity.
   2. Primary terminals:
      a. 240 x 480VAC.
      b. 230 x 460VAC.
      c. 220 x 440VAC.

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d. Finger-safe terminal covers.

3. Secondary terminals:
   a. a.120VAC.
   b. 115VAC.
   c. 110VAC.
   d. Finger-safe terminal covers.
4. Fusing:
   a. Dual primary fuse block.
   b. Single secondary fuse block.
   c. Finger-safe fuse block covers.
   d. Class CC fuses, sized for VA rating of transformer.
5. Mounting:
   a. Back panel.

2.03 PILOT DEVICE - INDICATING LIGHT

A. Manufacturer:
   1. Allen Bradley Bulletin 800T/800H.
   2. Cutler-Hammer.
   3. Square D.

B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.
   3. CE Compliant.

C. Mechanical:
   1. Size: 30.5 mm.
   2. Environmental rating:
      a. NEMA 4/13 watertight/oiltight: NEMA 1, 12, 3R, 4 control panels.
      b. NEMA 4/4X corrosion resistant: NEMA 4X control panels and remote control stations.
   3. Life expectancy: 200,000 operations.
   4. Push-to-test, transformer type, dual input.

D. Electrical:
   1. Input power: 120VAC.
   2. Lamp:
      a. High visibility, 28 chip cluster LED.
      b. Color: red, green, amber, as scheduled.
   3. Lens: High impact plastic, colored to match lamp.

E. Nameplate: Standard or jumbo with engraved service legend.

F. Field Mounted Control Stations:
   1. Type I Enclosure: NEMA 4X polycarbonate enclosure.
   2. Type II Enclosure: NEMA 4X stainless steel enclosure.
   3. Type III Enclosure: NEMA 7 hazardous location enclosure.

2.04 PILOT DEVICE - PUSHBUTTON

A. Manufacturer:
   1. Allen Bradley Bulletin 800T/800H.
   2. Cutler-Hammer.
   3. Square D.

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B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.
   3. CE Compliant.

C. Mechanical:
   1. Size: 30.5 mm.
   2. Environmental rating:
      a. NEMA 4/13 watertight/oiltight: NEMA 1, 12, 3R, 4 control panels.
      b. NEMA 4/4X corrosion resistant: NEMA 4X control panels and remote control stations.
   3. Life expectancy: 10,000,000 operations.
   4. Momentary contact, non-illuminated.

D. Electrical:
   1. Rated Voltage: 120VAC.
   2. Continuous current rating:
      a. AC: 10A.
      b. DC: 2.5A.
   3. Operational current:
      a. Make: 7200VA.
      b. Break: 720VA.
   4. Operator:
      a. Mushroom head: Emergency stop service.
      b. Flush-head: All other services.

E. Nameplate: Standard or jumbo with engraved service legend.

F. Field Mounted Control Stations:
   1. Type I Enclosure: NEMA 4X polycarbonate enclosure.
   2. Type II Enclosure: NEMA 4X stainless steel enclosure.
   3. Type III Enclosure: NEMA 7 hazardous location enclosure.

2.05 PILOT DEVICE - SELECTOR SWITCH

A. Manufacturer:
   1. Allen Bradley Bulletin 800T/800H.
   2. Cutler-Hammer.
   3. Square D.

B. Agency Approvals:
   1. UL Listed.
   2. CSA Certified.
   3. CE Compliant.

C. Mechanical:
   1. Size: 30.5 mm.
   2. Environmental rating:
      a. NEMA 4/13 watertight/oiltight: NEMA 1, 12, 3R, 4 control panels.
      b. NEMA 4/4X corrosion resistant: NEMA 4X control panels and remote control stations.
   3. Life expectancy: 1,000,000 operations.
   4. Maintained contact, non-illuminated (spring return from right or left where scheduled).

D. Electrical:
   1. Rated Voltage: 120VAC.
   2. Continuous current rating:

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a. AC: 10A.
b. DC: 2.5A.

3. Operational current:
a. Make: 7200VA.
b. Break: 720VA.

4. Operator:
a. Standard knob operator, two-position, or three-position.
b. Keyed operator: where scheduled.

E. Nameplate: Standard or jumbo with engraved service legend.

F. Field Mounted Control Stations:
1. Type I Enclosure: NEMA 4X polycarbonate enclosure.
2. Type II Enclosure: NEMA 4X stainless steel enclosure.
3. Type III Enclosure: NEMA 7 hazardous location enclosure.

2.06 POWER SUPPLY - 12/24VDC

A. Manufacturer:
1. Phoenix Contact Quint Series.
2. SOLA/Hevi-Duty Series SDP.
3. Or equal.

B. Agency Approvals:
1. UL Listed.
2. CSA Approved.

C. Mechanical:
1. Enclosure:
a. IP20.
b. Sealed plastic.
c. Fine ventilation grid.
2. Mounting: DIN rail.

D. Electrical:
1. Capacity:
a. Size to power connected loads. Reserve 25 percent of capacity for future use.
b. Provide multiple power supplies where needed to accommodate load.
2. Input:
a. Voltage: 100-240VAC.
b. Frequency: 45-65Hz.
c. Efficiency: 88.5 percent.
d. Current: 1.0A at 100VAC.
3. Output:
a. Voltage: 24VDC +/- 1% or 10-12VDC.
b. Voltage regulation: 1 percent.
c. Overvoltage protection: <32 VDC.
d. Noise suppression: EMI values below EN50081-1.
e. Current: 120W at 24VDC or 2.5A at 12VDC.
4. Redundancy Module.
a. For MCC applications provide active redundance module.
b. Auto Current Balancing.
c. Evenly distributes load balance between power supplies.
d. Over Voltage Protection.
5. Monitoring:

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a. LED Indicator.
b. Output power good status contact.

2.07 POWER SUPPLY - 120VAC, UNINTERRUPTIBLE

A. Manufacturer:
1. APC Smart-UPS.
2. Eaton/Powerware 9SX.
3. Or equal.

B. Agency Approvals:
1. UL Listed.
2. CE Marked.
3. FCC Approved.

C. General:
1. Topology: True online, double-conversion.
2. Diagnostics: Full system self-test on power up.
3. UPS Bypass Automatic: on Overload or UPS failure less than 4 ms.
4. Transfer Time to battery: 0 ms.
5. Overload Capacity:
a. 125 percent for 10 minutes before transfer to bypass.
b. 150 percent for 10 seconds before transfer to bypass.

D. Input:
1. Input voltage: 80-144VAC, single phase, 60 Hz.
2. Input power factor: greater than 95 percent.
3. Input Line: NEMA 5-15 plug and cord.
4. Protection: fuse or circuit breaker.

E. Electrical Output:
1. Voltage Regulation:
a. On Utility: +/-2 percent of nominal.
b. On Battery: +/-3 percent of nominal.
2. Nominal Output Voltage: Same as selected input voltage.
3. Output Voltage Waveform: Sine Wave.
4. Output Voltage Distortion: less than 3 percent THD.
5. Output Line: 4 NEMA 5-15 receptacles, minimum.
6. Output protection: Electronic overload sensing, and circuit breaker protection.
7. Efficiency:
a. Online Mode: greater than 86 percent.
b. Hi-Efficiency Mode: greater than 90 percent.

F. Battery:
1. Internal Battery type: Sealed, lead-acid; maintenance free.
2. On Battery Runtime: ten minutes.
3. Battery Replacement: Hot-swappable internal batteries.
4. Recharge Time: less than 4 hours to 90 percent capacity.
5. Start-On-Battery: Allows start of UPS without utility input.

G. Environmental:
1. Temperature:
a. Operating: 32 to 104 degrees F.
b. Storage: 5 to degrees 122 F.
2. Relative Humidity: 0 to 95 percent non-condensing.

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3. Audible Noise at 1 meter: less than 52dB.
4. Altitude: 10,000 feet without deteriorating.

H. Communications:
1. Relay Output:
   a. Common Alarm.
   b. Low Battery.
   c. UPS Fault.
2. User Interface: LCD status screen.
3. Audible Alarms UPS alarm conditions, including:
   a. On-Battery.
   b. Low Battery.
   c. Overload.
   d. UPS Fault.
4. Communications: One RS232 Serial Port; One Communications Slot; One USB Port.
5. Communications cable: 6-foot communications cable included.
6. Power Management Software: Powerware Software Suite CD.

I. Manufacturers Warranty:
1. Warranty: 2 year comprehensive, including battery.
2. Equipment Protection Policy: $25,000 lifetime protection including lightning damage.

2.08 RELAY - 120V GENERAL PURPOSE

A. Manufacturer:
1. Allen Bradley Bulletin 700-HB.
2. Finder 55 Series.
3. Or equal.

B. Agency Approvals:
1. UL Listed.
2. CE Marked.

C. Mechanical:
1. Enclosure: Transparent dust cover.
2. Contacts: Silver cadmium oxide.
3. Insulating Material: Molded, high dielectric.
4. Terminal Markings: In accordance with EN50-0005.
5. Life expectancy: 10,000,000 operations.
6. Operations:
   a. Pickup: 20 mS.
   b. Dropout: 4 mS.
   c. Maximum Rate: Four operations per second.
7. Blade style, quick connect terminals.

D. Electrical:
1. Contacts:
   a. Double-pole, double throw.
   b. Rated thermal current: 15A.
   c. Make: 60A.
   d. Break: 6A.
2. Coil:
   a. 120 VAC + 10, -20 percent.
   b. Consumption.
      1) Inrush: 2.85 VA.

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2) Sealed: 1.9 VA.

3. Voltage:
   a. Rated Insulation Voltage: 250V IEC-300V UL/CSA.
   b. Dielectric Withstand Voltage:
      1) Pole-to-Pole: 1500V.
      2) Contact to Coil: 6000V.
      3) Contact to Frame: 4000V.
4. Push-to-Test Operator.
5. Pilot light.

E. Relay Socket:
1. 11-blade.
2. Finger-safe terminal.
3. DIN rail mounted.
4. Double tier.
5. Retainer clip.
6. Relay identification snap-in markers.

2.09 RELAY - SOLID STATE

A. Manufacturer:
1. Allen Bradley Bulletin 700-SH.
2. Or equal.

B. Agency Approvals:
1. UL Recognized.
2. CE Marked.

C. Electrical:
1. Input:
   a. Voltage: 4-32VDC.
   b. Impedance: 15mA, maximum, voltage dependent.
   c. Pick-up voltage: 4VDC.
   d. Drop-out Voltage: 1VDC.
   e. Dielectric Strength: 2500VACrms.
   f. Reverse voltage protection.
2. Output:
   a. Continuous current: 10A.
   b. Voltage range: 19-264VAC.
   c. Contact: SPST - N.O.
   d. Off State leakage: 5 mA max (at 100VAC).
   e. Turn-On/Turn-Off time; 0.5 cycle.
3. Features:
   a. Photo isolation.
   b. Dual SCR output.
   c. Built-in snubber.

2.10 RELAY - TIME DELAY

A. Manufacturer:
1. Allen Bradley Bulletin 700-HS.
2. Finder 80 or 85 Series.
3. Or equal.

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B. Agency Approvals:
1. UL Listed.
2. CE Marked.

C. Mechanical:
1. Insulation resistance: 100 Mohms, minimum.
2. Dielectric strength: 1500VAC, 1 minute.
3. Vibration resistance: 6N.
4. Shock resistance: 500N.
5. Operating temperature: -20 to 65 degrees C.
6. Operating humidity: 45 to 85 percent, relative.
7. Blade style: quick-connect terminals.

D. Electrical:
1. Contacts:
   a. Two Form C double-pole, double-throw.
   b. 10A, 240VAC, resistive.
2. Timing functions:
   a. Delay on make/interval.
   b. Delay on break/single shot.
   c. Range: 0.1 seconds - 10 minutes, or 0.1 minutes - 10 hours.
3. Accuracy:
   a. Repeat: + 0.25 percent.
   b. Voltage: + 1.0 percent.
   c. Temperature error: + 2.0 percent.
   d. Setting error: + 10.0 percent.

E. Relay Socket:
1. 11-blade.
2. Finger-safe terminal.
3. DIN rail mounted.
4. Double tier.
5. Retainer clip.
6. Relay identification snap-in markers.

2.11 SURGE SUPPRESSOR - 24VDC/120VAC SIGNAL, PANEL MOUNTED

A. Manufacturer:
1. Circuit Components Incorporated, Surge Control SPU Series.
   a. Base Module: SPU-xx-LM.
   b. Daugher Module: SPU-xx-CD-30/120.
2. Or equal.

B. Agency Approvals:
1. UL Listed.

C. General Description:
1. Performance exceeds highest class severity level of IEC/EN 61000-4-4 and 61000-4-5.
2. Enhanced filtering to attenuate high frequency and bring equipment into compliance with IEEE /ANSI C37.90.1.
3. Universal hardwired version for all I/O modules including AC, DC, contact output, current output and signal input.
4. Multi-stage design provides the most effective suppression and filtering available, and requires no additional secondary protection.

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5. Sub-nano second response time stops failures due to lightning, spikes and over-voltage surges while filtering all other electrical noise.
6. Plug-in replaceable daughter card modules contain all active surge suppression.
7. Space efficient protector is hermetically sealed and suitable for the most harsh industrial environments.
8. Universal DIN-Rail mounting allows easy installation on any standard DIN-Rail configuration.
9. Automatic reset and fail safe design requires no maintenance. Eliminates “Out of Service” downtime and repair/replacement costs caused by damaging electrical surges.
10. Protection for current loop instrumentation and low frequency signal/data lines.
11. UL-497B listed for Data Models (60 VDC or less) UL file E205158.

D. Electrical:
1. Signal Channels: 5, 10, 15, or 20.
2. Operating: +/-30VDC.
3. Maximum Operating Voltage: 33VDC.
4. Maximum Operating Current: 0.5A.
5. Clamping Action Turn-On: 37.1V.
6. Maximum Clamping (8x20 micro-seconds): 52V.
7. Maximum Surge Voltage: 6kV.
8. Maximum Surge Current (8x20 micro-seconds): 2.5kA.
9. Response Time: Less than 1 nanosecond.
10. Operating & Storage Temperature: -40 to 85 degrees C.

2.12 TERMINAL BLOCK - INDICATING FUSED

A. Manufacturer:
1. Allen Bradley Bulletin 1492-H4 (AC) or 1492-H5 (DC).
2. Or equal.

B. Agency Approvals:
1. UL.
2. CSA.
3. IEC.

C. Specifications:
1. Voltage Rating: 300VAC/VDC.
2. Maximum Current: 12A.
3. Wire Range (Rated Cross Section): No.30 to no.12 AWG.
4. Leakage Current:
   a. 2 mA at 300VAC.
   b. 2 mA at 24VDC.
5. Working Voltage:
   a. 100 to 300VAC.
   b. 10 to 57VAC/VDC.
6. Fuse Size: 1/4 in x 1-1/4 in.
7. Wire Strip Length 0.38 in.
8. Tightening Torque: 3 to 7 lb-in.
9. Density: 33 pcs./ft.
10. Insulation Temperature Range: -40 to 221 degrees F.
11. Accessories:
    a. Aluminum DIN Rail with Standoff Brackets.
    b. End Barrier and End Anchors.
    c. Side Jumper Insulating Sleeve.
    d. Marking Systems.

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2.13 TERMINAL BLOCK - ISOLATING SWITCH

A. Manufacturer:
   1. Allen Bradley Bulletin 1492-H7.
   2. Or equal.

B. Agency Approvals:
   1. UL.
   2. CSA.
   3. IEC.

C. Specifications:
   1. Voltage Rating: 300VAC/VDC.
   2. Maximum Current: 15A.
   3. Wire Range (Rated Cross Section): No.30 to No.12 AWG.
   4. Leakage Current:
      a. 2 mA at 300VAC.
      b. 2 mA at 24VDC.
   5. Working Voltage:
      a. 100 to 300VAC.
      b. 10 to 57VAC/VDC.
   6. Dummy Fuse Size: 1/4 in x 1-1/4 in.
   7. Wire Strip Length 0.38 in.
   8. Tightening Torque: 3 to 7 lb-in.
   9. Density: 33 pcs./ft.
   10. Insulation Temperature Range: -40 to 221 degrees F.
   11. Accessories:
      a. Aluminum DIN Rail with Standoff Brackets.
      b. End Barrier and End Anchors.
      c. Side Jumper Insulating Sleeve.
      d. Marking Systems.

2.14 TERMINAL BLOCK - OPEN STYLE

A. Manufacturer:
   1. Allen Bradley Bulletin 1492-CAM1.
   2. Or equal.

B. Agency Approvals:
   1. UL.
   2. CSA.
   3. IEC.

C. Specifications:
   1. Voltage Rating: 600VAC/VDC.
   2. Maximum Current: 65A.
   3. Wire Range (Rated Cross Section): No.22 to No.8 AWG.
   4. Wire Strip Length 0.38 in.
   5. Tightening Torque: 10 to 16 lb-in.
   6. Density: 30 pcs./ft.
   7. Insulation Temperature Range: -40 to 221 degrees F.
   8. Accessories:
      a. Aluminum DIN Rail with Standoff Brackets.
      b. End Barrier and End Anchors.
      c. Side Jumper Insulating Sleeve.

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d. Marking Systems.

2.15 TRANSMITTER - ISOLATED DC TO DC

A. Manufacturer:
1. Wilkerson Instrument Co., Model MM4300A.
2. Or equal.

B. Agency Approvals:
1. UL Listed.

C. Construction:
1. 8-pin, relay socket.
2. Operating temperature: -10 to 60 degrees C.

D. Electrical:
1. Input: 4-20 mADC or 0-10VDC.
2. Input impedance:
a. Voltage: 200 kOhms.
b. Current 50 Ohms.
3. Output range:
a. Voltage: 0 - 10 VDC, 2 kOhm minimum load.
b. Current: 4-20 mADC, 24VDC compliance (1200 ohms/20 mADC).
4. Response time: Less than 100 ms.
5. Accuracy: + 0.1 percent of span.
6. Linearity: + 0.05 percent of span.
7. Common mode rejection: 120 dB.
8. Isolation:
a. 500 megohms.
b. 1000VAC.

E. Manufacturer's Warranty:
1. 10 year limited.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 20
INSTRUMENTATION DEVICES

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Instrumentation Devices.
1. Instrumentation Devices shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Instrumentation Devices, Lump Sum. When so provided, payment for Instrumentation Devices shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Instrumentation Devices, Inclusive. When no quantity is provided, Instrumentation Devices shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
b. ANSI/IEEE C37.90 - IEEE Standard for Relays and Relay Systems Associated with Electric Power Apparatus.
c. ANSI/IEEE C62.11- IEEE Standard for Metal-Oxide Surge Arresters for Alternating Current Power Circuits.
d. ANSI/IEEE C62.34 - IEEE Standard for Performance of Low-Voltage Surge-Protective Devices (Secondary Arresters).
e. ANSI/IEEE C62.41 - IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits.
2. CE - European Community, Applicable Directives.
a. EN50005 - for Terminal Markings.
b. EN50081-1- Generic Emission Standard.
c. EN50082-1 - Generic Immunity Standard.
d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
3. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA C22.2, Industrial Control Equipment.
4. CUL - Underwriter's Laboratories of Canada.
5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
a. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
a. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

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b. NEMA ICS 3 - Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.

7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL508 - Industrial Control Equipment.
   b. UL508A - Industrial Control Panels.
   c. UL 913 - Intrinsically Safe Specification.
   d. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

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1.11 DESIGN REQUIREMENTS

TYPE	TAG NUMBER	INSTRUMENT DESCRIPTION
26 90 11	XS-95-1-1	WELL NO.9 LOCAL CONTROL STATION (HOA)
26 90 11	XS-95-3-1	HIGH LIFT PUMP NO.1A LOCAL CONTROL STATION (HOA)
26 90 11	XS-95-14-2	CHLORINATION BOOSTER PUMP NO.1 LOCAL CONTROL PANEL (HOA)
26 90 11	XS-95-20-1	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.1 LOCAL CONTROL STATION (ON/OFF, RUN LT)
26 90 11	XS-95-20-3	CHEMICAL ROOM EXHAUST FAN LOCAL CONTROL STATION (ON/OFF, RUN LT)
26 90 11	XS-100-3-1	HIGH LIFT PUMP NO.2A LOCAL CONTROL STATION (HOA)
A4	AE-95-18-1	CHLORINE GAS SENSOR
A4	AIT-95-18-1	CHLORINE GAS SYSTEM ANALYZER/TRANSMITTER
F7	FE/FIT-95-1-1	WELL NO.9 FLOW METER SENSOR/FLOW INDICATOR AND TRANSMITTER
F7	FE/FIT-95-3-1	HIGH LIFT PUMP NO.1A FLOW SENSOR/FLOW INDICATOR AND TRANSMITTER
F12	FS-95-1-1	WELL NO.9 FLOW SWITCH
F12	FS-95-3-1	HIGH LIFT PUMP NO.1A POSITIVE FLOW SWITCH
F12	FS-100-3-1	HIGH LIFT PUMP NO.2A POSITIVE FLOW SWITCH
J1	JIT-95-16-1	MAIN SERVICE POWER MONITOR
L2	LT-95-3-1	DETENTION TANK NO.1 SUBMERSIBLE LEVEL TRANSMITTER
L2	LT-100-3-1	DETENTION TANK NO.2 SUBMERSIBLE LEVEL TRANSMITTER
L6	LSC-95-3-1	DETENTION TANK NO.1 PUMP ON BACKUP FLOAT SWITCH
L6	LSH-95-3-1	DETENTION TANK NO.1 HIGH-LEVEL BACKUP FLOAT SWITCH
L6	LSL-95-3-1	DETENTION TANK NO.1 LOW-LEVEL BACKUP FLOAT SWITCH
L6	LSC-100-3-1	DETENTION TANK NO.2 PUMP ON BACKUP FLOAT SWITCH
L6	LSH-100-3-1	DETENTION TANK NO.2 HIGH-LEVEL BACKUP FLOAT SWITCH
L6	LSL-100-3-1	DETENTION TANK NO.2 LOW-LEVEL BACKUP FLOAT SWITCH
T7	TT-95-20-1	CHLORINE GAS ROOM TEMPERATURE TRANSMITTER
T7	TT-95-20-3	CHEMICAL ROOM TEMPERATURE TRANSMITTER
T7	TT-95-20-4	TREATMENT TEMPERATURE TRANSMITTER
X1	YL-95-18-1	CHLORINE ROOM GAS SYSTEM ALARM BEACON
Z2	ZS-95-22-1	ELECTRICAL ROOM INTRUSION SWITCH
Z2	ZS-95-22-2	CHEMICAL ROOM INTRUSION SWITCH
Z2	ZS-95-22-3	CHLORINE GAS ROOM INTRUSION SWITCH
Z2	ZS-95-22-4	TREATMENT INTRUSION SWITCH NO.1 (SOUTHEAST DOOR)
Z2	ZS-95-22-5	TREATMENT INTRUSION SWITCH NO.2 (DOUBLE DOOR)
Z2	ZS-95-22-6	TREATMENT INTRUSION SWITCH NO.3 (NORTH DOOR)

PART 2 PRODUCTS

2.01 A4 - GAS ANALYZER/TRANSMITTER, CHLORINE GAS

A. Manufacturer:
   1. MSA.
   2. Sieger.
   3. Sierra.
   4. Or equal.

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B. Description.
1. Analyze for chlorine gas.
2. Sample Mode: Diffusion - no pumps considered.
3. Provide single individual sensors for each gas detected. Provide infra-red type sensor for combustibles. Provide extension kit to allow mounting of the hydrogen sulfide sensor at 6" A.F.F. with transmitter at 48" A.F.F.
4. Provide continuous level indication for each channel.
5. Output: SPDT dry contacts, rated 5A, 250V.
6. Power Supply: 120V, 60 Hz.
7. Control panel consisting of alarm lights and horn rated for NEMA 4X. Provide integral, thermostatically controlled, anti-condensation heater for outdoor installations.
8. Provide local, audible, and visual alarm, with reset switch integral to monitor.
9. Provide Hi-Lo dual alarm level for each channel (warning, alarm) and common alarm for fail and power loss.
10. Calibration kit, including gases.

2.02 F7 - ZERO LAY LENGTH FLOW METER, MAGMETER

A. Manufacturer:
1. Electromagnetic Sensor:
a. Endress Hauser Promag W0x DN.
b. Or Equal.
2. Signal Converter:
a. Endress Proline 400 or better.
b. Or Equal.

B. Electromagnetic Sensor:
1. ANSI B 16.5 Class 150, fully rated carbon steel flanges.
2. Elastomer (chlorobutyl rubber) liner.
3. Requires No Upstream or Downstream pipe lay lengths for 0.5% accuracy.
4. Full Bore construction causing no pipe restrictions or pressure loss through meter.
5. Flush elliptical Hastelloy C electrodes.
6. Ratings.
a. Minimum primary rated NEMA 4 (IP67), or as indicated on drawings.
b. IP 68 with factory potted sensor for below grade installation.
7. Include two 316 stainless steel grounding rings.
8. Suitable for process fluid temperature of 150 degrees F.
9. The sensor shall be rated for installation in harardous classified space as indicated on drawings.

C. Signal Converter:
1. Remote mounted signal converter rated NEMA 4X (IP65).
2. Isolated 4-20mA active output @ 800 Ohm load.
3. Isolated digital pulse output: active or passive.
4. Low flow cutoff programmable from 1 to 20%.
5. Programmable time constant for pulse and analog outputs from 0.2 to 99 seconds.
6. Minimum accuracy of actual flow of 0.3%.
7. Digital signal processing to attenuate flow noise.
8. 115/230 VAC, 48-63 HZ, 8 VA powered.
9. 3-line, LCD display for actual flow rate, flow totalization, programming, and diagnostics.
10. Read-out in gallons/minute for rate and gallons for total.
11. Be fully bi-directional for the display and outputs.
12. Totalize plus flow, minus flow, and sum the difference.
13. Be capable of measuring fluid with up to 5% non-conductive solids by weight without loss of accuracy or response.
14. Have empty pipe zero stabilization.

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D. Installation:
1. Provide 0 diameters upstream and 0- diameters downstream of clear uninterrupted straight pipe the same size as the meter.
2. Manufacturer to provide sufficient double shield signal cable.

2.03 F12 - FLOW SWITCH, PADDLE

A. Manufacturer:
1. GEMS Sensors FS-550 Series - High Pressure, Metal Paddle Switch.
2. Kobold Model PS - High Pressure switch with magnetic coupling.
3. Or equal.

B. General:
1. Switch sense liquid flow in either direction to monitor flow/no-flow conditions.
2. The paddle shall be trimmed during installation to permit switch actuation at the desired flow rate.
3. As flow increases in a pipe, the paddle of the switch pivots to move out of the liquid path, producing less than 3 PSIG of pressure drop regardless of pipe size.

C. Specifications:
1. Wetted Materials:
a. Housing: Brass or 316 Stainless Steel.
b. Paddle: 302 Stainless Steel.
c. Spring: 316 Stainless Steel.
d. Other Wetted Parts: Ceramic and Teflon.
2. Pipe Line Size: 1-1/4½ and Up.
3. Setting Type: Fixed.
4. Operating Pressure, Maximum: 2000 PSIG.
5. Pressure Drop: 3 PSIG Maximum.
6. Operating Temperature: -30 to 300 degrees F (-34.4 to 148.9 degrees C).
7. Set Point Accuracy: +/-25 percent.
8. Switch: SPDT, 20 VA.
9. Repeatability: +/-5 percent.
10. Electrical Termination: No.18 AWG, 24-in, Polymeric Lead Wires.

2.04 J1 - DIGITAL POWER MONITOR

A. Manufacturer:
1. Rockwell/Allen Bradley Power Monitor 500 w/ Firmware 5.00 or greater.

B. Function: capable of monitoring frequency, current, voltage, power factor, real power, reactive power, apparent power, average current, and peak current, average and peak demand, accumulated energy.

C. Enclosure: NEMA 12.

D. Display: door mounted, accessible without opening enclosure.

E. Communication: Ethernet/IP.

F. Application: main distribution panel, 480/277V, 3-phase, 4-wire.

2.05 L2 - LEVEL ELEMENT AND TRANSMITTER, SUBMERSIBLE WELL DRAW DOWN

A. Manufacturer:
1. Druck Incorporated Model PTX 1230.
2. Endress Hauser Water Pilot FMX21.

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3. or equal.

B. General.
1. The submersible/depth pressure transducer shall be specifically designed for depth/level measurements in the groundwater, well water, canals, rivers, and other similar applications. Titanium construction shall ensure life in the most hostile environments, including corrosive and hazardous chemical applications.

C. Process Measurement:
1. Operating Ranges: 5, 10, 15, 20, 30, 50, 75, 100, 150, 200, 300, 500, 900psia or psig as required by the application.
2. Overpressure: 4X operating range, 2000psi maximum.
3. Pressure Media: Fluids compatible with titanium and polyurethane.
4. Transduction Principal: Piezo-resistive micro-machined silicon strain gauge.
5. Combined Non-linearity, Hysteresis, and Repeatability: +/- 0.25 percent FS BSL for all ranges.
6. Temperature Effects: +/- 1.5 percent TEB for ranges of 5psi and above.
7. Resolution: Infinite.

D. Electrical:
1. Insulation Resistance: 100 Megohms, 50VDC.
2. Output: 2-wire, 4-20mA 9-32VDC excitation.
3. Electrical Connection: Vented polyurethane cable length as required to monitor entire range of well level movement.
4. Safety:
   a. FM & CSA intrinsically safe.
   b. Class I, Div 1 Groups A, B, C, D.
   c. EMC Emissions EN50081-1.
   d. EMC Immunity EN50082-2.
   e. Certification CE Marked.
5. Ingress Protection: NEMA 6 (IP68).

E. Environmental:
1. Relative Humidity: 0 to 100 percent.
2. Operating Temperature Range: -5 to +140 degrees F.
3. Ambient Compensated Temperature Range: 30 to 86 degrees F.

F. Mechanical Characteristics:
1. Sensor Body: Titanium.
2. Measurement Diaphragm: Titanium.
3. Pressure Connection: Depth cone with radial inlet holes.
4. Diameter: 0.69 inch.
5. Weight: 5oz nominally (excluding cable).

2.06 L6 - LEVEL SWITCH, WET WELL FLOAT

A. Manufacturer.
1. Anchor Scientific, Inc. WXX-NO/NC-SSTNM Non-Mercury Float.
2. Siemens Water Technologies Model 9G-EF Non-Mercury Float.
3. Or equal.

B. The wetwell float level switch shall be a Type 316 stainless steel, Teflon coated, watertight float enclosing a 20A/115 vac switch. The switch shall contain no mercury. The switch shall have a maximum activation/deactivation level differential of one inch. Float switches identified as detecting high level alarm conditions shall be equipped with normally closed contacts.

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C. The level switch cable shall be provided by the manufacturer and it shall consist of a No.14 AWG copper, three conductor, PVC jacketed, heavy duty SO cord with a maximum O.D. of 5/8 inch. The cable shall include a ground conductor for bonding the float body to the conduit system. The cable length shall be selected to accommodate locations of float and associated junction box. Contractor shall be responsible for selecting length of cable to accommodate initial mounting elevation with enough slack cable to allow two foot lower elevation. Excess cable shall be coiled and secured above the maximum water level.

D. The entire float switch assembly, including cable shall be rated for process fluid temperatures of 150 degrees F, minimum.

E. Mounting.
1. Float switch shall be provided with clamps and accessories suitable for fixed pipe mounting as shown on drawings.
2. Float switch shall be provided with 1/4" 316SS rope, 136SS cable mounting kit, complete with 15 lb plasticsol coated cast iron weight, stainless steel hardware clamps and accessories, as shown on drawings.

F. Where float switch is located in hazardous location, installation shall be intrinsically safe, suitable for use in Class I Division I atmospheres in accordance with the National Electrical Code. Installation shall include an intrinsically safe relay located in the control panel receiving the float signal.

2.07 T7 - TEMPERATURE TRANSMITTER, AMBIENT

A. Manufacturer:
1. ACI.
2. or Equal.

B. Equipment Description: Two wire temperature transmitter with local RTD.

C. References:
1. NEMA.
2. FM.
3. UL.

D. Environmental Conditions.
1. Sensor Ambient Temperature Limits: -58 - 392 degrees F.
2. Transmitter Operating Range: 32 - 158 degrees F.

E. Process Conditions: Measurement of exterior ambient temperature.

F. Conduit connetion - 1/2" NPT.

G. Power Supply - 7-35V DC with no polar sensitivity.

H. Input - 2-wire Platinum 100/1K Ohm Class A RTD I. Output - 2-wire, Linear 4-20mA DC.

I. Performance:
1. Linearity +/- 0.5% of full range span.
2. Sensor Accuracy +/- 0.06% at 32 degrees F.
3. ccuracy: +/- 0.1% of span.
4. Standardization: DIN-EIC-751.

J. Enclosure - NEMA 4x.

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2.08 X1 - ALARM STROBE

A. Manufacturer:
   1. Federal Signal.
   2. or Equal.

B. Equipment Description: Red Strobe Warning Light.
   1. FB2PST Fireball Strobe in non-rated areas.
   2. 27XST Hazardous Location Light for Hazardous areas.

C. References:
   1. NEMA.
   2. FM.
   3. UL.

D. Environmental Conditions.
   1. NEMA 4 for outdoor mounting.
   2. NEMA 12 for Indoor mounting - non hazardous.
   3. NEMA 7 for Hazardous rated areas.

2.09 Z2 - SECURITY DOOR SWITCH, MAGNETIC

A. Manufacturer:
   1. GE Sentrol 1078.
   2. or equal.

B. Construction:
   1. Recessed magnetic sensor.
   2. Rare earth magnet.
   3. Special design for steel mounting.
   4. Self-lock mounting.
   5. Rugged construction.
   6. 15/16-inch diameter hole required.
   7. UL approved for specific fire.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 30
PROGRAMMABLE LOGIC CONTROLLERS

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Programmable Logic Controllers.
1. Programmable Logic Controllers shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
a. Programmable Logic Controllers, Lump Sum. When so provided, payment for Programmable Logic Controllers shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
b. Programmable Logic Controllers, Inclusive. When no quantity is provided, Programmable Logic Controllers shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
b. ANSI/IEEE C37.90 - IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.
2. CE - European Community, Applicable Directives:
a. EN50005 - for Terminal Markings.
b. EN50081-1- Generic Emission Standard.
c. EN50082-1 - Generic Immunity Standard.
d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
3. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA C22.2, Industrial Control Equipment.
4. CUL - Underwriter's Laboratories of Canada.
5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
a. IEC1131-1. Programmable Controllers - Part 1: General Information.
b. IEC1131-2. Programmable Controllers - Part 2: Equipment Requirements and Tests.
c. IEC1131-3. Programmable Controllers - Part 3: Programming Languages.
d. IEC1131-4. Programmable Controllers - Part 4: User Guidelines.
e. IEC1131-5. Programmable Controllers - Part 5: Communications.
f. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.
6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
a. NEMA ICS 2- Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.

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b. NEMA ICS 3- Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.

7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL508 - Industrial Control Equipment.
   b. UL508A - Industrial Control Panels.
   c. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 90 00 - Process Instrumentation & Control.

B. Equip programmable logic controller systems with I/O as scheduled on the drawings.

C. Provide a single-user license, programmable logic controller programming software package and install on an Owner designated computer. Configure software for use with the programmable logic controllers specified and pre-load the specific configuration files for this project.

D. Provide modification to existing programmable logic controller systems as specified.

E. Software Configuration Rights:
   1. The software configuration files shall become the property of the owner. Identify all protection methods and turn over all keys and passwords to the owner.
   2. System supplier shall draft an agreement with the owner, to be reviewed by the engineer, identifying any consequences arising from modifications to the configuration files not authorized in writing by the system supplier during the specified warranty period. This agreement will be signed by the owner and supplier and copies of the document distributed to all parties. Unauthorized modifications to software configuration during the warranty period will result in a void warranty.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for programmable logic controllers:
   1. Software configuration consisting of data tables, ladder logic, and other parameters.
   2. Identify coordination requirements with other sections.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

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C. Submit the following information specifically for programmable logic controllers:
   1. As-built printout of all software configuration including data tables, ladder logic, passwords, and other parameters. Document software with English language descriptions and tag numbers where appropriate.
   2. Electronic documentation shall include fully annotated electronic copies of all PLC programs. As-built documentation shall include all changes made during the first year of operation.
   3. Software configuration files shall be included in the manual in two forms:
      a. Thumb drive.
      b. PDF.

D. Submit software license certificates, manufacturer provided software documentation, and software installation media.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

B. Supply one spare 24VDC discrete input/output module of each type supplied for this project.

C. Supply one spare 24VDC analog input/output module of each type supplied for this project.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturers:
   1. Allen-Bradley/Rockwell Automation.
   2. Without Exception.

2.02 GENERAL SYSTEM REQUIREMENTS

A. Common Hardware Specifications.
   1. Environmental.
      a. Ambient Temperature Rating:
         1) Operating: 0 to 60 degrees C.
         2) Storage: -40 to 85 degrees C.
      b. Humidity: 5 to 95 percent non-condensing.

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c. Shock:
   1) Operating: 30 Gs (3 pulses, 11 mS).
   2) Non-operating: 50.0 Gs (3 pulses, 11 mS).
d. Vibration:
   1) Vibration Operating: 5.0 G at 10 to 500 Hz.
e. Electromagnetic Compatibility:
   1) ESD immunity - 6kV cibtact discharges, 8kV air discharges.
   2) EFT / B immunity - +/- 4 kV at 5kHz on power ports, +/- 2 kV at 5 kHz on thernet ports.
   3) Surge transient immunity - +/- 1 kV line-line and +/- 2 Kv line -earth on power ports, +/- 2 kV line- earth on Ethernet ports.
   4) Conducted RF immunity - 10V rms with 1kHz sien wave 80% AB from 150 kHz - 80 MHz.
   5) Radiated Electromagnetic Susceptibility: 10V/m with 1kHz Sine wave to 2000 MHz,3V/m wutg 1 kHz sine wave from 2000 MHz - 2700 MHz.
   6) Votage variatio - 10 ms interruption on MOD power port.

2. Safety:
   a. Dielectric Withstand: 1500VAC per UL 508, CSA C22.2.
   b. Isolation between communication circuits: 500VDC.
   c. Isolation between backplane and I/O: 1500VAC.
   d. Flammability and Electrical Ignition: UL94V-0.
   e. Certification:
      1) UL listed.
      2) CSA certified.
      3) CUL listed.
      4) Class 1, Division 2, Groups A, B, C or D,
      5) CE compliant for all applicable directives.

B. Configuration.
   1. The programmable controller, associated I/O, chassis, and power supplies shall be of a modular design. The programmable controller and I/O modules shall mount into the chassis.
   2. Processor Systems shall include processor, power supply, input/output modules, communication modules, and remote interface modules as required to meet system requirements.
   3. Remote Input/Output Units shall include input/output modules, interface modules, communication modules, and power supply to meet system input and output requirements.
   4. Modules are to be supplied as specified unless system requirements dictate the use of alternative modules.

C. Selection.
   1. The programmable controller shall be selected from a family of programmable controllers with memory capability ranging up to 10 Mbytes.
   2. All system and signal power to the controller and support modules shall be distributed on a single motherboard or backplane.
   3. All system modules including the processor shall be removable from the chassis or inserted in to the chassis while power is being supplied to the chassis without faulting the processor or damaging the modules.
   4. All system modules and chassis shall be designed to provide for free airflow convection cooling.
   5. Modules shall be designed to plug into a chassis and to be keyed to allow installation in only one direction. The design must prohibit upside down insertion of the modules as well as safeguard against the insertion of a module into the wrong slot or chassis via an electronic method for identifying a module. Electronic keying shall perform an electronic check to insure that the physical module is consistent with what was configured for the corresponding slot.

D. Programming:
   1. Minimum Programming Instruction Set:

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a. Language Characteristics: Ladder diagram.
b. Logic Operations: AND, OR, XOR, NOT.
c. Register Operations: Store, recall.
d. Math Operations: Addition, subtraction, multiplication, division, square root, matrix operations.
e. Process Control: Proportional-Integral-Derivative.

2.03 PROGRAMMABLE LOGIC CONTROLLER SYSTEM - TYPE I, COMPACT LOGIX PLATFORM

A. Processor Unit:
1. Manufacturer:
a. Allen-Bradley Compact Logix 5380 L3, Model 5069-L320ER - As required by application (16 - I/O cards.).
2. Processor Memory:
a. User memory of 1, 2, or 3 Mbytes as dictated by the application. Compact flash memory card shall provide 1 Gb non-volatile memory.
b. All user memory in the processor not used for program storage shall be for the purpose of data storage.
3. Performance:
a. Capability of controlling up to 16 I/O modules.
b. Typical Throughput Time of 0.08 ms/K based upon a 1K ladder logic program consisting of simple ladder logic and communications servicing.
c. Bit Execution Time of less than 0.51 microseconds.
d. Proportional Integral Derivative Control with up to 451 microsecond execution time.
e. Online programming including runtime editing.
4. Features:
a. Standard RAM Memory Back-up provided through minimum two year lithium battery.
b. LED indicators for: POWER, RUN, CPU Fault, Forced I/O, Battery Low, DH485, RS-232.
c. One USB port.
d. Two Ethernet/IP port.
e. Real Time Clock.
f. Key Switch Positions for Remote, Program and Run.

B. Discrete AC Input and Output Modules:
1. Manufacturer:
a. 16-Point, 24VDC Input Module: Allen-Bradley Model 5069-IB16.
b. 16-Point, Contact Output Module: Allen-Bradley 5069-OW16.
2. 16-Point, 24VDC Input Module:
a. Input ratings of 4.7.4mA per channel @ 10.32VDC.
b. Sixteen non-isolated Inputs.
c. Removable terminal block.
1) Terminal identification diagram one each module.
2) Terminal blocks to have barriers on 3 sides.
3) Optical isolation between digital and field circuits.
4) Wiring terminals with self-lifting pressure plates to secure two No.14 AWG wires.
d. LEDs to indicate the status of each I/O point.
e. No tools shall be required to install or remove modules. Modules shall have upper and lower panel mounting tabs as well as latches for DIN rail mounting.
3. 16-Point, Contact Output Module:
a. Voltage rating of 5 to 264VAC, 5 to 30VDC.
b. Provide signal isolation where needed.
c. Continuous current rating per point: 2A AC per channel.
d. Continuous current rating per module: 8 A AC per group and 16A per module.
e. Removable terminal block:
1) Terminal identification diagram on each module.

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2) Terminal blocks to have barriers on 3 sides.
3) Optical isolation between digital and field circuits.
4) Wiring terminals with self-lifting pressure plates to secure two No.14 AWG wires.

f. LEDs to indicate the status of each I/O point.

g. No tools shall be required to install or remove modules. Modules shall have upper and lower panel mounting tabs as well as latches for DIN rail mounting.

C. Analog Input and Output Modules:

1. Manufacturer:
   a. Analog Input Module, Differential: Allen-Bradley Model 5069-IF8.
   b. Analog Output Module, Isolated: Allen-Bradley Model 5069-OF8.
2. Differential Analog Input Module:
   a. Eight input channels per module.
   b. Ratings:
      1) Current Rating of 0 to 20mA, 4 to 20mA.
      2) Voltage Rating of Plus/Minus 10VDC, 0 to 10VDC, 0 to 5VDC,
      3) Current Terminal Impedance:
         a) Current Rating of 70 - 110 Ohms.
         b) Voltage Rating of >1M ohm.
      4) Resolution of 16 bits.
   c. Overall Accuracy:
      1) Current Terminal Rating of Plus or Minus 0.3 percent full scale at 25 degrees C.
      2) Voltage Terminal Rating of Plus or Minus 0.2 percent full scale at 25 degrees C.
   d. Input channel configuration via configuration software screen or the user program.
   e. Input Group to Bus Isolation of 500VAC for (1) minute.
   f. Removable terminal block:
      1) Terminal identification diagram one each module.
      2) Terminal blocks to have barriers on 3 sides.
      3) Wiring terminals with self-lifting pressure plates to secure two No.16 AWG wires.
   g. LEDs to indicate the status of each I/O point.
   h. No tools shall be required to install or remove modules. Modules shall have upper and lower panel mounting tabs as well as latches for DIN rail mounting.
3. Analog Output Module:
   a. Eight output channels per module.
   b. Provide signal Isolation where needed.
   c. Ratings:
      1) Current Rating of 0 to 20mA, 4 to 20mA.
      2) Voltage Rating of Plus/Minus 10VDC, 0 to 10VDC, 0 to 5VDC.
   d. Loading:
      1) Inductive load of 1 mH maximum for current outputs.
      2) Resistive load of 500 Ohm on current output, 1000 Ohm on Voltage output.
      3) Capacitive load of 1 miroF maximum for voltage outputs.
      4) Current load of 10mA maximum on voltage output.
   e. Resolution of 16 bits.
   f. Overall accuracy:
      1) Plus or minus 0.1 percent full scale at 25 degrees C for current terminal.
      2) Plus or minus 0.1 percent full scale at 25 degrees C for voltage terminal.
   g. Open and short-circuit protection:
      1) Output voltage protection.
      2) Input Group to Bus Isolation of 500VAC for (1) minute.
   h. Removable terminal block:
      1) Terminal identification diagram one each module.
      2) Terminal blocks to have barriers on 3 sides.
      3) Wiring terminals with self-lifting pressure plates to secure two No.16 AWG wires.
   i. LEDs to indicate the status of each I/O point.

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j. No tools shall be required to install or remove modules. Modules shall have upper and lower panel mounting tabs as well as latches for DIN rail mounting.

D. Serial Communications.
1. Manufacturer.
a. Allen-Bradley Model 5069-Serial.
2. General.
a. Provides serial communications protocols RS-232, RS-422, RS-485.
b. Utilizes only MOD power buss.

E. Power Supplies:
1. Manufacturer.
a. Provide MOD External Power Supply - 24VDC - 10A max.
b. Provide SA External Power Supply - if 24DC - 10A max per buss.
2. Selection Requirements:
a. Select capacity of power supply for each Power Supply based on requirements of modules installed in rack with 20 percent of power supply capacity reserved for future.
b. Provide seperate Power supplies for Panel requirements and PLC requirements.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

B. Provide interconnect cables of the approriate type as needed.

3.04 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.05 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 31
HUMAN-MACHINE INTERFACE EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Work Results:

B. Principal Products:

1.02 MEASUREMENT AND PAYMENT

A. Human-Machine Interface Equipment.
1. Human-Machine Interface Equipment shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 1.
a. Human-Machine Interface Equipment, Lump Sum. When so provided, payment for Human-Machine Interface Equipment shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 1.
b. Human-Machine Interface Equipment, Inclusive. When no quantity is provided, Human-Machine Interface Equipment shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.03 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.04 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/National Fire Protection Agency (ANSI/NFPA), Specifications and Standards, current edition:
a. ANSI/NFPA 70 - National Electrical Code and state amendments thereto.
b. ANSI/IEEE C37.90 - IEEE Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.
2. CE - European Community, Applicable Directives.
a. EN50005 - for Terminal Markings.
b. EN50081-1- Generic Emission Standard.
c. EN50082-1 - Generic Immunity Standard.
d. EN61000-4-4 - Electromagnetic compatibility (EMC). Testing and measurement techniques.
e. EN61000-4-5 - Electromagnetic compatibility (EMC). Testing and measurement techniques. Surge immunity test.
3. Canadian Standards Association (CSA), Specifications and Standards, current edition:
a. CSA C22.2, Industrial Control Equipment.
4. CUL - Underwriter's Laboratories of Canada.
5. International Electrotechnical Commission (IEC), Specifications and Standards, current edition:
a. IEC1131-1. Programmable Controllers - Part 1: General Information.
1) IEC1131-2. Programmable Controllers - Part 2: Equipment Requirements and Tests.
2) IEC1131-3. Programmable Controllers - Part 3: Programming Languages.

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3) IEC1131-4. Programmable Controllers - Part 4: User Guidelines.
4) IEC1131-5. Programmable Controllers - Part 5: Communications.

b. IEC 60529 - Classification of Degrees of Protection Provided by Enclosures.

6. National Electrical Manufacturers Association (NEMA), Specifications and Standards, current edition:
   a. NEMA ICS 2- Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
   b. NEMA ICS 3- Industrial Control and Systems: Medium Voltage Controllers Rated 2001 to 7200 Volts AC.
7. Underwriters Laboratories, Inc. (UL), Specifications and Standards, current edition:
   a. UL508 - Industrial Control Equipment.
   b. UL508A - Industrial Control Panels.
   c. UL94 - Tests for Flammability of Plastic Materials for Parts in Devices and Appliances.

1.05 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 90 00 - Process Instrumentation & Control.

B. Equip human machine interface systems with memory and functional capacity to perform the specified interface, display, and data recording functions specified. Provide a minimum of twenty-five percent tag capacity reserved for future use for software licensed on a tag basis.

C. Provide a single-user license, human machine interface system programming software package(s) and install on the programming terminal specified in Section 26 90 50 - SCADA System hardware. Configure software for use with the human machine interface systems specified and pre-load the specific configuration files for this project.

D. Software Configuration Rights:
   1. The software configuration files shall become the property of the owner. Identify all protection methods and turn over all keys and passwords to the owner.
   2. System supplier shall draft an agreement with the owner, to be reviewed by the engineer, identifying any consequences arising from modifications to the configuration files not authorized in writing by the system supplier during the specified warranty period. This agreement will be signed by the owner and supplier and copies of the document distributed to all parties. Unauthorized modifications to software configuration during the warranty period will result in a void warranty.

1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for human-machine interface equipment:
   1. Provide copies of all graphic screens. Each screen shall be formatted on a single page which shall include a narrative description of the parameters displayed, ranges for adjustable parameters and recommended or typical values. The screens shall be organized in a logical fashion. An Index or Table of Contents shall be provided with a page numbering system or tabs which permit ready access to the information contained therein.
   2. Software configuration consisting of data tables and other parameters.

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1.07 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for human-machine interface equipment:
   1. Provide copies of all graphic screens. Each screen shall be formatted on a single page which shall include a narrative description of the parameters displayed, ranges for adjustable parameters and recommended or typical values. The screens shall be organized in a logical fashion. An Index or Table of Contents shall be provided with a page numbering system or tabs which permit ready access to the information contained therein.
   2. As-built printout of all software configuration including data tables, passwords, and other parameters. Document software with English language descriptions and tag numbers where appropriate.
   3. Electronic documentation shall include fully annotated electronic copies of all HMI programming. As-built documentation shall include all changes made during the first year of operation.
   4. Software configuration files shall be included in the manual in two forms:
      a. Thumb drive.
      b. PDF.

D. Submit software license certificates, manufacturer provided software documentation, and software installation media.

1.09 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 WARRANTY

A. See Division 01 for additional requirements.

1.11 EXTRA MATERIALS

A. See Division 01 for additional requirements.

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PART 2 PRODUCTS

2.01 OPERATOR INTERFACE TERMINAL

A. Manufacturer:
   1. Rockwell Automation/ Allen-Bradley PanelView Plus 7 - Performance Terminal 12."
   2. The Owner will consider products of another manufacturer only as alternate bid equipment in accordance with Division 01 of these specifications.

B. Agency approvals:
   1. C-UL certified.
   2. UL listed.
   3. CE marked.
   4. Class I Div 2, Groups A, B, C, D.
   5. Class II Div 2, Groups F, G.
   6. Class III, Div 1.

C. Environmental:
   1. Temperature:
      a. Operating: 32 to 131 degrees F.
      b. Storage: -13 to 158 degrees F.
   2. Relative Humidity: 5 to 95 percent non-condensing.
   3. Shock:
      a. Operating: 15 g at 11 ms.
      b. Non-Operating: 30 g at 11 ms.
   4. Vibration:
      a. 0.012 in p-p, 10 to 57 Hz.
      b. 2 g peak, 57 to 500 Hz.
   5. Ratings: NEMA Type 12, 13, 4X, IP54, IP65.

D. Electrical:
   1. Input Voltage:
      a. 85 to 264VAC.
      b. 47 to 63 Hz.
   2. Power Consumption: [160] VA maximum.

E. Display:
   1. Type: Color Active Matrix TFT
   2. Size: 12.1 inches.
   3. Aspect Ration 16:10.
   4. Backlight: [field replaceable, CCFL, 50 000 H]

F. Memory:
   1. Real-time Clock Battery-backed clock timestamps critical data.
   2. Application Memory: 64 MB Flash/64 MB RAM, Not Expandable

G. Communications Ports: Ethernet, RS-232, 2 USB

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 SOFTWARE CONFIGURATION SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

B. Refer to the requirements of Section 26 90 51 - SCADA System Software.

3.05 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.06 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 50
SCADA SYSTEM HARDWARE

PART 1 GENERAL

1.01 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
   1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
      a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
      b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
      c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
      d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
      e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.

1.02 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
   1. Section 26 90 00 - Process Instrumentation & Control.

1.03 SUBMITTALS

A. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.04 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.05 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

B. Submit the following information specifically for human-machine interface equipment:

C. Submit software license certificates, manufacturer provided software documentation, and software installation media.

1.06 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

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C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.01 CONTROL PANEL MOUNTED PC-SCADA SYSTEM COMPUTER

A. Computer, Small Form Factor Workstation:
   1. Manufacturer: Dell Precision 3460 Small Form Factor Workstation, or equal.
   2. Processor: Intel Core i7-14700 (5.4GHz with Turbo Boost, 33MB Cache).
   3. Memory: 16 GB DDR5 SDRAM at 5600MHz - 2 SODIMMS.
   4. Graphics: NVIDIA T1000, 4GB GDDR6, 4mDP to DP adapter
   5. Hard Drive: 2 – 1 TB Solid state hard drive
   6. Raid 1 configuration
   7. Connectivity
      a. Integrated 10/100/1000 Ethernet LAN on system board
   8. Ports:
      a. Video: 1 15-pin VGA video connector
      b. USB: 9 externally accessible USB Ports (3 front, 6 back); 1 externally accessible USB-C port
      c. Audio: One back-panel connector for line-in/-out, one front-panel connector for headphone-output and microphone-in
      d. Other: 1 RJ-45 10/100/1000
      e. Wireless: USB Keyboard and Mouse Adapter
   9. User Input Devices.
      a. Keyboard: Wireless Keyboard.
      b. Pointing device: Wireless Mouse.

B. Industrial Monitor and Touchscreen.
   1. Manufacturer:
      a. Hope Industries Model No. HIS-MLXX-STVB.
      b. or equal.
   2. Display
      a. Environmental: NEMA 4/12 Panel Mount
      b. Size: 15-inch diagonal
      c. Native Resolution: SXGA (1280 x 1024 at 60 Hz)
      d. Aspect Ratio: 5:4
      e. Number of Colors: 16.8 million
      f. Brightness (white): 250 nits (cd/m2)
      g. Viewing Angle (Hori/Vert): 170° / 160°
      h. Contrast Ratio: 1000:1 (static); 2000:1 (dynamic)
      i. Backlight Brightness half-life: 4 CCFTs, 50,000 hours
   3. Video:
      a. Input Connectors: HD-15, DVI-D
      b. Input Signal Formats: RGB Analog, Separate H/V, Combined sync, Sync on Green, DVI
      c. Horizontal / Vertical Scan: 30-82 kHz / 50-75 Hz
      d. Response Rate: 5 ms
   4. Touchscreen
      a. 5-wire resistive system
      b. Emulates a mouse
   5. Serial RS-232 or USB interface to host computer
   6. Software

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C. Genuine MicroSoft Windows 11 Professional 64 bit
   1. Microsoft® Office Professional 2021, English
   2. Adobe Acrobat STD
   3. Trend Micro Worry-Free Business Security Services, 36-months
   4. SCADA System Software
   5. Historical Data Management Software
   6. Accessories.
   7. Interconnecting Cables and Cords, as needed.
   8. UPS.

2.02 OPERATOR PC-SCADA SYSTEM COMPUTER

A. Computer, Tower:
   1. Manufacturer: Dell (Precision 7875 Tower Workstation is spec basis)
   2. Processor: AMD Ryzen™ Threadripper™ PRO 7945WX (76MB total cache 12 core 24 thread 4.70-5.30GHz Turbo 350W)
   3. Memory: 32 GB, 2 x16GB DDR5 at 5200MHz - ECC .
   4. Graphics: NVIDIA T1000, 8GB GDDR6, 4mDP to DP adapter
   5. Integrated Audio: two channel High Definition Audio
   6. Hard Drive: 2 - 512 GB Solid state hard drive
   7. Raid 1 configuration
   8. 1 - 1TB External hard drive configured for automatic backup.
   9. Intel Integrated Controller - Front FlexBay NVMe PCIe Drives
   10. Connectivity
      a. Integrated 10/100/1000 Ethernet LAN on system board
   11. Ports:
      a. HDMI and DisplayPort connectors
      b. USB: 5 externally accessible USB-A Ports (2 front, 3 back); 5 externally accessible USB-C Ports (2 front, 3 back)
      c. Audio: back-panel connector for line-out, one front-panel connector for universal audio port
      d. Other: 1 RJ-45 10/100/1000
      e. Wireless: USB Keyboard and Mouse Adapter
   12. User Input Devices.
      a. Keyboard: Wireless Keyboard.
      b. Pointing device: Wireless Mouse.

B. Monitor
   1. Display
      a. Quantity - 1
      b. Type: Widescreen Flat Panel Display
      c. Size: 27-inch
      d. Native Resolution: SXGA (1920 x 1080 at 60 Hz)
      e. Aspect Ratio: 16:9
      f. Number of Colors: 16.7 million
      g. Brightness (white): 250 nits (cd/m2)
      h. Viewing Angle (Hori/Vert): 178° / 178°
      i. Contrast Ratio: 1000:1 (static); 1000:1 (dynamic)
      j. Backlight: LED
      k. USB 3.0 Ports: Four
      l. Input Connectors: 2-HDMI(MHL)
      m. Sound: Soundbar with DC Power Connector

C. Software
   1. Genuine MicroSoft Windows 11 Professional 64 bit

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2. Microsoft® Office Professional 2021, English
3. Remote access software: Splash Top, PC Anywhere, Real VNC, Team Viewer, or equal.
4. Cyberlink Media Suite
5. Adobe Acrobat XI Standard.
6. Trend Micro Worry-Free Business Security Services, 36-months.

D. Accessories.
1. Interconnecting Cables and Cords, as needed.
2. UPS with surge protection - APC.
3. Printer: Epson WorkForce WF-7720
   a. 18 PPM mono / 10 PPM color
   b. 500 Sheet paper tray
   c. WiFi
   d. 2-sided printing, copy, Scan, (and yes - Fax)
   e. Wireless printing
   f. 2 sets of spare ink cartrideges
4. Printer Stand: Kantek Model PS540 three shelf with locking castors, 75lb weight rating.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 SOFTWARE CONFIGURATION SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

B. Refer to the requirements of Section 26 90 51 - SCADA System Software.

3.05 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.06 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 51
SCADA SYSTEM SOFTWARE

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. SCADA System Software
1. SCADA System Software shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
2. SCADA System Software, Lump Sum. When so provided, payment for SCADA System Software shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
3. SCADA System Software, Inclusive. When no quantity is provided, SCADA System Software shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.
f. ANSI/ISA-101.01-2015, Human Machine Interfaces for Process Automation Systems
g. ANSI/ISA-18.2-2016 Management of Alarm Systems for the Process Industries
h. IEC 62443-2-1 Establishing an industrial control system security program
i. IEC 62443-3-2 Security risk assessment for system design
j. IEC 62443-3-3 System security requirements and security levels
k. NIST Special publication 800-63B, Digital Identity Guidelines

1.04 DESCRIPTION OF WORK

A. Provide complete and operable SCADA system software as required under Section 26 90 00 - Process Instrumentation & Control.

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B. Provide software licensing and tag capabilities for the software as needed to satisfy the functional requirements of the system. All licensing will be perpetual licensing - no subscription based licensing will be allowed. Provide twenty-five percent additional tag capacity for future use.

C. System Configuration:
   1. SCADA applications shall be configured to communicate with new PLCs, execute calculations for real-time monitoring, and share tag database.
   2. SCADA system shall be provided with capabilities to allow secure remote access to the system.
   3. SCADA System shall provide the ability notify Alarm Conditions to both local and remote operators.
   4. SCADA software shall be commercially available off-the shelf and shall be non-proprietary, such that independent systems integrators are able to provide configuration and maintenance services as required.

D. Software Configuration Rights:
   1. The software configuration files shall become the property of the owner. Identify all protection methods and turn over all keys and passwords to the owner. Additionally, any libraries or custom code or scripts developed or used by this application will be provided to the owner upon completion in a format that is readable, commented, documented and modifiable by the owner.
   2. System supplier shall draft an agreement with the owner, to be reviewed by the engineer, identifying the following risk areas:
      a. Configuration files that should not be altered without written consent from the system supplier. Unauthorized modifications to software configuration during the warranty period will result in a void warranty.
      b. Identifying all custom code, third party modules and scripts developed by the system supplier that are not supported by the SCADA software manufacturer. The owner will be financially responsible for any changes to third party modules or custom script or code modifications that might be required for future upgrades.
      c. This agreement will be signed by the owner and supplier and copies of the document distributed to all parties.

1.05 RELATED SECTIONS

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:.
   1. Section 26 90 00 - Process Instrumentation & Control.

1.06 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Submit shop drawings in accordance with Division 01.

C. Submit shop drawings for the software specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

1.07 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

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B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

C. Submit software license certificates, manufacturer provided software documentation, and software installation media.

1.09 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

1.10 WARRANTY

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 SCADA / HMI SOFTWARE

A. Manufacturer:
1. VTScada by Trihedral Engineering

B. General Requirements:
1. The SCADA software shall consist of a human machine interface (HMI) system with support for supervisory and process control, real-time data acquisition, alarm and event management, historical data collection, report generation, local or remote telemetry communications to PLCs/RTUs, and internet/intranet communications for remote access.
2. The software shall be easy-to-use, with an object-oriented graphics development environment and have an open architecture, which utilizes the latest in Windows 11 Professional / Windows Server 2025 client/server networking technology from Microsoft. The system shall have the built-in flexibility to permit easy configuration of the system in accordance with the specific end user requirements as well as quick and easy modification by the end user in the field.
3. Software shall support running in a virtualized server environment and be compatible with RAID, Storage Area Network (SAN) or Network-Attached Storage (NAS) systems.
4. Provide payment schedule for software maintenance, three year time period.

C. System Capacity and Performance Requirements:
1. The system shall have a minimum of 5,000 I/O tag capacity. Tag capacity constitutes I/O Scanning, Historizing, Reporting, and Alarming.
2. The system shall have the following high level system performance requirements:
   a. Alarm notification via email, SMS, and voice capability.
   b. Remote access using Thin Client connections, two concurrent sessions
   c. Commercially supported Historian through SCADA provider or third party.
   d. Reporting through SCADA provider or third party.
   e. Static backup archive through SCADA provider or third party.
   f. Revision control: show history with rollbacks, merges and audits
   g. Wisconsin based regional manufacturer technical support.
3. Communication drivers/protocol support:

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a. Ethernet/IP (Rockwell PLC/RTU products)
b. Modbus TCP/IP (common device protocol)
c. DNP3 (Supported RTU's and power monitoring)
d. SNMP (network traffic monitoring).
e. OPC-UA Server (sending data to third party software applications).
f. MQTT Publisher (sending data to third party software applications).

D. User Interface Software Requirements:
1. Software should be capable of providing an ISA-101 compliant user interface design.
2. The SCADA system operator shall be able to execute all monitoring and supervisory control functions from any workstation or client device. Typical operations include modifying set points for control loops, alarm acknowledgement and set point adjustment, auto/manual switching and on/off control of field devices and taking points or devices on/off scan.
3. Easy navigation to all process and SCADA activities through easily recognized icons, pull down or full screen menus.
4. The operator shall be able to have access to context sensitive on-line help or instructions from any display at any time during operation of the system with a single keystroke or mouse click.
5. All user interface options such as thin client, thick clients, shall have native multiple monitor support. All client configurations shall be done server side and not require physical access to the client devices.
6. For systems with touchscreen input only, all controls required for user input will be provided on the page and not require external devices such as external keyboards.

E. Event Logging:
1. All operator actions shall be logged to an event logger. The event logger shall keep track of each new operator log-on, log-off, setpoint change, or device control.
2. Each event log shall record the date, time, operator logged in and the type of action taken (setpoint change, state change, etc.).
3. Software shall include a predefined events management interface. The interface shall provide searching and filtering events based on data range, operator, tag or event type.
4. Event logs and filtered event lists should be reportable and exportable to CSV or Excel.
5. If redundancy is specified, the event log database and configuration will be including in the system redundancy.

F. Alarms and Alarm Logging:
1. Software shall provide Alarming consistent with the ANSI/ISA 18.2-2009 Management of Alarm Systems for the Process Industries standard.
2. An alarm management page will be provided to lists all Current, Unacknowledged, Disabled, Active, Configured Historical and Shelved alarms along with tools for searching, filtering and basic reporting including histograms and alarm count over selected time periods.
3. The ability to acknowledge, mute or silence individual alarms or all visible alarms.
4. Alarm shelving options for a defined period or indefinitely. Shelved alarms shall still be recorded to the alarms history but shall not annunciate or require acknowledgement. Shelved alarms to be visible at all times in lists of Historical alarms and events.
5. Alarm annunciation shall be configurable to use alarm tones, text to speech descriptions, sound files or popup displays. Users must be notified, both visibly and audibly, of the occurrence of an alarm, regardless which display is presently being viewed.
6. Alarms records shall include:
a. Time/Date stamp.
b. The name and description of the alarm tag.
c. Priority.
d. Status of Alarm (i.e. Active, Acknowledged, Cleared). Alarm Acknowledgement records shall include the name of the user who acknowledged the alarm.
e. The value of the associated tag at the time of alarm occurrence.
f. The value of the alarm setpoint at the time of alarm occurrence.

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7. If redundancy is specified, the alarm database and configuration will be including in the system redundancy.
8. Alarm logs and filtered event lists should be reportable and exportable to CSV or Excel.

G. Alarm Notification:
1. The Alarm Notification System shall support alarm notification via dial-out over voice modem (using text-to-speech), VoIP (voice over Internet protocol), an Internet service such as Twilio®, SMS text message, email and alphanumeric pager. Alarm acknowledgement shall be supported during voice calls and via email and text message.
2. The Alarm Notification System shall allow the configuration of delays between, and repeats of, any individual contact or group of contacts in a contact list.
3. Alarm acknowledgment will be integrated into the system Alarm logging including user, time/date stamp, and ack source (SMS, email, or voice)
4. The Alarm Notification System shall be configured for use with a VOIP service provider such as VOIP.MS. System integrator shall be responsible for all costs for the first three years of VOIP service.

H. Security:
1. System shall be implemented in accordance with the following industry standards for best practice in security:
   a. IEC 62443-2-1 Establishing an industrial control system security program.
   b. IEC 62443-3-2 Security risk assessment for system design
   c. IEC 62443-3-3 System security requirements and security levels
   d. NIST Special publication 800-63B, Digital Identity Guidelines
2. System shall support authentication of user accounts via a Windows domain and authorizing SCADA user roles from domain security groups. Software shall include a security system with privilege and role-based user accounts. System will support an unlimited number of users, accounts and privileges and provide the ability to disable users.
3. All output controls and alarm acknowledgments shall be locked automatically when no user is logged in.
4. System shall support running as a Windows service, and support the use of Smart Cards, and Proximity cards for authentication.
5. System shall support Multi-Factor Authentication for both internet connected systems and air-gapped, non-internet connected systems.

I. Remote Access
1. The SCADA Software shall provide an integrated server for all thin client connections using the same authentication service for all users and groups with all associated permissions, with access to all operator screens. Third party screen sharing applications such as TeamViewer or VNC will be not be permitted.
2. All network connections to the SCADA system will be secure TLS 1.3 direct connections and not routed through a third party servers. However, VPN connections will allow the use of cloud based management consoles for managing VPN endpoints such as the SCADA servers or client devices.
3. System shall provide a mechanism to limit client access to specific IP addresses and a management utility to monitor and disconnect thin client sessions.

J. Historian:
1. Historian shall support logging of all the SCADA system data, including real-time, historical, transactions, alarms, and events for all I/O tags configured in the system, including alarms and events.
2. If required, Historian shall be supported by the SCADA provider, or if a third party historian is used, end user support will be required. No unsupported freeware, or shareware databases will be used. End user forum support will be considered unacceptable.
3. Databases shall be time series databases, sometimes referred to as process historian, and not relational databases for long term performance reasons.

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4. Historian must support SQL commands through a standard interface such as REST or ODBC.
5. If redundancy is required, the historian shall be configured in a high availability configuration that allows additional redundant databases to be added. There shall be no limited to the number of databases than can be added to the cluster. Management pages will be added to the system to monitor database synchronization status, performance, and load.
6. Storage limiting: The historian must have the option for limiting data storage: Database size, time duration, or number of records stored.

K. Trending:
1. Software shall display historical and real-time data in both plot and tabular formats.
2. Software shall support ad-hoc and preconfigured trend plots of real-time and historical data as integrated elements of graphical process displays. Historical and real-time plotted values shall be shown in a continuous, uninterrupted, scrolling fashion. The display shall support:
    a. An unlimited number of pens: both analog and digital values.
    b. Pens can be viewed as either layered or as stacked individual plots.
    c. Time frame selectable from one second to five years.
    d. Scaling for each pen as high/low values or graduated divisions.
    e. Value of each tag at the date/time of the mouse location.
    f. Statistical data: average, min and max values for each plot.
    g. Stop/pause scrolling.
    h. Zoom in/out on the time (x) and value (y) axis.
3. Ability to export plotted data to.csv or Excel file.

L. HMI Development Requirements:
1. An intuitive graphical development environment with drag and drop tools shall be used for configuration of application displays
2. A large library of static and animated graphics including High Performance / HMI tools shall be provided with the software. Software shall support dragging and dropping additional graphics into the library.
3. Built in screen objects:
    a. Alarm display table that can be filtered by area, data
    b. Trending and tabular views of historical data.
    c. Page Navigation through buttons and clickable screen images.
4. Ability to create custom, reusable graphics objects to match custom tag objects, along with the ability to make reusable pages and popup pages that can be associated with different instances of those objects - for example: a motor control or lift station control.
5. Ability to have standard style settings for user interface elements such as text fonts, and color conventions. Modifications to these style settings will update all instances of those screen objects that use these configuration settings.

M. Tag Database Development Requirements:
1. A tag management utility shall be included for the creation, modification and deletion of tag data.
2. A tag export/import utility shall be required for the bulk changes to the tag database. For protocols supporting PLC/RTU browsing, tags shall be importable directly from the PLC/RTU over the network.
3. SCADA software shall support custom tag objects/templates that can match preconfigured tag groups in a PLC/RTU for easy reuse. These tag objects will support the use of simple configurations and parameters that will allow them to easily match the different variations of the associated PLC/RTU programming objects such as AOIs (Add On Instructions) such as a "Motor Block", "Pump Block" or "Alarm Block".
4. The tag tree or database should have a structure matching the facility layout for easy navigation and location of I/O tags.
5. I/O tags definitions will have the following minimum requirements:
    a. Tag Name: Easily identifiable and meaningful
    b. Description: Additional details to the shorter tag name.

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c. Area: Section of the facility that this I/O is physically located.
d. PLC/RTU Register Address
e. Scaling: Min/Max Range, Expected Ranges, Display Range
f. Units
g. Alarm configuration: priority, levels, other specific configurations
h. Logging: Configuration details for historian logging.

N. General System Setup Requirements:
1. All SCADA servers, workstation and Operator Interface Terminals will be configured to boot on power on and launch to the appropriate SCADA screen without user intervention. Windows services will be configured to Auto Start.
2. All Virtual Machines will be configured with dedicated, non-shared, resources for processor cores and memory. Storage will be local to the physical hardware running the VM unless approved by the design engineer.

O. Data Entry and Reporting:
1. The system shall have the ability to create data entry pages for manually gathered data such as lab data, operations data, and other maintenance data. Operators will be capable of entering the appropriate data into the current field, with the ability to save this date to the historian with the appropriate time stamp and tag information. The system will have the ability to correct and modify data for incorrectly submitted data.
2. SCADA software shall have the ability to create custom formatted reports
3. SCADA software shall have a built in report scheduler for running all regularly run reports.
4. Report formats should be configurable: csv, Excel, HTML or pdf.
5. Report outputs shall be configurable: printer, screen, email or file system.
6. Running reports shall be operator selectable using standard on screen objects to print, email, or save to filesystem any configured report for any time period.
7. Software shall have the ability to add data to customer provided Microsoft Excel spreadsheets through either Microsoft Excel templates or through Excel's standard data query options or add-ins.

P. Revision/Version Control:
1. If required, the SCADA software shall have an integrated version control system that automatically logs application configuration changes. A chronologically ordered summary of versions shall display timestamp, user, and details of changes.
2. The software shall allow switching to different version, reversing changes (rollbacks), merging changes, and identifying current revision for each workstation/server.

Q. Technical Support from Software Manufacturer
1. If required, the SCADA manufacturer will have factory technical support in the regions stated. Factory personnel will be available to be on site for startup, technical support, and end user training if requested.
2. The owner shall be able to contact the SCADA software manufacturer directly to resolve software issues. The software manufacturer will be responsible for the resolution of these issues with the owner.
3. The owner may contact any other authorized reseller of the SCADA software for continued local support and will not be bound to the original system provider.

R. Software Maintenance Schedule
1. If required, the systems provider will provide the requested software maintenance payment schedule over the time period specified. This payment schedule will include all software components of the SCADA software including third party software if utilized: historian, reporting, alarm notification, backup software, anti-virus software, and any other costs associated with keeping the software up to date for the duration specified.

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PART 3 EXECUTION

3.01 3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 SOFTWARE CONFIGURATION SERVICES

A. General Graphic Screen Design Requirements:
   1. Present displays in a consistent manner in accordance with industry conventions and standards.
   2. Screens shall display information in a logical, hierarchical fashion that allows simple navigation and operator understanding of the interface.
   3. Provide a minimum of one screen for each unit process as defined in Section 26 90 00 and on the Process and Instrumentation Drawings (P&IDs). The exact number of screens and detail will be dictated by the scope and complexity of the project.
   4. The System Integrator is encouraged to solicit feedback throughout the development of the graphic screens. Formal feedback will be provided at the point of the pre-submittal coordination conference, shop drawing submittal, and factory witness test.
   5. Refer to Section 26 90 00 for detailed requirements for functionality of the various components of each display screen.

B. Graphic Overview Screens:
   1. System Overview:
      a. Provide a city or village overview map which locates the structures and provides a means for navigating to the respective structures.
      b. Overview map may be a commercially available map or an aerial photograph provided by the owner. The determination as to which is to be used will be made during the shop drawing review.
   2. Plant Overview:
      a. Provide a plant overview which locates the structures and provides a means for navigating to the respective structures.
      b. Overview map may be a representation made using an AutoCad drawing of the Site or an aerial photograph provided by the owner. The determination as to which is to be used will be made during the shop drawing review.

C. Process Trending
   1. Provide pre-configured trend screens for all analog process variables. In addition, provide two trend screens with operator assignable pens that may be reconfigured as specific trending needs arise. Trend screens shall be quickly accessible through a menu button which allows navigation to the trend screen keyed to that respective process screen. In addition, provide a means to navigate to a selected trend screen from the main menu system. Typical analog process variable trend screens would include the following:
      a. Influent and Effluent Flow
      b. Pumping Parameters (Levels, Pump On/Off, Pump Speed where VFD Controlled).
      c. Clarification (RAS Return Rate, Influent/Effluent Flows)
      d. RAS and WAS flows (include Influent and Effluent Flows)
      e. Aeration system parameters (include D.O. Values, Speed for each Active Blower, Air Flow)

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f. Tank Levels.
g. System Pressures.

D. Totalized Information Display:
1. Equipment Totals:
a. Display cumulative, non-resettable runtime.
b. Display daily runtime total for yesterday and today.
c. Display number of starts for yesterday and today.
2. Flow Totals:
a. Display cumulative, non-resettable flow totals.
b. Display daily flow total for yesterday and today.

E. User Security Levels:
1. Configure the following username and password controlled security levels for each utility (water, wastewater, etc.):
a. Operator Standard - Display Only
b. Operator Advanced - Display, Control, and Reporting Only
c. Supervisor - Display, Control, Reporting, and Set Point Adjustment
d. Engineering - Display and Reporting Only
2. Coordinate additional security levels with Owner and Engineer during shop drawing review and determine if using an Authentication or Active Directory Server will be required.
3. Coordinate with owner if Multi Factor Authentication will be required.

F. Process Setpoint Capture:
1. Display all current values for operator adjustable process control set-points; provide print out or screen capture capability.

G. Facility Management Screens:
1. Provide screens to facilitate monitoring and control of the following when included on the project:
a. Standby Power Systems and Load Control
b. Alarm Channel Assignment and Control
c. Alarm History
d. Event History
e. Environmental monitoring
f. Access monitoring and control
g. Surveillance monitoring

H. Alarm Management Screens:
1. Provide screens which depict active and historical alarm lists.
2. If alarm notification is required, provide screens for configuring call out rosters, and call out schedules.
3. Provide user interface options to disable groups of alarms for areas under maintenance.
4. On each alarm window provide report link for an Alarm Pareto configurable by time period, area of plant, piece of equipment, etc.

I. Additional Screens:
1. Provide up to five additional screens as directed by the Owner. The need for these screens will be determined during the shop drawing review, witness testing, and start-up phases.

J. Alarming:
1. Method of alarm acknowledgement and silencing (horn & dialer) standard set by System Integrator after discussion with Engineer and all involved vendors.

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K. Communication:

1. Networking: System Integrator will assign IP addresses to all system devices. All workstations, servers, and OITs will be assigned hostnames. Systems Integrator and owner will determine if a local DNS server will be configured to resolve hostnames and IP addresses, or if a host files will be provided to each workstation, server, and OIT, and how that will be maintained as additional devices are added over time. For SCADA computers that will be accessed from outside the SCADA network, Fully Qualified Domain Names will be assigned and public and local DNS records will be created for name resolution.
2. Systems Integrator will coordinate with owners' IT personnel to ensure that all system devices are accessible by all SCADA workstations and servers. If redundancy and failover is required, system failover will be tested,
3. Control system equipment failure and communication failure procedure shall be discussed and confirmed with all vendors that communicate I/O requests.

3.05 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.06 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 53
HARDWARE ALARM NOTIFICATION SYSTEM

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Hardware Alarm Notification System.
1. Hardware Alarm Notification System shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Conditions - Division 1.
a. Hardware Alarm Notification System, Lump Sum. When so provided, payment for Hardware Alarm Notification System shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 1.
b. Hardware Alarm Notification System, Inclusive. When no quantity is provided, Hardware Alarm Notification System shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.

1.04 DESCRIPTION OF WORK

A. Provide complete and operable hardware alarm notification system as required under Section 26 90 00 - Process Instrumentation & Control.

B. Hardware alarm notification system shall be configured to communicate with the following:
1. Commercially available voice pager.
2. Standard voice telephone lines to residential or commercial sites, or cellular phones.

1.05 RELATED SECTIONS

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of:
1. Section 26 90 00 - Process Instrumentation & Control.

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1.06 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for hardware alarm notification system:
   1. Software configuration consisting of data tables and other parameters.

1.07 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.08 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for hardware alarm notification system:
   1. As-built printout of all software configuration including data tables, call lists, passwords, and other parameters. Document software with English language descriptions and tag numbers where appropriate.

1.09 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.10 WARRANTY

A. See Division 01 for additional requirements.

B. The dialer shall be covered by a five year warranty covering parts and labor performed at the factory.

PART 2 PRODUCTS

2.01 HARDWARE ALARM DIALER-EXPANDABLE

A. Manufacturer.
   1. RACO Manufacturing and Engineering Company Verbatim Gen 2.
   2. or equal.

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B. Operational Functionality:

1. The Dialer shall have a minimum of 20 independent channels for discrete alarms.
2. The dialer shall be a solid state component capable of dialing up to 16 telephone numbers, each up to 60 digits in length. Phone numbers and Standard pulse dialing or Touch Tone DTMF dialing are user programmable via the system's keyboard or remotely via Touch Tone telephone. In addition, the dialer shall:
    a. Group Alarm Calls - On alarm, system shall selectively call the correct phone number according to the specific alarm(s).
    b. Detect Telephone Line Fault and indicate condition with Front Panel LED.
    c. Automatically select Tone versus Pulse Dialing.
    d. Monitor Call Progress - Detect Busy and Ringing Signals, Abandon Call if Busy, Wait until phone is answered to Annunciate Voice Reports.
    e. Provide Numeric Pager Support.
    f. Provide PBX Support.
3. The unit shall have two different categories of speech message capability, all implemented with permanent non-volatile solid state circuitry with no mechanical mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front panel.
    a. User Field Recorded Messages: The user may record and re-record his own voice messages for each input channel and for the Station ID.
        1) There shall be no limit on the length of any particular message within the overall available message recording time, which shall vary from 26 to 635 seconds, depending upon the number of input channels selected, and the recording rate used.
        2) The unit shall allow selective recording of both Normal and Alarm advisory messages for each input channel.
        3) The unit shall provide for automatic setting of the optimum speech recording rate for the total set of messages recorder, in order to achieve optimum recording sound quality.
        4) Circuit board switches or jumper straps shall not be an acceptable means of manipulating message length or recording rates.
    b. Permanent Resident Non-Recorded Messages: Permanent built-in messages shall be included to support user programming operations, to provide supplemental warning messages such as advising that the alarms have been disabled, and to allow the unit to be fully functional even when the installer has not recorded any messages of his own.
4. Upon initiating an alarm call, the system is to “speak” only those channels which are currently in “alarm status”. Inquiry phone calls can be made directly to the unit at any time, for a complete status report.
5. Alarms are acknowledged either by pressing a Touch Tone “9” as the call is being received, or by calling the unit back after having received an alarm call.
6. The user may optionally elect to alter the following parameters from their standard normal default values via keyboard entry or remotely from any Touch Tone telephone.
    a. Alarm Response Delay: 0.1 to 999.9 seconds, with different delays being assignable to different alarms.
    b. Delay Between Alarm Call outs: 0.1 to 99.9 minutes.
    c. Alarm Reset Time: 0.1 to 99 hours, or “No Reset”.
    d. Incoming Ring Response (Answer) Delay: 1 to 20 Rings.
    e. Number of Message Repetitions: 1 to 20 Repetitions.
    f. Autocall Test: When enabled, the unit shall place a single round of test calls, both at the time this function is enabled, and also at regular subsequent intervals until this function is disabled.
    g. Remote System Microphone Activation.
    h. Remote Arming and Disarming of System.

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C. Input Monitoring Function:

1. The basic unit shall continuously monitor the presence of AC power and the status of four (4) contact closure inputs. AC power failure, or violation of the alarm criteria at any input shall cause the unit to go into alarm status and begin dial-outs. The unit shall, upon a single program entry, automatically accept all input states as the normal non-alarm state, eliminating possible confusion about Normal Open versus Normally Closed inputs. Further, as a diagnostic aid, unit shall have the capability of directly announcing the state of any given input as currently “Closed Circuit” or “Open Circuit” without disturbing any message programming. Each input channel shall also be independently programmable, without the need to manipulate circuit board switches or jumpers, to any of the following:
   a. Normally Open, Normally Closed, or for No Alarm (Status Only).
   b. Run Time Meter - to accumulate and report the number of hours a particular input circuit has been closed. Any channel so configured will never cause an alarm call, rather, on inquiry will recite it's message according to the status of the input and then report the closed circuit time to the tenth of an hour. The input will accumulate and report in tenths of hours up to a total accumulated running time of 99,999.9 hours. The initial value of the Run Time Meter shall be programmable in order to agree with existing electromechanical Run Time Meters. Up to a total of 8 Run Time Meters may be programmed.
   c. Pulse Totalizer - to count the accumulated number of pulses (momentary contact closures) occurring at the input so programmed. Any input channel may be programmed for a Totalizer Function, up to a maximum of 8. Maximum Input pulse rate is 100 Hz, with a 50% Duty Cycle. The spoken scaled value will not “roll-over” to zero until a value of 4,294,967,294. has been exceeded.
2. The standard unit shall be modular in design, permitting it, therefore, to accept “plug-in” expansion circuit boards to incorporate any of the following:
   a. Contact Closure Expansion Capability to a total of 8, 16, 24, or 32 total dry contact inputs.
   b. Analog Input Capability to a total of 1, 4, 8, or 16 total analog inputs.
   c. Remote Supervisory Control Outputs to manipulate 4 or 8 output relays.
3. The unit shall accept an expansion card which enables it to communicate directly with devices utilizing Modbus RTU Protocol. A unit so configured shall be capable of “reading” and “writing” to 32, 64, or 96 data registers via Touch Tone Telephone. No modem or host computer shall be required. Interface shall consist of a single RS-232 Serial Cable.
4. The unit shall be equipped with a centronics parallel printer port, enabling the user to print alarm reports, download programming data, and generate scheduled status reports as required. Alternatively, the unit shall be able to accept an optional modular, plug-in asychronous communications card to permit any of the following:
   a. Local Data Logging - Permits a single dialer to communicate with a local Serial printer to log routine status reports, alarm reports, and programming data.
   b. Central Data Logging - Permits one or more dialers to communicate with a single centrally located Serial printer equipped with a suitable modem to log routine status reports, alarm reports, and programming data.
   c. Data Acquisition and Control - Permits one or more dialers to communicate with a centrally located Computer/Printer System equipped with a SCADA software package, thereby functioning as a stand alone SCADA system.

D. Hardware Features:

1. User-entered programming and voice messages shall be kept intact, even during power failures or when all power has been removed, for up to ten (10) years. This shall be accomplished through inclusion in the system of a lithium battery separate from the unit's backup rechargeable gel cell battery.
2. The dialer is to use a standard “dial-up” telephone line (direct leased line is not required), and is to be F.C.C. approved. Connection to the telephone is through a 4-pin modular jack (RJ 11).

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3. The unit shall be capable of dialing any phone number on command and functioning as a speakerphone. A built-in microphone shall allow anyone at a remote site to listen to local sounds and to have a two-way conversation with personnel at the dialer.
4. The unit shall be equipped with a real time clock thereby making it possible to:
    a. Alarm Ready Schedule - The dialer shall be user programmable to follow a specific schedule of operations. This shall include the flexibility to set a weekday, weekend, and holiday schedule. With this feature the dialer shall arm and disarm itself according to the schedule programmed.
    b. In the event any of the printer configurations outlined in Section 6, are utilized, all alarm reports will be time and date stamped. Routine scheduled status reports can also be programmed.
5. Normal power shall be 105-135 Vac, 15 watts nominal. The product is to contain its own gel cell rechargeable battery which is automatically kept charged when AC power is present. The system shall operate on battery power for a minimum of 20 continuous hours in the event of AC power failure. A shorter backup time shall not be acceptable. The built-in charger shall be precision voltage controlled, not a “trickle charger”, in order to minimize recharge time and to maximize battery life available.
6. All power, phone line, dry contact, and analog signal inputs shall be protected at the circuit board to IEEE Standard 587, Category B (6,000 volts open circuit/3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each line.
7. All keyboard and front panel switches shall be sealed to prevent contamination.
8. Front panel LED's shall indicate: Normal Operation, Program Mode, Call in Progress, Status for each Channel, AC Power present, AC Power failure, and Low, Discharging, or Recharging Battery.
9. On any inquiry telephone call, or On-Site status check, the voice shall provide specific warning if no dial out phone numbers are entered, or if the unit is in “alarm disabled“ mode, or if AC power is off or has been off since last reset.

E. Technical/Customer Support:
1. All users shall be provided and/or shall have access to the following support resources.
    a. Each autodialer shall be shipped with a VHS Format Video Tape which details all features of the product and provides an in-depth step-by-step programming: guide. A superficial marketing overview will not be acceptable.
    b. A Fax-on-Demand System which allows any user to call the manufacturer and retrieve copies of all technical information available directly into his own fax system. This service shall be available on a 24 hour basis.
    c. A toll free 800 number shall be available during manufacturer's normal working day to permit users to talk directly with technical service personnel and resolve problems not solved by either the Video Instruction Tape or the information provided via Fax-on-Demand.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

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3.04 CONFIGURATION SERVICES

A. Provide dialer with telephone line or cellular data plan established in Owners name. Dialer shall be functional and tested at factory acceptance test. After Final Completion phone plan and billing to be transfered to Owner.

B. Configure alarm handling for each specified alarm point.

C. Configure unique, verbalized alarm message for each specified alarm point.

D. Configure phone book for alarm message destinations. Coordinate requirements with owner representative and customize phone book to the owner's particular needs.

E. Configure activity log to record alarm events.

F. Configure notification of alarms as follows:
   1. Transmission of alarm information to commercially available voice pagers.
   2. Transmission of alarm information over standard telephone lines to residential or commercial sites, or cellular phones, provide for verbalization of alarm information and allow for the password secured remote acknowledgment of such alarms.

G. Configure health monitoring and alarming strategy such that the programmable logic controller system will activate the back-up alarm dialer if any of the following conditions occur:
   1. Software alarm notification system is not communicating with SCADA system software.
   2. Software alarm notification system is not communicating with the associated notification hardware (telephone modem, internet, etc.).
   3. SCADA system software is not communicating with the programmable logic controller systems.
   4. Programmable logic controller systems are not functioning.
   5. An active alarm remains un-acknowledged for fifteen minutes.

3.05 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.06 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 26 90 60
ETHERNET NETWORKING EQUIPMENT

PART 1 GENERAL

1.01 MEASUREMENT AND PAYMENT

A. Ethernet Networking Equipment.
1. Ethernet Networking Equipment shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Conditions - Division 1.
a. Ethernet Networking Equipment, Lump Sum. When so provided, payment for Ethernet Networking Equipment shall be included with payment for Process Instrumentation & Control and shall be made at the contract lump sum price bid or as specified in Special Conditions - Division 1.
b. Ethernet Networking Equipment, Inclusive. When no quantity is provided, Ethernet Networking Equipment shall be included with payment for Process Instrumentation & Control and shall be considered inclusive to payment for work scheduled under this contract.

1.02 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.03 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent applicable.
1. American National Standards Institute/Instrument Society of America (ANSI/ISA), Specifications and Standards, current edition:
a. ANSI/ISA-5.1-1984 - Instrumentation Symbols and Identification.
b. ANSI/ISA-5.3-1983 - Graphic Symbols for Distributed Control/Shared Display Instrumentation, Logic, and Computer Systems.
c. ANSI/ISA-95.00.01-2000 - Enterprise Control System Integration, Part 1: Models and Terminology.
d. ANSI/ISA-TR99.00.01-2004, Security Technologies for Manufacturing and Control Systems.
e. ANSI/ISA-TR99.00.02-2004, Integrating Electronic Security into the Manufacturing and Control Systems Environment.
2. Telecommunications Industry Association (TIA), Electronic Industries Alliance (EIA), Specifications and Standards, current edition:
a. TIA/EIA-568-A - Commercial Building Telecommunications Wiring.
b. TIA/EIA-569-A - Commercial Building Standards for Telecommunications Pathways and Spaces.
c. TIA/EIA-606 - Documentation.
d. TIA/EIA-607 - Commercial Building Bonding and Grounding Requirements.
e. TIA/EIA TSB-67 - Transmission Performance for Field Testing of Unshielded Twisted Pair Cabling Systems.
f. TIA/EIA TSB-72 - Centralized Optical Fiber Cabling Guidelines.
g. TIA/EIA-526-14 - Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant.
h. TIA/EIA-429-AAA - Detail Specification for 62.5 - UM Core Diameter/125-UM Platting Diameter Class 1A Multimode, Graded Index Optical Wave Guide Fibers.

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1.04 DESCRIPTION OF WORK

A. For the purpose of obtaining a complete and integrated process instrumentation and control system, the work specified herein shall be included under the scope of.
   1. Section 26 90 00 - Process Instrumentation & Control.

1.05 SUBMITTALS

A. Submit shop drawings in accordance with Division 01.

B. Submit shop drawings for the equipment specified herein as part of the complete, integrated submittal for the process instrumentation & control system and in accordance with the requirements specified under Section 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for Ethernet networking equipment:
   1. Literature sufficient in scope to demonstrate compliance with the requirements of this specification.
   2. Identify all software licensing requirements.

1.06 FACTORY TESTING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. Submit operation & maintenance manuals and instructions in accordance with Division 01.

B. Submit operation and maintenance manuals for the equipment specified herein as part of the complete, integrated manual for the process instrumentation and control system and in accordance with the requirements specified under 26 90 00 - Process Instrumentation & Control.

C. Submit the following information specifically for Ethernet Networking Equipment:
   1. As-built printout of all software configuration including data tables, passwords, and other parameters.
   2. Connection diagrams for each individual piece of equipment.
   3. Complete riser diagram indicating all equipment and interconnecting components with indication of location of each device.
   4. Provide copy of written warranty.
   5. Complete test reports for fiber optic cable. Provide a fiber test form which includes the following:
      a. Date and time of:
         1) Fiber installation.
         2) Fiber termination.
         3) Testing.
      b. Testing equipment used information including:
         1) Make.
         2) Model.
         3) Date of calibration.
      c. Name of person performing test and the installers.
      d. dB loss of each connector installed.
      e. dB loss of each fiber segment.
      f. End to end attenuation.
      g. Optical Time Domaine Reflectometer (OTDR) Signature trace.
      h. Cable shall be tested at the following frequencies:
         1) 850 nm.
         2) 1300 nm.
   6. Complete test report for category 6 cabling. Provide test form which includes the following:

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a. Date and time of:
   1) Cable installation.
   2) Cable termination.
   3) Testing report.
b. Testing equipment used information including:
   1) Make.
   2) Model.
   3) Date of calibration.
c. Name of person performing test and the installers.
d. Provide in spreadsheet format. Cable number with test reporting of cable length at near-end crosstalk and attenuation at frequency MHz at 1, 4, 10, 20 and 100. Also indicate room number of each jack.

7. Submit software license certificates, manufacturer provided software documentation, and software installation media.

1.08 QUALITY ASSURANCE

A. All materials, equipment, and parts shall be new and unused of current manufacture.

B. System supplier shall be responsible for providing all necessary accessories required for a complete and operable system.

C. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

D. Products: Listed and classified by UL or testing firm acceptable to the authority having jurisdiction as suitable for the purpose specified and indicated.

1.09 WARRANTY

A. See Division 01 for additional requirements.

1.10 EXTRA MATERIALS

A. See Division 01 for additional requirements.

PART 2 PRODUCTS

2.01 INDUSTRIAL ETHERNET NETWORK SWITCH, 16-PORT, MANAGED

A. Manufacturer:
   1. N-TRON Corp. Model 716TX as shown on drawings.

B. General.
   1. High Reliability/Availability.
   2. Extended Environmental Specifications.
   3. Rugged DIN-Rail Enclosure.
   4. High Performance.
   5. MTBF greater than 2M Hours (measured).
   6. Ease of Use.
      a. Plug & Play Operation.
      b. Auto-sensing 10/100BaseT.
      c. Auto-sensing Full/Half Duplex.
      d. Auto Cable Sensing (MDIX).

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e. Unmanaged Operation.
f. Compact DIN-Rail Package.

7. Increased Performance.
   a. Full Wire Speed Capable.
   b. 100BaseFX Fiber Uplink.
   c. Full Duplex Capable.
   d. Eliminates Network Collisions.
   e. Increases Network Determinism.
8. N-View Switch Viewing Option.
   a. The N-TRON N-View OLE for Process Control (OPC) Server Software an be combined with popular HMI software packages to add network traffic monitoring, trending and alarming to any application using N-Tron switches configured with the N-View option. N-TRON's N-View OPC Server collects 45 different traffic variables per port and 5 system level variables per switch. This information can provide a complete overview of the network load, service quality, and packet traffic. OPC client software can use N- View OPC Server data to resolve network problems quickly and improve system reliability.

C. Switch Properties.
1. Number of MAC Addresses: 4,000.
2. Aging Time: Programmable.
3. Latency Min.: 2.2 us.
4. Backplane Speed: 2.6Gb/s.
5. Switching Method: Store & Forward.

D. Shock & Vibration.
1. Shock: 200g @ 10ms.
2. Vibration/Seismic: 50g, 5-200Hz, Triaxial.

E. Electrical.
1. Input Voltage: 10-30 VDC.
2. Input Current: 400 mA at 24V.
3. Heavy-duty, industrial power supply, rack-mounted.

F. Environmental.
1. Operating Temperature: -40 to 85 degrees C (for -S option 509FX) -20 to 70° C Operating, -40 to 85° C Storage.
2. Storage Temperature: -40 to 85 degrees C.
3. Operating Humidity: 10 to 95 percent, non-condensing.
4. Operating Altitude: 0 to 10,000 ft.

G. Network Media.
1. 100BaseTX: >Cat6 Cable.

H. Connectors.
1. 10/100BaseTX: Sixteen (16) RJ-45 Copper Ports.
2. Serial Port: Com Parameters 9600,n,8,1.

I. Recommended Wiring Clearance:
1. Front: 5-inch.
2. Side: 3-inch.

J. Emissions and Safety Approvals:
1. FCC Part 15 Class A.
2. UL Listed (US & Canada).
3. CLASS I, DIV 2, GROUPS A,B,C,D, T4A.

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4. CE: EN55011,EN61000-6-2 and -6-4.
5. EN61000-4-2, 3, 4, 5, 6, 11, EN61010-1.
6. Class III, Pollution Degree2, Installation Category I.

2.02 INDUSTRIAL ETHERNET NETWORK SWITCH, UNMANAGED

A. Manufacturer:
1. N-TRON Corp. Model 116TX.
2. or equal.

B. General.
1. High Reliability/Availability.
2. Extended Environmental Specifications.
3. Rugged DIN-Rail Enclosure.
4. High Performance.
5. MTBF greater than 128.1 years.
6. Ease of Use.
   a. Plug & Play Operation.
   b. Auto-sensing 10/100BaseT.
   c. Auto-sensing Full/Half Duplex.
   d. Auto Cable Sensing (MDIX).
   e. Unmanaged Operation.
   f. Compact DIN-Rail Package.
7. Increased Performance.
   a. Full Wire Speed Capable.
   b. Full Duplex Capable.
   c. Eliminates Network Collisions.
   d. Increases Network Determinism.

C. Switch Properties.
1. Number of MAC Addresses: 4,000.
2. Aging Time: Programmable.
3. Latency Min.: 2.2 us.
4. Backplane Speed: 2.6Gb/s.
5. Switching Method: Store & Forward.

D. Shock & Vibration.
1. Shock: 15g @ 11ms.
2. Vibration/Seismic: 1g, 9-150Hz, Triaxial.

E. Electrical.
1. Input Voltage: 10-30 VDC.
2. Input Current: 200 mA@ 24V.
3. Heavy-duty, industrial power supply, rack-mounted.

F. Environmental.
1. Operating Temperature: 0 to 60 degrees C.
2. Storage Temperature: -40 to 70 degrees C.
3. Operating Humidity: 10 to 95 percent, non-condensing.
4. Operating Altitude: 0 to 10,000 ft.

G. Network Media.
1. 10BaseT: >Cat5 Cable.
2. 100BaseTX: >Cat6 Cable.

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H. Connectors.
1. 10/100BaseT: sixteen (16) RJ-45 Copper Ports.
2. Serial Port: Com Parameters 9600,n,8,1.

I. Recommended Wiring Clearance:
1. Front: 2-inch.
2. Side: 3-inch.

J. Emissions and Safety Approvals:
1. FCC Part 15 Class A.
2. UL Listed (US & Canada).
3. CLASS I, DIV 2, GROUPS A,B,C,D, T4A.
4. CE: EN55011,EN61000-6-2 and -6-4.
5. EN61000-4-2, 3, 4, 5, 6, 11, EN61010-1.
6. Class III, Pollution Degree2, Installation Category I.

2.03 HARDWARE FIREWALL

A. Manufacturer.
1. Sonic Wall TZ270.
2. Or equal.

2.04 UTP PATCH CABLE

A. Manufacturer:
1. Belden DataTwist 3600.
2. Or equal.

B. General:
1. Non-plenum rated 4 pair UTP (unshielded twisted pair) cable, 23 AWG, solid bare copper, FEP insulated, bonded-pairs, ripcord, flexible PVC jacket. Jacket is sequentially marked at two foot intervals.
2. High flexibility patch cordage. RJ-45 compatible for either T568A or T568B configurations.
3. Design minimizes changes in electrical characteristics due to bending and kinking associated with patch cables.
4. Patch cable impedance is matched with DataTwist 3600 horizontal cables to reduce signal reflections caused by impedance mismatches and decrease system return loss.
5. Resistant to attenuation increases due to high humidity environments.

C. Physical Characteristics:
1. Temperature range: -20 TO 80 deg. C.
2. Insulation material: FEP.
3. Jacket material: PVC.
4. Maximum pulling tension: 40 lbs.
5. Minimum conductor OD: 0.020-in.
6. Minimum insulation OD: 0.035-in.
7. Minimum bend radius: 0.25-in.
8. Flame test: UL 1581 Vertical Tray.
9. Color code:
    a. Pair 1: white/blue & blue.
    b. Pair 2: white/orange & orange.
    c. Pair 3: white/green & green.
    d. Pair 4: white/brown & brown.

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D. Electrical Characteristics:
   1. Maximum operating voltage: 300 V rms.
   2. Mutual capacitance (pF/100-m): 5.6 nominal.
   3. Nominal velocity of propagation: 70 percent.
   4. Propogation Delay (Skew) (nS/100-m): 30 nominal.
   5. Velocity of Propagation at 10 MHz (percent): 72 nominal.
   6. Capacitance unbalance (pF/100-m): 90.0 maximum.
   7. DCR at 20C (Ohms/100-m): 7.7 maximum.
   8. DCR unbalance (percent): 3.0 maximum.

E. Usage:
   1. Instrumentation & Control system UTP patch cable.

PART 3 EXECUTION

3.01 FIELD MEASUREMENTS

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.02 DELIVERY STORAGE AND HANDLING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.03 INSTALLATION

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.04 SOFTWARE CONFIGURATION SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

B. [A], [B], [C], and []

3.05 TESTING AND START-UP SERVICES

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

3.06 TRAINING

A. Refer to the requirements of Section 26 90 00 - Process Instrumentation & Control.

END OF SECTION

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SECTION 31 05 19.13
GEOSYNTHETICS FOR EARTHWORK

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing geotextile fabrics for subgrade separation and stabilization, and under riprap in accordance with the contract drawings and specified herein, and in accordance with Section 645 of the State of Wisconsin, Department of Transportation, Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Subgrade Preparation - Division 31

D. Riprap - Division 31

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. The Contractor shall furnish to the Engineer at least ten days prior to use in the work a manufacturer's Certified Report of Test or Analysis that the geotextile fabric delivered for use conforms to this specification. The delivered geotextile fabric shall bear markings to clearly identify it with the applicable test report furnished to the Engineer.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL

A. The geotextile fabric shall consist of either woven or nonwoven polyester, polypropylene, stabilized nylon, polyethylene or polyvinylidene chloride. All fabric shall have the minimum strength values in the weakest principal direction. Nonwoven fabric may be needle punched, heat bonded, resin bonded, or combinations thereof.

B. The geotextile fabric shall be insect, rodent, mildew, and rot resistant.

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C. The geotextile fabric shall be furnished in a wrapping which will protect the fabric from ultraviolet radiation and from abrasion due to shipping and hauling. The geotextile is to be kept dry until installed.

D. The geotextile fabric rolls shall be clearly marked showing the type of fabric.

E. Samples of fabric for testing may be obtained from the job site as specified herein or as determined by the Engineer.

F. If sewn seams are used, the Contractor shall furnish a field sewn seam sample produced from the geotextile fabric and thread and with the equipment to be used on the project, prior to its incorporation into the work.

G. All numerical values specified below represent minimum/maximum average roll values (i.e., the average of minimum test results on any roll in a lot should meet or exceed the minimum specified values).

2.02 GEOTEXTILE FABRIC, TYPE SAS (SUBGRADE AGGREGATE SEPARATION)

A. The fabric shall comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength, lbs	ASTM D 4632	170 min.
Apparent Opening Size, U.S. Standard Sieve	ASTM D 4751	70 max.
Permittivity, SEC^{-1}	ASTM D 4491	0.35 min.

B. Acceptable materials are Geotex 701, Thrace-LINQ 160EX, Mirafi 170N, and US 180 NW, or equal.

2.03 GEOTEXTILE FABRIC, TYPE R (RIPRAP)

A. The fabric shall comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength, lbs	ASTM D 4632	200 min.
CBR Puncture Strength	ASTM D 6241	500 min.
Apparent Breaking Elongation, Percent	ASTM D 4632	20 min.
Apparent Opening Size, U.S. Standard Sieve	ASTM D 4751	30 max.
Permittivity, SEC^{-1}	ASTM D 4491	0.40 min.

B. Acceptable materials are Geotex 801, Thrace-LINQ 180EX, Mirafi 180N, and US NW 205, or equal.

2.04 GEOTEXTILE FABRIC, TYPE HR (HEAVY RIPRAP)

A. The fabric shall comply with the following physical properties:

Test	Method	Value
Grab Tensile Strength, lbs	ASTM D 4632	300 min.
CBR Puncture Strength	ASTM D 6241	800 min.
Apparent Breaking Elongation, Percent	ASTM D 4632	20 min.
Apparent Opening Size, U.S. Standard Sieve	ASTM D 4751	30 max.
Permittivity, SEC^{-1}	ASTM D 4491	0.40 min.

B. Acceptable materials are Geotex 1201, Thrace-LINQ 275EX, Mirafi 1120N, Mirafi HP370, and US 300 NW, or equal.

2.05 GEOTEXTILE FABRIC, TYPE RSF (RECIRCULATING SAND FILTER)

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A. The filter fabric shall be of preferentially orientated isostatic polypropylene. Fabric shall be nonwoven and may be needle punched, heat bonded, resin bonded or combination thereof. Fabric shall have the following characteristics:

Test Property	Test Method	Value Minimum Requirements[1]
Nominal Weight (oz/yd^2)	ASTM D5261	8.0
Grab Tensile (lbs)	ASTM D4632	205
Grab Elongation At Break (%)	ASTM D4632	50
Puncture Resistance (lbs)	ASTM D4833	95
Trapezoidal Tear (lbs)	ASTM D4533	85
Mullen Burst (psi)	ASTM D3786	300
Water Flow Rate (gpm/ft^2)	ASTM D4491	130
Permittivity (sec^{-1})	ASTM D4491	1.6
Permeability kv (cm/sec)	ASTM D4491	0.4
A.O.S.[2] (sieve size)	ASTM D4751	120-80
UV Resistance (500 hrs)[3]	ASTM D4355	>85
pH Resistance		2-13

B. Acceptable manufacturer of filter fabric materials are Phillips 66, Polyfelt, Mirafi, Du Pont, Webtec, or equal.

PART 3 EXECUTION

3.01 GENERAL

A. Installation procedures shall be in accordance with manufacturer's recommendations and as specified herein.

B. Sewing. All factory and field seams shall be sewn with a thread having the same or greater durability as the material in the fabric. A 401 stitch conforming to Federal Standard No. 751a shall be used for all seams. All seams shall develop a tensile strength equal to or greater than 60 percent of the specified grab tensile strength of the fabric, unless otherwise specified.

3.02 GEOTEXTILE FABRIC, TYPE SAS

A. Prior to the placement of the geotextile fabric, the subgrade shall be smoothed, shaped and compacted to the required grade, section, and density. After the fabric has been placed on the subgrade area, no traffic or construction equipment will be permitted to travel directly on the fabric.

B. The fabric shall be rolled out on the roadway and pulled taut manually to remove wrinkles. Separate pieces of fabric shall be joined by overlapping or sewing. The fabric in the overlapped joints shall be placed with a minimum overlap of 18 inches.

C. Weight or pins may be required to prevent lifting of the fabric by wind.

D. After placement, the fabric shall be exposed no longer than 48 hours prior to covering.

E. The base course material shall be placed over the fabric by back dumping with trucks and leveling with a crawler dozer. Construction equipment shall be such that ruts do not exceed 3 inches in depth. All ruts shall be filled with additional material. The smoothing of ruts without adding additional material will not be permitted. Damaged areas shall be covered with a patch of fabric using a 36 inch overlap in all directions.

3.03 GEOTEXTILE FABRIC, TYPE R

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[1] Values in weaker principal direction. All minimum values represent minimum average roll values (i.e., test results from any sampled roll in a lot, tested in accordance with ASTM D 4759 shall meet or exceed the minimum values listed).

[2] Small sieve size number represents the maximum average roll value.

[3] UV resistance testing is based on results from independent conformance testing.

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A. The area shall be graded smooth and all stones, roots, sticks, or other foreign material which would interfere with the fabric being completely in contact with the soil shall be removed prior to placing the fabric.

B. The fabric shall be placed loosely and laid parallel to the direction of the water movement. Pinning or stapling may be required to hold the geotextile in place. Separate pieces of fabric shall be joined by overlapping or sewing. The fabric in the overlapped joints shall be placed with a minimum overlap of 24 inches in the direction of the flow.

C. After placement, the fabric shall be exposed no longer than 48 hours prior to covering.

D. Damaged areas shall be covered with a patch of fabric using a 36 inch overlap in all directions.

E. Placement of riprap shall be from the base of the slope upward. Height of free fall of riprap shall be determined by the Engineer but in no case shall this height exceed 12 inches.

3.04 GEOTEXTILE FABRIC, TYPE HR

A. The construction methods for Type HR fabric shall conform to the requirements of Subsection 3.03, except that the height of freefall of riprap shall not exceed 6 inches.

3.05 GEOTEXTILE FABRIC, TYPE RSF (RECIRCULATING SAND FILTER)

A. The fabric shall be placed directly upon the sand filter liner.

B. After placement, the liner shall be exposed no longer than 48 hours prior to covering.

C. Damaged areas shall be covered with a patch of fabric using a 36 inch overlap in all directions.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Geosynthetics for earthworks shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 GEOTEXTILE FABRIC

A. Geotextile Fabric, Square Yards. The measurement for geotextile fabric of the specified type shall be by the square yard of surface area upon which the geotextile fabric has been placed. Payment shall be made at the contract unit price bid per square yard of geotextile fabric of the specified type installed, as measured.

END OF SECTION

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SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the grading for this project.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Structural Excavation for Structures - Division 31

C. Trenching and Backfilling - Division 31

D. Erosion and Sedimentation Controls - Division 31

E. Topsoil Placement and Grading - Division 32

F. Seeding - Division 32

G. Sodding - Division 32

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (NONE)

PART 3 EXECUTION

3.01 PROTECTION OF EXISTING UTILITIES

A. Locate existing underground utilities in the areas of work before starting grading operations and provide adequate means of protection during earthwork operations. Should uncharted or incorrectly charted piping or other utilities be encountered during grading, consult the Engineer immediately for directions on how to proceed. Cooperate with the Owner, and public and private utility companies in keeping their respective services and facilities in operation.

B. Repair damaged utilities to the satisfaction of the utility owner.

3.02 PRESERVATION OF TREES AND SHRUBS

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A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

B. When necessary or required by the Contract Documents, trees or shrubs around which embankment is placed shall be protected by tree wells built in accordance with detailed drawings or as laid out in the field by the Owner or Engineer.

3.03 GRADING

A. General. All areas within the project limits shall be graded to the finished grades, lines and details less an allowance for topsoil and/or sod depth, pavement, base and structures.

B. Construction Methods. Grading shall be performed in accordance with Sections 205, 206, 207, and 208, of the State of Wisconsin, Department of Transportation Standard Specifications. If borrow is needed to provide the grades and elevations required, a borrow area will be selected by the Owner. The borrow area shall be restored to smooth lines, topsoiled with a minimum of 6 inches of salvaged topsoil and seeded.

C. Tolerance. Finish earth grades shall be in reasonably close conformity with the lines, grades and thickness shown on the contract drawings or established by the Engineer with particular concern for drainage and appearance. Finish earth grades along buildings or structures, under and adjacent to pavements and in drainageways shall be within 0.10 foot of those staked or shown on the contract drawings. Grades in all other areas shall be within 0.50 foot unless drainage considerations require more accuracy.

3.04 DRAINAGE

A. During construction, ditches and channels shall be drained by keeping the excavation areas and embankment sloped to the approximate section of the final earth grade. If existing surface drainage must be interrupted, temporary drainage shall be provided.

B. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

C. Precautions shall be taken to preserve, protect, and continue service of all existing tile drains, sewers, and other subsurface utilities; repair any damage to drains, sewers, and utilities.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Grading shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 GRADING

A. Grading, Square Yards. When so provided, payment for grading shall be made at the contract square yard price bid.

B. Grading, Lump Sum. When so provided, payment for grading shall be made at the contract lump sum price bid.

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C. Grading, Inclusive. When no quantity is provided, grading shall be inclusive to payment for work associated with related utility or infrastructure improvement.

END OF SECTION

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SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, equipment, and labor required to execute the earthwork for this project in accordance with Sections 201 through 214 of the State of Wisconsin, Department of Transportation Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Erosion and Sedimentation Controls - Division 31

C. Aggregate Base and Subbase - Division 32

D. Topsoil Placement and Grading - Division 32

E. Seeding - Division 32

F. Sodding - Division 32

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS (N/A)

PART 3 EXECUTION

3.01 PRESERVATION OF TREES AND SHRUBS

A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

B. When necessary or required by the Contract Documents, trees or shrubs around which embankment is placed shall be protected by tree wells built in accordance with Detailed Drawings or as laid out in the field by the Owner or Engineer.

3.02 UNCLASSIFIED EXCAVATION AND GRADING

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A. Excavation to subgrade shall be performed to provide a finished subgrade prepared for the application of crushed aggregate, curb and gutter, sidewalks and topsoil as shown on the typical section.

B. Also included is the removal and disposal of existing stumps, trees, miscellaneous structures and rubble as shown on the contract drawings and any other obstructions encountered which interfere with the proposed construction. Stumps shown on contract drawings to be removed from terraces or backslopes shall be shredded to a minimum of 6 inches below finish subgrade or otherwise removed by the Contractor.

C. Driveways shall be graded to a 10:1 maximum slope to match proposed construction.

D. The Contractor shall adjust all valve boxes, manhole frames, and other utility appurtenances to within 1 inch of the final grade as shown on the contract drawings or as staked in the field by the Engineer.

3.03 FILLING

A. All suitable excavated material shall be used for roadway construction, and at other places shown on the drawings.

B. Fill shall be spread in successive uniform horizontal layers not exceeding 9 inches in depth over entire area before compaction. Each layer shall be worked to break down clods over 6 inches in size and to secure uniform moisture content. Where filling in 9 inch layers is not feasible, as in the case of filling in water or over steep slopes, construct fill in one layer to the minimum elevation at which equipment can be operated. Above this elevation, the fill shall be constructed in layers of the specified depth.

C. Compact each layer of fill material to the following percentage of maximum dry density per modified proctor (ASTM D1557).
   1. 91 percent for fine grained soils (more than 50 percent passing the No. 200 sieve).
   2. 93 percent for coarse-grained soils (less than 50 percent passing the No. 200 sieve).

3.04 PREPARATION OF SUBGRADE

A. The preparation of the subgrade shall consist of bringing the area to be paved to a subgrade conforming to the required grade and cross section, of uniform density, ready to receive the base course. This is to be accomplished by excavating or backfilling as needed, shaping, watering as required, or permitting to dry to proper consistency, and rolling the entire area with an approved self-propelled roller weighing not less than 8 tons. Shaping and rolling shall be continued until the subgrade has been properly prepared and shows that no further compaction of any practical benefit would result from continued compaction. The subgrade shall be tested as to cross section, crown, and elevation. After being properly prepared, it shall be so maintained until the base course is constructed. A completed subgrade shall be maintained sufficiently in advance of the base course operations to permit proper control. Any part of the subgrade area not accessible to a roller shall be thoroughly compacted by hand or mechanical compaction in a manner acceptable to the Engineer. This work shall be in accordance with Section 211 of the State of Wisconsin, Department of Transportation Standard Specifications.

3.05 UNSTABLE SUBBASE/EXCAVATION BELOW SUBGRADE (EBS)

A. Deposits of frost-heave material, unstable soils, topsoil containing considerable amounts of organic matter, or other undesirable foundation material shall be removed from the area within the roadbed depths as shown on the drawings or as directed by the Engineer and shall be replaced as directed by the Engineer in the field.

B. Contractor shall notify the Engineer of any questionable material. The work shall be performed in accordance with Section 205 of the State of Wisconsin, Department of Transportation, Standard Specifications.

3.06 DRAINAGE

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A. During construction, ditches and channels shall be drained at all times by keeping the excavation areas and embankments sloped to the approximate section of the final earth grade. If existing surface drainage must be interrupted, temporary drainage shall be provided.

B. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

C. Precautions shall be taken to preserve, protect, and continue service of all existing tile drains, sewers, and other subsurface utilities; repair any damage to drains, sewers and utilities.

3.07 TESTING

A. A testing laboratory will perform compaction and density tests at locations determined by the Owner's Authorized Representative. Where tests indicate that the subgrade does not conform to the compaction density specified, the subgrade shall be replaced or re-worked until it does conform.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Subgrade preparation shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 UNCLASSIFIED EXCAVATION

A. Unclassified Excavation, Cubic Yards. The measurement and payment for this item shall be per cubic yard. Measurement shall be taken in the field by cross sections before excavation and after topsoiling is placed, where required. Payment shall be made at the contract unit price bid per cubic yard of unclassified excavation.

B. Unclassified Excavation, Lump Sum. Payment for subgrade preparation shall be made at the contract lump sum price bid for unclassified excavation.

4.03 UNSTABLE SUBBASE/EXCAVATION BELOW SUBGRADE

A. Excavation Below Subgrade, Cubic Yards. The measurement and payment for this item shall be per cubic yard. Measurement shall be taken in the field by cross sections before any excavation below subgrade takes place and after a stable subbase is reached. Payment shall be made at the contract unit price bid per cubic yard of excavation below subgrade.

END OF SECTION

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SECTION 31 23 16.16
STRUCTURAL EXCAVATION FOR STRUCTURES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable Provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor - Part 1926 Regulations, Current Edition.
   3. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall include all excavation, backfill and compaction for structures and other miscellaneous excavation, backfill and compaction required but not designated under other sections.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Subgrade Preparation - Division 31

C. Rock Excavation – Division 31

D. Dewatering - Division 31

E. Trenching and Backfilling - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 INSITU BACKFILL MATERIAL

A. Previously excavated soil or material free of organic debris, clay balls, and aggregate larger than 1-1/2 inches as approved by the Engineer.

2.02 IMPORTED GRANULAR FILL AND GRANULAR FOUNDATION

A. Imported granular fill and granular foundation shall be sand conforming to State of Wisconsin, Department of Transportation, Standard Specifications Section 209.2.2, Grade No. 1 Granular Backfill or well-graded sand and gravel conforming to State of Wisconsin, Department of Transportation, Standard Specifications Section 305.2.2.1 1-1/4 inch dense graded base with not more than eight percent (8 percent) by weight passing a No. 200 sieve.

2.03 PIPE EMBEDMENT

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A. Embedment for pipe lines under footings shall be Class B for rigid pipe and Class II for flexible pipe, as applicable for the pipe material to be installed, as specified by ASTM C12 and ASTM D2321 respectively.

PART 3 EXECUTION

3.01 GENERAL CLASSIFICATION

A. Excavation and trenching of all materials encountered under this contract will be unclassified without regard to type, difficulty to remove, or suitability for use in the construction.

3.02 BARRICADES

A. Provide sufficient barricades and protective devices adjacent to excavations to safeguard against injury. Provide and maintain sufficient safety lanterns at walks, roadways and parking areas to provide safety at night.

3.03 EXCESS MATERIAL

A. To the extent needed, all suitable excavated materials shall be used for foundation backfill and site grading. The suitability of materials for specific purposes shall be determined by the Engineer. All surplus or unsuitable excavated materials will be designated as waste and used only for site grading.

3.04 EXCAVATION

A. Excavate to achieve necessary dimensions, lines, grades and cross sections. Notify the Engineer of any remaining pockets of organic or unsuitable soil, debris, existing foundations or poorly compacted fill soils. Unsuitable materials shall be removed and replaced with compacted granular fill or backfill material. Bottoms of trenches shall be excavated to proper grade so that pipes will be supported on a firm bed of undisturbed natural earth or suitable, compacted backfill.

3.05 UNAUTHORIZED EXCAVATION

A. Consists of removal of materials beyond indicated elevations or dimensions without specific direction of the Engineer. Notify the Engineer when unauthorized excavations are made.

3.06 STABILITY OF EXCAVATION

A. Slope sides of excavations to comply with local codes and ordinances having jurisdiction. Provide shoring and bracing to retain banks and prevent collapse of excavations as necessary to safeguard workmen, prevent movement of adjacent ground, and avoid damage to existing improvements.

3.07 COLD WEATHER PROTECTION

A. Protect excavation bottoms against freezing when atmospheric temperature is less than 35 degrees Fahrenheit.

3.08 PIPE EMBEDMENT

A. Embedment pipe lines under footings shall be performed in accordance with the methods required as Class B for rigid pipe and Class II for flexible pipe, as applicable for the pipe material to be installed, as specified by ASTM C12 and ASTM D2321 respectively.

B. Where fill is required to raise the subgrade to elevations required, it shall be made in horizontal layers not to exceed 8 inches in depth and compacted as specified as herein.

3.09 BACKFILLING AND COMPACTION

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A. Place backfill to bring excavations to natural grade unless otherwise noted. Backfill within foundation walls and outside foundation walls to a distance of 10 feet outside the building line and under pavements and walks shall be spread and compacted uniformly in 6 inch to 8 inch lifts to at least 95 percent maximum dry density per modified proctor (ASTM D1557).

B. Site backfill placed outside a distance 10 feet from the building line shall be spread uniformly in 12 inch maximum lifts and trench backfill and similar work shall be with approved excavated material or granular backfill compacted in 8 inch maximum lifts to 93 percent dry density per modified proctor (ASTM D1557).

C. Backfill shall not be placed against any concrete structure which retains earth until the concrete has been in place 14 days or until test cylinders show the concrete strength to be at least 3000 pounds per square inch, nor shall high-early-strength concrete structures be backfilled before 6 days after the day of pouring or until test cylinders show the strength of the concrete to be at least 3000 pounds per square inch. Concrete structures which have earth on both sides (i.e., footings, frost walls, etc.), may be backfilled uniformly on both sides after the concrete has been in place 4 days, or 2 days for high-early-strength concrete. In no case shall backfilling start before required curing and protection, surface finishing, dampproofing, and waterproofing of the work to be covered by backfilling has been completed. When so permitted by the Engineer, footings may be backfilled uniformly on all sides to the top of such footing immediately upon removal of forms.

D. Contractor shall provide all necessary equipment required to obtain specified compaction. Compaction by travel of grading equipment is not considered adequate for uniform compaction. Small vibratory compactors are required wherever fill is placed adjacent to foundation walls, footings and piers.

E. Backfilling shall be so performed as to prevent wedging action against the structure. Slopes within ten feet of the structure shall be stepped, terraced, or otherwise treated as necessary to prevent slippage and wedging of the backfill.

F. Water shall not be used to expedite settlement of the backfill except to adjust moisture content to optimize compaction. The groundwater level shall be kept below the level of the lift of material being compacted.

3.10 SAMPLING

A. All required sampling, preparing of specimens, and testing except as modified by these specifications shall be performed by an independent laboratory and paid for by the Owner. The laboratory shall meet the requirements of ASTM E329. The Engineer shall determine when compaction tests shall be made.

3.11 TESTING

A. Any testing required because of failure of backfill to meet specification requirements shall be paid for by the Contractor. Test reports shall be sent to the Contractor with copies to the Engineer.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Structural excavation, backfilling and compaction shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 STRUCTURAL EXCAVATION FOR STRUCTURES

A. Structural Excavation for Structures, Inclusive. When no quantity is provided, structural excavation for structures shall be included in the payment for contract work related to the associated structure.

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4.03 IMPORTED GRANULAR FILL AND GRANULAR FOUNDATION

A. Imported Granular Fill and Granular Foundation, Cubic Yard. The measurement for imported granular fill and granular foundation shall be by the cubic yard, as in truck volume. Payment shall be made at the contract unit price bid per cubic yard installed.

B. Imported Granular Fill and Granular Foundation, Ton. The measurement for imported granular fill and granular foundation shall be by the ton, as trucked in weight. Weight tickets from approved truck scales shall be provided. Payment shall be made at the contract unit price bid per ton installed.

C. Imported Granular Fill and Granular Foundation, Inclusive When no quantity is provided, imported granular fill and granular foundation shall be included in the payment for contract work related to the associated structure.

END OF SECTION

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SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Building excavation.

1.02 RELATED WORK

A. Section 01 40 00 - Quality Requirements: Inspection of bearing surfaces and compaction testing.

B. Section 31 23 23 - Backfill and Compaction.

1.03 PROTECTION

A. Protect benchmarks from equipment and vehicular traffic.

B. Protect above and below grade utilities which are to remain.

C. Protect excavations by shoring, bracing, sheet piling, underpinning, or other methods required to prevent cave-in or loose soil from falling into excavation.

D. Notify Architect/Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

E. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

F. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reference the Foundation Exploration Report in Division 01 of this specification manual for a description of the existing soils on site.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum. Coordinate with 01 30 00 - Administrative Requirements.

B. Identify known underground utilities. Stake and flag locations.

C. Identify and flag surface and aerial utilities.

D. Notify utility company to remove and relocate utilities.

E. Maintain and protect existing utilities remaining which pass through work area.

3.02 EXCAVATION

A. Excavate subsoil required for building foundations, construction operations, and other work.

B. Machine slope banks to angle of repose or less until shored.

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C. Excavation shall not interfere with normal 45 degree bearing splay of any foundation.

D. Hand trim excavation and leave free of loose matter.

E. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume.

F. Correct unauthorized excavation at no cost to Owner.

G. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Architect/Engineer.

H. Stockpile excavated material in area designated on site and remove excess subsoil not being reused, or not re-usable from site.

I. Excavation for building foundations shall extend to footing bearing.

3.03 DEWATERING

A. Water collected in footing trenches from surface run-off or seepage of groundwater shall be removed by sump pump or other conventional dewatering method prior to placement of foundation concrete.

B. Any soil softened by standing water shall be removed prior to resuming construction activities.

C. Site grades shall be maintained during construction to prevent flow toward open excavations and the construction area.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under the provisions of Section 01 40 00.

B. An independent inspection and testing firm shall observe and perform field compaction tests on the bearing surfaces to determine if the existing soils are adequate for a bearing surface for the proposed structure. If the existing soils are found not to be adequate, the independent firm shall provide recommendation on the course of action required to correct the situation. The building foundation has been designed for an allowable soil bearing capacity of 2,500 psf.

END OF SECTION

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SECTION 31 23 19
DEWATERING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Wisconsin Administrative Code (WAC), Department of Natural Resources Environmental Protection Regulations, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all materials and labor to keep all excavations free of water during the preparation of the subgrade, to keep all concrete and masonry work free of water through the time period specified herein, and to keep the excavation free of water during backfilling.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Trenching and Backfilling - Division 31

C. Erosion and Sedimentation Controls - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.07 PERMITS AND APPROVALS

A. The Contractor shall obtain a High Capacity Well Permit from the Wisconsin Department of Natural Resources for all wells installed or operated for pumping groundwater to lower the groundwater table, for which the single or aggregate well capacity may be 70 gallons per minute (gpm) or greater. The Contractor shall submit the High Capacity Dewatering Well Application (Form 3300-258) to the Wisconsin Department of Natural Resources, Private Water Supply Section, P.O Box 7921, Madison, WI 53707, along with any necessary permit fees, and obtain said permit prior to the construction or operation of said high capacity well(s).

B. Permit Fees. Permit fees include, but are not limited to, high capacity well permits and Great Lakes Basin discharge fees.

C. The Contractor shall be responsible for all equipment, labor, materials and supplies required to comply with the requirements of the High Capacity Dewatering Well Permit, if necessary, at no additional cost to the Owner.

HIGH CAP WELL - GENERAL PERMIT APPLICATION INSTRUCTION -
https://dnr.wisconsin.gov/sites/default/files/topic/Wells/HighCap/HighCapAppInstructions.pdf

HIGH CAP WELL - GENERAL PERMIT APPLICATION –
https://dnr.wi.gov/files/PDF/forms/3300/3300-258.pdf

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D. The Contractor shall apply for and obtain a Dewatering Operations General Permit (Form 3400-201, available from the link below), Wisconsin Pollution Discharge Elimination System (WPDES) Permit No WI-0049344-5. The permit, if required should be submitted on the DNR's website through their online permitting process.

DEWATERING - GENERAL PERMIT AND REQUEST FOR COVERAGE -
Wizard: Wastewater General Permit Eligibility: Dewatering Operations (WI-0049344-05-0) Survey
Application Log-in: https://permits.dnr.wi.gov/water/SitePages/Waste%20Water%20Permit.aspx

E. The Contractor shall apply for and obtain a Dewatering Operations General Permit (Form 3400-201, available from the link below), Wisconsin Pollution Discharge Elimination System (WPDES) Permit No WI-0049344-5. The permit, if required should be submitted on the DNR's website through their online permitting process.

F. The Contractor shall be responsible for all requirements of the General Discharge Permit Dewatering Operations, including monitoring, metering, sampling, testing, and reporting, and shall also be responsible for compliance with all discharge limits contained in the General Discharge Permit.

G. The Contractor shall be responsible for all equipment, labor, materials and supplies required to comply with the requirements of the General Discharge Permit for Dewatering Operations, at no additional cost to the Owner.

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL

A. The Contractor shall furnish dewatering sumps, wells, discharge pipe, and pumping equipment as may be required to adequately dewater the work.

2.02 PUMPING EQUIPMENT

A. Pumping equipment shall be capable of running continuously except for conditions which may be approved by the Engineer.

2.03 WELLS

A. For the purposes of compliance, the provisions of chapter NR 812 apply to all new and existing drill holes to be utilized for the purpose of dewatering and the following:
   1. Wells governed under chapter NR 141 do not apply, unless they are high capacity wells, and shall not be used for the purpose of dewatering.

PART 3 EXECUTION

3.01 WATER LEVELS

A. At all times during the excavation period and until its completion and acceptance at final inspection, ample means and equipment shall be provided with which to remove promptly, and dispose of properly, all water entering any excavation or other parts of the work. The excavation shall be kept dry and groundwater levels shall be kept low enough to prevent a quicksand condition from ruining the excavation bottom.

B. Water levels shall be maintained at a level below all open excavations for structures and below the level of concrete until the concrete has been in place for 14 days or until test cylinders show the concrete strength to be at least 3,000 pounds per square inch or until high-early-strength concrete has been in place for 6 days or until test cylinders show the strength of the concrete to be at least 3,000 pounds per square inch. Water levels will be allowed to rise on structures prior to the concrete attaining its strength provided that

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water levels are raised uniformly on each side of walls. At no time shall water be allowed to rise on a structure within 12 hours of the final concrete placement.

C. Concrete immersed in water for the required period of time shall be an acceptable alternative for the concrete curing specified in Cast-in-Place Concrete - Division 03 of these specifications.

D. Water levels shall be maintained at a minimum level of 6 inches below the invert elevation of a pipe during placement.

3.02 WELLS

A. For the purposes of construction and installation, and abandonment, the provisions of chapter NR 812 apply to all drillholes and wells.

B. For the purpose of operation for wells used for dewatering, these operations shall be in accordance with the requirements of these specifications, the Engineer and all local, municipal, and state codes, rules and regulations.

3.03 DISCHARGE LINE

A. Discharge line shall be at a location approved by the Engineer.

3.04 DISPOSAL OF WATER

A. All water discharged from work sites shall be disposed of in such a manner to minimize erosion and sedimentation. Water must be discharged to a hard surface such as metal sheeting, wood sheeting, concrete, etc., so that erosion at the discharge point is eliminated.

B. Temporary and permanent erosion and sedimentation control measures shall be performed by the Contractor during construction to control water pollution, erosion and siltation, through the use of intercepting embankments, berms, dikes, dams, settling basins, sodding, planting and other erosion control devices or methods.

C. No water shall be discharged to sanitary sewers.

D. No water containing settleable solids shall be discharged into storm sewers.

3.05 SAMPLING AND MONITORING

A. Sampling and monitoring shall be performed by the Contractor in accordance with WPDES permit requirements. The cover letter accompanying the permit shall specify which parameters shall be monitored to assure compliance with water quality standards or treatment technology based standards.

B. Samples representative of the discharge shall be collected after treatment and prior to discharge to the environment. When treatment efficiency reporting is required, the influent sample shall be collected before the water passes through the treatment unit.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Dewatering shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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4.02 DEWATERING

A. Dewatering, Lump Sum. When so provided, payment for dewatering shall be made at the contract lump sum price bid.

B. Dewatering, Inclusive. When no quantity is provided, dewatering shall be considered inclusive to payment for work associated with the related utility or construction.

END OF SECTION

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SECTION 31 23 23.14
GRANULAR FILL

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the filling, compaction, and testing of all subgrade excavations for this project.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Subgrade Preparation - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 GRANULAR FILL

A. All granular subbase and granular fill materials shall conform to Section 209 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Unless otherwise noted in the Contract Drawings or specifications, all Granular Backfill material shall be Grade 1 Backfill in accordance with the gradation requirements of Section 209 of the State of Wisconsin, Department of Transportation, Standard Specifications.

PART 3 EXECUTION

3.01 COMPACTION

A. Granular fill materials shall be mechanically compacted in 6 inch to 8 inch lifts to 93 percent maximum dry density per modified proctor (ASTM-D1557).

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Granular fill shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 GRANULAR FILL

A. Granular Fill, Cubic Yards. The measurement for granular fill shall be by the cubic yard truck volume or as specified in Special Procedures - Division 01. Payment shall be made at the contract unit price bid per cubic yard of granular fill installed, as measured or as specified in Special Procedures - Division 01.

B. Granular Fill, Ton. The measurement for granular fill shall be by the ton or as specified in Special Procedures - Division 01. Weight tickets from approved truck scales shall be provided. Payment shall be made at the contract unit price bid per ton of granular fill installed, as measured or as specified in Special Procedures - Division 01.

C. Granular Fill, Inclusive. When no quantity for granular fill is provided, granular fill shall be inclusive to payment for work associated with related infrastructure improvements.

END OF SECTION

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SECTION 31 23 23
BACKFILL AND COMPACTION

PART 1 GENERAL

1.01 WORK INCLUDED

A. Backfilling to subgrade elevations around building foundations.

B. Compaction of existing subsoil prior to backfilling.

C. Compaction requirements.

1.02 RELATED WORK

A. Section 01 40 00 - Quality Requirements.

B. Section 31 23 16 - Excavation.

1.03 REFERENCES

A. ANSI/ASTM C136 - Sieve Analysis of Fine and Coarse Aggregates.

B. ANSI/ASTM D698 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 5.5 lb 2.49 kg Rammer and 12-inch Drop.

C. ANSI/ASTM D1557 - Moisture-Density Relations of Soils and Soil-Aggregate Mixture Using 10-pound Rammer and 18-inch Drop.

PART 2 PRODUCTS

2.01 COMMON FILL MATERIALS

A. Type A: Subsoil; Existing, free of all topsoil and organic material, roots, gravel larger than 3-inch size, and debris may be used to backfill around building foundations.

B. Type B: Imported granular sand, conforming to the gradations required in Section 209 of the State of Wisconsin Department of Transportation Standard Specifications.

C. Type C: Imported borrow, aggregate base course, ¾-inch dense graded base, crushed stone or crushed gravel conforming to the gradations required in Section 305.2.2.1 of the State of Wisconsin, Department of Transportation, Standard Specifications.

PART 3 EXECUTION

3.01 INSPECTION

A. Verify foundation or basement walls are braced to support surcharge forces imposed by backfilling operations.

B. Verify areas to be backfilled are free of debris, snow, ice, or water, and ground surfaces are not frozen.

3.02 BACKFILLING

A. Backfill areas to contours and elevations. Use unfrozen materials.

B. Backfill systematically, as early as possible, to allow maximum time for natural settlement. Do not backfill over porous, wet, or spongy subgrade surfaces.

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C. Place and compact fill materials in continuous layers not exceeding 8 inches loose depth.

D. Maintain optimum moisture content of backfill materials to attain required compaction density.

E. Backfill simultaneously on each side of unsupported foundation walls.

F. Slope grade away from building minimum 2 inches in 10 feet unless noted otherwise.

G. Make changes in grade gradual. Blend slopes into level areas.

H. Remove surplus backfill materials from site.

I. Leave stockpile areas completely free of excess fill materials.

3.03 TOLERANCES

A. Top Surface of Backfilling: Plus or minus 1 inch.

B. Allow adequate space for topsoil or paving.

3.04 FIELD QUALITY CONTROL

A. Field inspection and testing shall be performed under the provisions of Section 01 40 00.

B. An independent inspection and testing firm shall perform field compaction tests on the compacted backfill materials.

C. If compaction tests on backfill material indicate work does not meet specified requirements, remove work, replace, and retest at no cost to Owner.

3.05 SCHEDULE OF LOCATIONS

A. The paragraphs below identify location, fill material to be used and compaction expressed as a percentage of maximum density with ANSI/ASTM D1557.

B. Interior Slab-On-Grade: One 6 inch minimum layer of Type C directly under the slab and Type B or C for fill to raise the grade up to that point, each lift compacted to 95 percent.

C. Around Foundations Within the Building Area: Type B, each lift compacted to 95 percent.

D. Fill Under Grass Areas at Exterior Side of Perimeter Foundation Walls: Type A or B, compacted to 90 percent, compacted to 95 percent within 10 feet of foundation walls.

E. Fill Under Concrete Paving at Exterior Side of Perimeter Foundation Walls: Type B, compacted to 95 percent.

F. Fill Under Asphalt Paving at Exterior Side of Perimeter foundation Walls: Type B, compacted to 95 percent.

G. Fill and Base Course Under Concrete Sidewalks: Type B or C, provide 6-inch thick layer, compact to 95 percent.

END OF SECTION

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SECTION 31 23 33
TRENCHING AND BACKFILLING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.
   3. Wisconsin Administrative Code (WAC), Department of Natural Resources, Environmental Protection, Regulations, Current Edition.
   4. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall include all excavating, trenching, and backfilling for utilities as indicated from the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Dewatering - Division 31

C. Rock Excavation – Division 31

D. Structural Excavation for Structures - Division 31

E. Erosion and Sedimentation Controls - Division 31

F. Utility Horizontal Directional Drilling – Division 33

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 INSITU BACKFILL MATERIAL

A. Previously excavated soil free of organic debris, clay balls, and aggregate larger than 1-1/2 inches as approved by the Engineer.

2.02 IMPORTED GRANULAR BACKFILL (TRUCKED BACKFILL) MATERIAL

A. Imported granular fill (trucked backfill) shall be sand conforming to State of Wisconsin, Department of Transportation, Standard Specifications Subsection 209.2.2, Grade No. 1 Granular Backfill or well-graded sand and gravel conforming to Subsection 305.2.2.1 of said State Standard Specification 1-1/4 inch dense graded base with not more than eight percent (8 percent) by weight passing a No. 200 sieve.

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2.03 FLOWABLE BACKFILL

A. A cubic yard of flowable backfill shall consist of 1,350 pounds of sand, 775 pounds of #1 stone, 1,150 pounds of #2 stone, and 25 gallons of water. All weights are damp weights and no additional water will be allowed.

B. The #1 stone shall conform to the gradation of ASTM C33 No. 67 Stone. The #2 stone shall conform to the gradation of ASTM C33 No. 4 stone.

2.04 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

A. The CLSM shall include fine aggregate, cementious material, and water to produce a flowable, non-shrinking backfill. The strength of the CLSM shall be less than 1200 psi. If future excavation of the area is a possibility, the CLSM shall have a maximum strength of 150 psi. The Contractor shall submit a mix design to the Engineer for approval prior to use.

PART 3 EXECUTION

3.01 SURFACE OBSTRUCTIONS

A. Structures, sidewalk, driveways, curb and gutter, trees, shrubs, lawns, signs, fences, utilities, survey monuments, pavements, culverts and other appurtenances which are adjacent to the right-of-way or work easements, shall be carefully protected against damage. In the event of damage or inadvertent injury or removal of these surface features by failure of the Contractor to exercise reasonable precautions or proper construction techniques, he shall bear the full cost and responsibility for resulting damages and shall replace or repair such damage as early as possible. No allowance for extra payment or time lost will be allowed for such interferences that the Contractor could have suspected or anticipated during pre-bid site inspection and interpretation of the bidding documents.

B. Clearing, grubbing, and removal of all pavements, sidewalks, curbs, signs, poles, fences, etc., shall be done only as necessary for the completion of the work. Brush, trees, shrubs, concrete, rubble, and other removals, which are not intended to be replaced, shall be disposed of by the Contractor off the work site.

C. Obstructions, which are intended to be reset, shall be stored and protected by the Contractor. Fences, signs, mailboxes, trees, shrubs, structures, and similar features requiring removal, shall be restored to their original position except where permanent removal is indicated.

D. Monuments for land surveys encountered in the path of work shall be carefully protected from movement. Should removal be necessary, the Contractor shall notify the Engineer in advance. The Contractor will be held responsible for re-establishing monuments lost due to his negligence or failure to notify the Engineer at least 24 hours in advance of disturbing.

3.02 SUBSURFACE OBSTRUCTIONS

A. The approximate location and size of sewers, drains, culverts, gas mains, water mains, survey monuments, electric and telephone conduits and other underground structures shown on the drawings are based on records available to the Owner or surface markings indicating their existence.

B. The Contractor shall use caution in excavating and trenching so that the exact location of underground structures, both known and unknown, may be determined; he shall be held responsible for the repair of such structures when broken or otherwise damaged during construction.

C. The Contractor shall make arrangements with the utility companies for any relocation of interfering utilities. No extra cost due to unexpected delays or coordination work shall be incurred on the Owner except for authorized utility alterations performed by the Contractor as provided below.

D. When the Engineer permits the Contractor to make a change to avoid a utility relocation, the Engineer shall determine whether the change constitutes extra work as defined in the General Conditions.

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E. Any underground utilities or other structures, which the Contractor wishes to have moved to facilitate construction, shall be arranged with the owner of such structures. The Contractor shall pay all costs of the accommodation.

F. In the event that there is any question as to whether any of the above enumerated obstructions, underground utilities or other structures cross or pass through the space occupied by the completed structures of this contract, the Engineer's decision shall be binding upon the Owner and the Contractor.

G. During the construction of the pipe lines, it may be necessary to cross under certain sewers, drains, culverts, water lines, gas lines, electric conduits and other underground structures. Where necessary, the flow in drains or culverts shall be diverted so that the excavation is kept dry during the progress of the construction work. Every effort shall be made to prevent damage to such underground structures. Wherever such structures are disturbed or broken, they shall be restored to good condition at no additional cost to the Owner.

H. The Contractor shall use sand or gravel backfill beneath said structures. This backfill shall be deposited and thoroughly compacted by mechanical means in layers not to exceed 6 inches in depth.

3.03 EXCAVATION

A. General. All excavation of every description and of whatever substances encountered shall be performed to the depths indicated or as otherwise specified.
   1. During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or suitable for backfill shall be removed and wasted as specified. Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations and any water accumulated therein shall be removed by pumping or by other approved methods.
   2. Sheeting and shoring shall be placed as may be necessary for the protection of the work and for the safety of personnel. Unless otherwise indicated, excavation shall be by open cut.

B. Trench Excavation. Trenches shall be of the necessary width for proper laying of pipe and shall conform to WAC requirements. The banks of pipe trenches shall conform to OSHA requirements and the Contractor is responsible for all safety requirements of said codes.
   1. Care shall be taken not to overexcavate. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe. Bell holes and depressions for joints shall be dug after the trench bottom has been graded, and in order that the pipe rest on the prepared bottom for as nearly its full length as practicable, bell holes and depressions shall be only of such length, depth, and width as required for properly making the particular type of joint. Stones shall be removed as necessary to avoid point bearing.
   2. Except as hereinafter specified for wet or other unstable material, overdepths shall be backfilled as and with materials specified for, backfilling the lower portion of trenches. Whenever wet or otherwise unstable material that is incapable of properly supporting the pipe is encountered in the bottom of the trench, such material shall be overexcavated to a depth to allow for construction of a stable pipe bedding. The trench shall be backfilled to the proper grade with suitable approved materials.
   3. Trench Width. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not be less than 6 inches nor exceed 8 inches on either side of the pipe, unless otherwise approved by the Engineer in writing. The width of the trench above that level shall be as wide as necessary for sheeting and bracing and the proper performance of the work.
   4. Excavation for Appurtenances. Excavation for manholes and similar structures shall be sufficient to leave at least 12 inches clear space between the outer surface of structure and the bank or timber that may be used to hold and protect the banks. Any overdepth excavation below such appurtenances that has not been directed will be considered unauthorized and shall be refilled with sand, gravel, or concrete, as directed, at no additional cost to the Owner.

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5. Embedment. Embedment for utilities shall be as specified in the respective utility specification section.

C. Protection and Removal of Utility Lines. The Contractor shall notify all affected utility companies at least three consecutive working days preceding his construction operations to coordinate his work regarding poles, wires, valve boxes and other surface obstructions and to determine the location of gas, water main, power, light, telephone or telegraph conduit or service connection thereto or any other subsurface structure that crosses or passes through the space occupied by any of the proposed improvements. The Contractor shall make advance arrangements with the utility companies for any relocation of interfering utilities so as not to delay construction.

D. Interruptions of Services. Interruptions of utility services to existing buildings or facilities which become necessary either directly or indirectly due to work required under this contract shall be coordinated with the Owner through the Engineer. If the down time for connections is limited by them as to duration and time (weekend, nights or holidays), the Contractor shall perform the work during the designated period at no additional cost to the Owner.

3.04 BACKFILLING

A. Types of Backfill. Backfill for sanitary sewers, water mains, storm sewers, culverts, and drainpipes is the material placed between the bedding and the ground surface. Debris, frozen material, organic matter, unstable material, or stones greater than 8 inches in diameter shall not be suitable for backfill. Large clods and stones not exceeding 8 inches in diameter, when allowed for use as backfill, shall not be placed within two feet of the top of the pipe. Backfill shall be of the following types:

1. Type I Backfill:
   a. Type I backfill shall be used where shown on the contract drawings or stated in Special Procedures - Division 01, and unless directed otherwise shall extend from the top of the embedment to the underside of surface restoration.
   b. Type I backfill shall be used under and around all existing underground structures, tunnels, conduits, and pipes crossing the excavation. Such backfill shall extend underneath and on all sides to a structure, tunnel, conduit or pipe.
   c. Type I backfill shall be selected fill material consisting of granular subbase course, base course or approved existing sand. The backfill material shall be mechanically compacted in 6-inch layers, from a distance of one foot above the pipe to the surface. The degree of compaction shall be to 95 percent maximum dry density per modified proctor (ASTM D1557).
2. Type II Backfill:
   a. Type II backfill shall be used where shown on the contract drawings or stated in Special Procedures - Division 01.
   b. Type II backfill shall be suitable excavated material, or other approved material, placed in uniform layers and mechanically compacted. The following compaction percentages based on the maximum dry density per modified proctor (ASTM D1557) for the materials are required:
      1) For fine grained soils (more than 50 percent passing the No. 200 sieve).
         Zone III: From bottom of surface restoration to 3 feet below - 91 percent
         Zone II: From bottom of Zone III to top of the embedment - 88 percent
         Zone I: Specified as embedment
      2) For coarse grained soils (less than 50 percent passing the No. 200 sieve).
         Zone III: From bottom of surface restoration to 3 feet below - 93 percent
         Zone II: From bottom of Zone III to top of the embedment - 90 percent
         Zone I: Specified as embedment
3. Type III Backfill:
   a. Type III backfill shall be used in all areas where shown on the Plans or stated in Special Procedures - Division 01. Backfill material shall be suitable excavated material placed, from top of embedment to the bottom of surface restoration, in 12 to 18 inch layers and consolidated by jetting, spading, tamping, or puddling, to the approval of the Engineer, to insure complete filling of the trench.
4. Type IV Backfill:

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a. Utilize Type III Backfill with the following jetting: at least a 1-1/2 inch jetting hose, equipped with a regulating valve which permits the hydrant valve to be fully open during use, with a minimum 1-1/2 inch diameter pipe nozzle at least 6 feet long shall be used. During the flooding operation, the nozzle shall be inserted as deeply into the backfill as is possible without damaging the sewers, water mains, or foundations. The insertions shall be made at intervals of 5 feet or less and maintained until the backfill is saturated. Depressions caused by flooding shall be backfilled until there is no further settlement.

5. Flowable Backfill:

a. The materials shall be placed in a clean cement mixer truck and thoroughly mixed. Just prior to placement, the mixer shall be run at mixing speed for one full minute to insure an even mixture. The mixture shall be deposited in the trench directly from the mixer truck. Copies of the load tickets shall be provided to the Engineer.

B. After Settlement. Should after settlement occur, succeeding any of the above backfilling methods, the Contractor shall scarify the surface of the fill material and place additional fill material in the same manner as herein described so that the surface elevation conforms to that shown on the Plans. No additional compensation shall be allowed for repairing filled areas where after-settlement occurs.

C. Backfill Placement. The excavated space around and above underground structures, tunnels, conduits and pipes not filled with embedment material and where select fill backfill is not shown or specified may be backfilled by machine.

D. Backfilling work shall be done in such a way as to prevent dropping of material directly on top of any conduit or pipe through any great vertical distance. In no case shall backfilling material from a bucket be allowed to fall directly on a structure or pipe and in all cases, the bucket shall be lowered so that the shock of falling earth will not cause damage.

E. Lumps shall be broken up and if there are any stones, pieces of crushed rock or lumps, which cannot be readily broken up, they shall be distributed throughout the mass so that all interstices are solidly filled with fine material. Stones, lumps and clods shall also be placed to maintain a 2 foot minimum separation distance from the top of the pipe or structure. No frozen material shall be used for backfilling.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Trenching and Backfilling for utilities shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 TRENCHING AND BACKFILLING

A. Trenching and Backfilling, Inclusive. When no quantity is provided, trenching and backfilling shall be included in the payment for contract work related to the associated utility.

4.03 IMPORTED GRANULAR BACKFILL (TRUCKED BACKFILL)

A. Imported Granular Backfill (Trucked Backfill), Cubic Yard. Measurement for imported granular backfill (trucked backfill) shall be per cubic yard, as in truck volume. Payment shall be made at the contract unit price bid for imported granular backfill (trucked backfill), as measured.

B. Imported Granular Backfill (Trucked Backfill), Ton. Measurement for imported granular backfill (trucked backfill) shall be per ton, as trucked in weight. Payment shall be made at the contract unit price bid for imported granular backfill (trucked backfill) as measured.

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C. Imported Granular Backfill (Trucked Backfill), Inclusive. When no quantity is provided, imported granular backfill (trucked backfill) shall be included in the payment for contract work related to the associated utility.

4.04 FLOWABLE BACKFILL

A. Flowable Backfill. Measurement for flowable backfill shall be per cubic yard, as in truck volume. Payment shall be made at the contract unit price bid for flowable backfill, as measured.

END OF SECTION

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SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Natural Resources (WDNR), Conservation Practice Standards, Current Edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover providing the necessary materials, equipment and labor to control erosion and sedimentation controls by the methods specified herein. If no specific quantities are shown on the contract drawings, the Contractor shall use whatever quantities are necessary to prevent sediment transport off the job site, into permanent manmade storm water conveyances or management facilities or to Waters of the State.

B. The Contractor will be required to provide erosion control as per the current edition of the applicable State of Wisconsin, Department of Natural Resources (WDNR), Conservation Practice Standards. Copies of these standards can be obtained by contacting the following:

State of Wisconsin Department of Natural Resources
Non-Point Source and Land Management Section
101 South Webster Street, P.O. Box 7921
Madison, WI 53707-7921

or by visiting the following website:
http://dnr.wi.gov/topic/stormwater/standards/const_standards.html

C. The Engineer has prepared an erosion control plan for this project. The intent of this plan is to identify erosion control provisions for the construction site that comply with local, state, and federal regulations. The Contractor shall submit for approval by the appropriate regulatory agency any changes to the Erosion Control Plan, prior to beginning any construction on the project which may cause erosion in the portion of the site where the change to the Erosion Control Plan is proposed.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Clearing and Grubbing - Division 31

C. Grading - Division 31

D. Subgrade Preparation - Division 31

E. Structural Excavation for Structures - Division 31

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F. Trenching and Backfilling - Division 31

G. Riprap - Division 31

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 TOPSOIL

A. Topsoil shall be fertile, friable, natural loam surface soil, reasonably free of subsoil, clay lumps, brush, weeds and free of roots, stumps, stones larger than 2 inches in any dimension, and other matter harmful to plant growth. Topsoil to supplement insufficient topsoil on the site shall originate from local sources, but not from bogs or marshes.

2.02 LIME

A. Lime used for soil amendment shall be agricultural grade limestone ground sufficiently fine so that 80 percent passes a No. 8 sieve. Lime shall contain 80 percent calcium carbonate equivalent. Moisture shall not exceed 10 percent.

2.03 FERTILIZER

A. Fertilizer used in conjunction with seeding shall be dry, free-flowing granular fertilizer suitable for application by agricultural fertilizer spreaders or blower equipment, or non-volatile liquid commercial fertilizer, having an analysis of 20-10-10 (Nitrogen-Phosphoric Acid-Potash), or equal, unless use of phosphorus based fertilizers are banned by the community where the work is to be completed. In such communities, an analysis of 20-0-10, or equal, shall be used. Fertilizer having other analysis shall be applied at a rate to achieve at least the individual following amounts of nutrient per unit area:

Nutrient	Application Rate (Per Acre)	Application Rate (Per 1000 Sq. Ft.)
Nitrogen (N)	100 pounds	2.3 pounds
Phosphoric Acid (P_2O_5)	50 pounds	1.2 pounds
Potash (K_2O)	50 pounds	1.2 pounds

2.04 SEEDING FOR CONSTRUCTION SITE EROSION CONTROL

A. Seeding for Construction Sites shall conform with Wisconsin DNR Conservation Practice Standard 1059.

B. Seed mixtures shall conform to one of the following:
1. WisDOT, 2003. State of Wisconsin Standard Specifications For Highway and Structure Construction. Section 630, Seeding.
2. United States Department of Agriculture – Natural Resource Conservation Service Field Office Technical Guide Section IV, Standard 342, Critical Area Planting.
3. UWEX Publication A3434 Lawn and Establishment & Renovation.

C. All seed shall conform to the requirements of the Wisconsin Statutes and of the Administrative Code Chapter ATCP 20.01 regarding noxious weed seed content and labeling.

D. Seed mixtures that contain potentially invasive species or species that may be harmful to native plant communities shall be avoided.

E. Seed shall not be used later than one year after the test date that appears on the label.

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F. Seed shall be tested for purity, germination and noxious weed seed content and shall meet the minimum purity and germination requirements as prescribed in the current edition of Rules for Testing Seed, published by the Association of Official Seed Analysts.

2.05 MULCH FOR CONSTRUCTION SITES

A. Mulching for construction sites shall conform with Wisconsin DNR Conservation Practice Standard 1058.

B. Mulch shall consist of natural biodegradable material such as plant residue (including but not limited to straw, hay, wood chips, bark and wood cellulose fiber), or other equivalent materials of sufficient dimension (depth or thickness) and durability to achieve the intended effect for the required time period.

C. Mulch shall be environmentally harmless to wildlife and plants. Materials such as gravel, plastic, fabric, sawdust, municipal solid waste, solid waste byproducts1, shredded paper, and non-biodegradable products shall not be used.

D. Mulch shall be free of diseased plant residue (i.e., oak wilt), noxious weed seeds, harmful chemical residues, heavy metals, hydrocarbons and other known environmental toxicants.

E. Marsh hay shall not be used as mulch in lowland areas but may be used on upland sites to prevent the spread of invasive, nonnative species (i.e., reed canary grass) commonly found in marsh hay.

F. Straw and hay mulch that will be crimped shall have a minimum fiber length of 6 inches.

G. Wood chips or wood bark shall only be used for sites that are not seeded.

2.06 EROSION MAT

A. Non-Channel Erosion Mat products shall conform with Wisconsin DNR Conservation Practice Standard 1052.

B. Channel Erosion Mat products shall conform with Wisconsin DNR Conservation Practice Standard 1053.

C. Erosion mat shall conform to the requirements of the State of Wisconsin, Department of Transportation, Product Acceptability List (PAL) for Erosion Control Revegetative Mat (ECRM) and Turf-Reinforcement Mat (TRM).

D. For mats that utilize netting, the netting shall be bonded to the parent material to prevent separation of the net for the life of the product.

E. For urban class mats the following material requirements shall be adhered to:
   1. Only 100% organic biodegradable netted products are allowed, including parent material, stitching, and netting.
   2. The netting shall be stitched with biodegradable thread/yarn to prevent separation of the net from parent material.
   3. All materials and additive components used to manufacture the anchoring devices shall be completely biodegradable as determined by ASTM D 5338.
   4. Mats with photodegradable netting shall not be installed after September 1st.
   5. Steel wire pins or staples shall not be used in lawns.

2.07 SEEDING AND SODDING

A. Seeding and sodding shall conform to Seeding - Division 32 and Sodding - Division 32.

2.08 STRAW BALE EROSION BARRIERS

A. Straw Bale (Sediment Bale Barriers) shall conform with Wisconsin DNR Conservation Practice Standard 1055.

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B. Bales used for erosion control shall be either hay or straw, shall have rectangular surfaces, and shall be tightly bound with twine, not wire. The material in the bales shall be reasonably free of grain, weed seed and mold, and shall be dry and suitable for the purpose intended.

C. The minimum cross sectional area for wood stakes shall be 2.0 by 2.0 inches nominal.

D. The minimum diameter of steel (rebar) stakes shall be one-half inch.

2.09 SEDIMENT CONTROL FENCE (SILT FENCE)

A. Silt Fence shall conform with Wisconsin DNR Conservation Practice Standard 1056.

B. Silt fence shall be in accordance with Section 628.2.6 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction.

C. Wood Posts:
1. Wood Posts used to support the fabric shall be at least 1-⅛ inch x 1-⅛ inch in cross-section and shall be a minimum of 4 feet with a minimum in ground depth of 2 feet. Posts shall be made from kiln-dried hickory or Oak.
2. Staples used to attach silt fence to wood posts shall be at least 0.5-inches in length.

D. Steel Supports:
1. Steel posts shall be at least 5 feet long with a strength of 1.33 pounds per foot and shall have projections for the attachment of fasteners.
2. The silt fence fabric shall be attached in at least three places on the upslope side with 50 pound plastic tie straps or wire fasteners.

E. Silt fence shall have a support cord.

F. The Contractor shall furnish upon request a manufacturer's Certificate of Compliance that the geotextile fabric as furnished meets the above requirements.

G. Silt Fence shall be installed in accordance with Wisconsin DNR Conservation Practice Standard 1056.

2.10 STONE DITCH CHECKS

A. Stone Ditch Checks shall be installed in accordance with Wisconsin DNR Conservation Practice Standard 1062.

2.11 RIPRAP

A. Riprap shall be established in accordance with Riprap - Division 31 of this specification.

2.12 LAND APPLICATION OF POLYACRYLAMIDE

A. Land Application of Polyacrylamide shall be performed in accordance with Wisconsin DNR Conservation Practice Standard 1050.

2.13 STONE TRACKING PAD

A. Stone Tracking Pads shall be established in accordance with Wisconsin DNR Conservation Practice Standard 1057.

B. The aggregate for tracking pads shall be 3 to 6 inch clear or washed stone. All material to be retained on a 3-inch sieve.

2.14 VEGETATIVE BUFFERS

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A. Vegetative Buffers for Construction shall be established in accordance with Wisconsin DNR Conservation Practice Standard 1054.

B. Prior to land disturbance the perimeter of vegetative buffers shall be flagged or fenced to prevent equipment from creating ruts, compacting the soil and to prevent damage to existing vegetation.

C. Trees should not be cut down to establish a vegetative buffer. Other erosion control measures are preferred.

2.15 TEMPORARY SEDIMENT TRAPS

A. Temporary Sediment Traps shall conform with Wisconsin DNR Conservation Practice Standard 1063.

B. The stone outlet of a Sediment Trap shall consist of a stone section of embankment located at the discharge point. Stone shall consist of angular well graded 3 to 6 inch clear washed stone.

C. If filter fabric is indicated for the up-slope side of the stone outlet, a monofilament type fabric shall be used (such as WisDOT Type FF or equivalent).

2.16 TEMPORARY CONSTRUCTION SITE DIVERSION

A. Temporary Construction Site Diversions shall conform to Wisconsin DNR Conservation Practice Standard 1066.

2.17 DUST CONTROL

A. Dust Control measures shall be implemented in accordance with Wisconsin DNR Conservation Practice Standard 1068.

B. Asphalt and petroleum based products shall not be used for dust control.

C. Mulch or seed and mulch may be applied to protect exposed soil from wind erosion according to the provisions of WDNR Conservation Practice Standard 1058 Mulching for Construction Sites and 1059 Seeding for Construction Site Erosion Control.

D. Polymers may be used for dust control according to the provisions of WDNR Conservation Practice Standard 1050 Erosion Control Land Application of Polymers.

E. Tackifiers and Soil Stabilizers Type A – Products must be selected from the WisDOT Erosion Control PAL.

F. Solid board fences, snow fences, burlap fences, crate walls, bales of hay and similar material may be used to control air currents and blown soil.

2.18 CONSTRUCTION SITE DE-WATERING

A. Construction Site Dewatering activities shall be conducted in accordance with Wisconsin DNR Conservation Practice Standard 1061.

2.19 STORM DRAIN INLET PROTECTION

A. Storm Drain Inlet Protection shall conform Wisconsin DNR Conservation Practice Standard 1060.

B. All fabrics used as part of an inlet protection device must be selected from the list of approved fabrics certified for inlet protection, Geotextile Fabric, Type FF in the current edition of the WisDOT Product Acceptability List (PAL).

C. Inlet Protection Barriers include, but are not limited to, straw bales, sandbags, other material filled bags and socks, and stone weepers.

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D. Manufactured bags, when used, shall conform to the standards below:
   1. Minimum Size 14 x 26 inches
   2. Grab Tensile strength of fabric, ASTM D-4632 = 95 lb. min.
   3. UV stability, ASTM D-4355 = 70 % min.
   4. Fabric shall be sewn together with double stitching.

E. Straw Bale installation shall conform to the criteria outlined in the WDNR Conservation Practice Standard (1055) Sediment Bale Barrier (Non-Channel).

F. Stone weeper installation shall conform to the criteria in WDNR Conservation Practice Standard (1063) Sediment Trap.

2.20 DITCH CHECK (CHANNEL)

A. Ditch Checks for erosion and sediment control in drainage ditches and channels shall conform Wisconsin DNR Conservation Practice Standard 1062.

B. Stone ditch checks shall be constructed of a well-graded angular stone, a D50 of 3 inch or greater, sometimes referred to as breaker run or shot rock.

C. Manufactured products listed in WisDOT's PAL are also acceptable for temporary ditch checks.

D. Silt fence and single rows of straw bales are not permitted.

2.21 LAND APPLICATION OF ANIONIC POLYACRYLAMIDE (POLYMERS, PAM).

A. Land Application of Anionic Polyacrylamide (PAM) shall conform Wisconsin DNR Conservation Practice Standard 1050.

B. Anionic PAM mixtures shall be environmentally benign, harmless to fish, aquatic organisms, wildlife, and plants. Anionic PAM mixtures shall be non-combustible.

C. Cationic PAM shall not be used at any level. Anionic PAM mixtures shall have $\leq$0.05% free acrylamide monomer by weight as established by the Food and Drug Administration (FDA) and the Environmental Protection Agency (EPA).

D. The manufacturer or supplier shall provide a product expiration date for anionic PAM mixtures based on product expiration date of PAM in pure form. PAM shall not be used if the expiration date will be reached prior to establishment of vegetation in areas where PAM is to be used.

E. Contractor shall store and mix polymer in accordance with manufacturer or supplier written instructions.

PART 3 EXECUTION

3.01 EROSION CONTROL REQUIREMENTS

A. The erosion control requirements specified in the project Storm Water Management Plan shall be adhered to at all times.

B. Temporary and permanent erosion control measures shall be performed by the Contractor. The Contractor shall control water pollution, erosion, and siltation through the use of intercepting embankments, berms, dikes, dams, settling basins, slope paving, ditch checks, riprap, mulches, erosion mats, seeding, sodding, plantings and other erosion control devices or methods.

C. The Contractor shall submit for approval his plan of operations for accomplishing temporary and permanent erosion control work relating to grubbing, grading, paving and other work which might create erosion.

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D. The area of erosive land exposed to the elements by grubbing, excavation, borrow and fill operations at any one time shall be minimized to the maximum extent practicable and the duration of such exposure prior to final trimming, finishing and seeding or application of temporary erosion control measures shall be as short as practicable. Construction in and adjacent to rivers, streams, lakes, or other waterways shall be performed in such a manner as to avoid washing, sloughing or deposition of materials into such waterways which would obstruct or impair the flow thereof thus endangering the roadway or stream banks, or which would result in undue or avoidable contamination, pollution or siltation of such waterways.

E. The Owner or Designated Representative shall have full authority to suspend or limit grading and other operations pending adequate performance of such permanent erosion control measures as finish grading, topsoiling, mulching, matting and seeding and any temporary erosion control measures ordered by the Engineer.

F. Grubbing and grading operations shall be performed in proper sequence with other work to minimize erosion. Intercepting ditches or dikes shall be constructed as soon as practical after clearing and grubbing operations are completed and prior to or during the operations of excavating the cuts. Where erosion is likely to be a problem, the permanent erosion control measures shall follow immediately after the grading operations if conditions permit, unless the Engineer shall authorize temporary erosion control measures.

G. Water pumped from the site shall be treated by temporary sedimentations basins, grit chambers, sand filters, upslope chambers, hydro-cyclones, swirl concentrators, or other appropriate controls designed and used to remove total suspended solids (TSS) to 40 mg/l or less for the highest dewatering pumping rate. If the water is demonstrated to contain less than 40 mg/l TSS during dewatering operations, then no control is needed before discharge. Water may not be discharged in a manner that causes erosion of the site or receiving channels. Construction Site Dewatering activities shall be conducted in accordance with Wisconsin DNR Conservation Practice Standard 1061.

H. The Contractor shall take all possible precautions to prevent sediment from being tracked onto public or private roadways. Any sediment reaching a public or private road shall be removed by street cleaning (not flushing) before the end of each workday.

I. All storm drain or culvert inlets shall be protected with appropriate erosion control practices as identified in the appropriate Conservation Practice Standard. Channelized runoff from adjacent areas passing through the site shall be diverted around disturbed areas, if practical. Otherwise, the channel shall be protected. Sheet flow runoff from adjacent areas greater than 10,000 square feet in area shall also be diverted around disturbed areas unless shown to have resultant runoff velocities of less than 0.5 ft/sec across the disturbed area for one-year design storms having a duration of from 0.5 to 24 hours. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels.

J. All disturbed ground left inactive for seven (7) or more days shall be stabilized by seeding or sodding (only prior to October 15) or by mulching or covering, or other equivalent control measure.

K. For sites with more than 10 acres disturbed at one time, or if a channel originates in the disturbed area, one or more Temporary Sediment Traps shall be constructed in accordance with Wisconsin DNR Conservation Practice Standard 1063. The basin discharge rate shall also be sufficiently low as to not cause erosion along the discharge channel or the receiving water.

L. For sites with less than 10 acres disturbed at one time, sediment control fences, hay bales, or equivalent control measures shall be placed along all sideslope and downslope sides of the site. If a channel or area of concentrated runoff passes through the site, sediment control fences shall be placed along the channel edges to reduce sediment reaching the channel.

M. Any soil or dirt storage piles containing more than ten cubic yards of material should not be located with a downslope drainage length of less than 25 feet to a roadway or drainage channel. If remaining for more than seven (7) days, they shall be stabilized by mulching, vegetative cover, tarps, or other means. Erosion from piles which will be in existence for less than seven (7) days shall be controlled by placing hay bales or sediment control fence barriers around the pile. In-street utility repair or construction soil; or dirt storage

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piles located closer than 25 feet to a roadway or drainage channel must be covered with tarps or a suitable alternative control must be used if exposed for more than seven (7) days, and storm drain or culvert inlets must be protected with straw bales or other appropriate filtering barriers (CPS 1060).

3.02 TEMPORARY SEEDING

A. Seeding for Construction Sites shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1059.

B. Temporary Seeding (Cover Crop) - Areas needing protection during periods when permanent seeding is not applied shall be seeded with annual species for temporary protection. See table below for seeding rates of commonly used species. The residue from this crop may either be incorporated into the soil during seedbed preparation at the next permanent seeding period or left on the soil surface and the planting made as a no-till seeding.

Species	Lbs/Acre	Percent Purity
Oats	131[1]	98
Cereal Rye	131[2]	97
Winter wheat	131[2]	95
Annual Ryegrass	80[2]	97

1 Spring and summer seeding

2 Fall seeding

C. Permanent Seeding - Rates shall be based on pounds or ounces of Pure Live Seed (PLS) per acre. If a nurse crop is used in conjunction with permanent seeding, the nurse crop shall not hinder establishment of the permanent vegetation. A nurse crop shall be applied at 50% its temporary seeding rate when applied with permanent seed.

D. Inoculation - Legume seed shall be inoculated in accordance with the manufacturer's recommendations. Inoculants shall not be mixed with liquid fertilizer.

E. Sowing
1. Seed grasses and legumes no more than 1/4 inch deep. Distribute seed uniformly. Mixtures with low seeding rates require special care in sowing to achieve proper seed distribution.
2. Seed may be broadcast, drilled, or hydroseeded as appropriate for the site.
3. Seed when soil temperatures remain consistently above 53°F. Dormant seed when the soil temperature is consistently below 53°F (typically November 1st until snow cover). Seed shall not be applied on top of snow.

F. Turf seedlings must not be mowed until the stand is at least 6 inches tall. Do not mow closer than 3 inches during the first year of establishment.

G. Alternate plans must be submitted for approval.

3.03 APPLICATION OF STRAW OR HAY MULCH

A. Mulching for Construction Sites shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1058.

B. Application Rate:
1. Mulch shall cover a minimum of 80% of the soil surface for unseeded areas. For seeded areas, mulch shall be placed loose and open enough to allow some sunlight to penetrate and air to circulate but still cover a minimum of 70% of the soil surface.
2. Mulch shall be applied at a uniform rate of 1½ to 2 tons per acre for sites that are seeded, and 2 to 3 tons per acre for sites that are not seeded. This application results in a layer of ½ to 1½ inches thick for seeded sites, and 1½ to 3 inches thick for sites not seeded.

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3. Wood chips or wood bark shall be applied at a rate of 6 to 9 tons per acre to achieve a minimum of 80% ground cover. This application should result in a layer of wood chips or wood bark ½ to 1½ inches thick.

C. In areas where mulch is to be placed over seed, mulch shall be placed within 24 hours of seeding.

D. Mulch Anchoring Methods - Anchoring of mulch shall be based on the type of mulch applied, site conditions, and accomplished by one of the following techniques:
1. Crimping: Immediately after spreading, the mulch shall be anchored by a mulch crimper or equivalent device consisting of a series of dull flat discs with notched edges spaced approximately 8 inches apart. The mulch shall be impressed in the soil to a depth of 1 to 3 inches.
2. Polypropylene Plastic, or Biodegradable Netting: Apply plastic netting over mulch application and staple according to manufacturer's recommendations.
3. Tackifier: Tackifier shall be sprayed in conjunction with mulch or immediately after the mulch has been placed. Tackifiers must be selected from those that meet the WisDOT Erosion Control Product Acceptability List (PAL). Asphalt based products shall not be applied.
   a. The tackifiers shall be applied at the following minimum application rates per acre:
      1) Latex-Base: mix 15 gallons of adhesive (or the manufacturer's recommended rate which ever is greater) and a minimum of 250 pounds of recycled newsprint (pulp) as a tracer with 375 gallons of water.
      2) Guar Gum: mix 50 pounds of dry adhesive (or the manufacturer's recommended rate which ever is greater) and a minimum of 250 pounds of recycled newsprint (pulp) as tracer with 1,300 gallons of water.
      3) Other Tackifiers: (Hydrophilic Polymers) mix 100 pounds of dry adhesive (or the manufacturer's recommended rate which ever is greater) and a minimum of 250 pounds of recycled newsprint (pulp) as a tracer with 1,300 gallons of water.

3.04 PLACING EROSION MAT

A. Installation instructions shall be supplied by the manufacturer. The Contractor shall install the mat in accordance with the manufacturer's recommendations and in accordance with Section 628.2 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, and the State of Wisconsin, Department of Transportation general requirements for erosion mat except as may be modified herein.

B. Erosion control revegetative mats shall be installed after all topsoiling, fertilizing, liming and seeding is complete.

C. The mat shall be in firm and intimate contact with the soil. It shall be installed and anchored per the manufacturer's recommendation.

D. The mat shall be unrolled and draped loosely, without stretching, so that continuous ground contact is maintained. In ditches, mat shall be unrolled and applied parallel to the direction of drainage. On slopes, mat shall be applied parallel to the slope direction.

E. Turf-reinforcement mat shall be installed in conjunction with the topsoiling operation and shall be followed by Erosion Control Revegetative Mat installation.

F. At time of installation, document the manufacturer and mat type by retention of material labels and manufacturer's installation instructions. Retain this documentation until the site has been stabilized.

G. In channels and on slopes, each upslope and each downslope end of each piece of mat shall be placed in a 4-inch trench, stapled on 12-inch centers, backfilled and tamped. Where one roll ends and second roll starts, the upslope piece shall be brought over the end of the downslope roll so that there is a 12 inch overlap, placed in a 4 inch trench, stapled on 12 inch centers, backfilled and tamped. In channels, erosion mats shall extend for whichever is greater: upslope one-foot minimum vertically from the ditch bottom or 6 inches higher than the design flow depth.

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H. On slopes, where two or more widths of mat are applied, the two edges shall be overlapped according to the manufacturer's installation instructions and stapled at 18 to 24 inch intervals along the exposed edge of the lap joint. The body of the mat shall be stapled in a grid pattern with staples 3 feet on center each way.

I. Where heavy concentrations of water or extremely erodible soil conditions exist, as noted on the contract drawings, erosion checks shall be installed at intervals of 50 feet, or less. Such a check shall consist of a 4-inch deep trench perpendicular to the flow direction across the entire width of the fabric. The mat shall be stapled at 9-inch intervals along the bottom of the trench across the entire width of the mat. The trench shall then be backfilled and tamped.

J. If anchoring devices become loosened, or if any fabric loosens, is torn or undermined, repairs shall be made immediately without additional compensation.

K. Erosion mat when used in conjunction with fertilizing and seeding done for surface restoration, shall be installed immediately after fertilizing and seeding operations have been completed. Straw or hay mulch shall not be used under the fabric.

L. Erosion mat shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.
   1. If there are signs of rilling under the mat, install more staples or more frequent anchoring trenches. If rilling becomes severe enough to prevent establishment of vegetation, remove the section of mat where the damage has occurred. Fill the eroded area with topsoil, compact, reseed and replace the section of mat, trenching and overlapping ends per manufacturer's recommendations. Additional staking shall be provided where rilling was filled.
   2. If the reinforcing plastic netting has separated from the mat, remove the plastic and if necessary replace the mat.
   3. Maintenance shall be completed as soon as possible with consideration to site conditions.

3.05 VEGETATIVE BUFFERS

A. Vegetative Buffers for Construction shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1054.

B. Trees should not be cut down to establish a vegetative buffer.

C. A stand of dense vegetation shall be maintained to a height of 3 – 12 inches.

D. Vegetative buffers shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period. Vegetative buffers shall be inspected for proper distribution of flows, sediment accumulation and signs of rill formation.

E. If the vegetative buffer becomes silt covered, contains rills, or is otherwise rendered ineffective, other perimeter sediment control measures shall be installed. Eroded areas shall be repaired and stabilized. Repair shall be completed as soon as possible with consideration to site conditions.

3.06 TEMPORARY SOD PLACEMENT

A. The Contractor shall place sod with edges in close contact and with joints staggered. Sod placement on slopes shall commence at the bottom of the slope, and the rows shall be laid perpendicular to the slope. The edge of the sod at the tops of slopes shall be turned slightly under, and a layer of soil shall be compacted over the edge to direct surface drainage over the edge onto the top of the sod. Sod placement in areas other than on slopes shall be made so that the top sod surface is flush with adjoining surfaces.

B. On slopes steeper than 4:1 horizontal to vertical, the Contractor shall stake the sod with split cedar shingles, or other equally effective stakes, spaced from 18 to 36 inches apart along the longitudinal axis of the sod strip. These stakes shall be placed near the top edge of the sod strip and shall be driven flush with the sod.

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C. After the sod is placed, it shall be rolled or firmly tamped to press the sod onto the underlying soil. The Contractor shall, at the end of the day in which the sod is laid, thoroughly soak all sodded areas by sprinkling them with water.

D. Sod shall be maintained in a moist, growing condition. The Contractor shall repair all areas damaged by erosion or traffic of any kind.

3.07 PLACING HAY BALE BARRIERS

A. Straw Bale (Sediment Bale Barriers) shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1055.

B. Sufficient bales shall be on the site to create the necessary barriers prior to the start of groundbreaking operations. The bales shall be stacked and covered with plastic sheeting until required for use.

C. At a minimum, sediment bale barriers shall be placed in a single row, lengthwise on the contour, with the ends of adjacent sediment bale barriers tightly abutting one another. The holes between bales shall be chinked (filled by wedging) with straw, hay or equivalent material to prevent water from escaping between the bales.

D. The maximum allowable slope lengths contributing runoff to a sediment bale barrier are specified below:

Slope	Barrier Row Spacing
< 2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 33%	25 feet
33 to 50%	20 feet
> 50%	Not Permitted

E. Sediment bale barriers shall not be placed perpendicular to the contour.

F. The end of the sediment bale barrier shall be extended upslope to prevent water from flowing around the barrier ends.

G. Installed sediment bale barrier shall be a minimum of 10 inches high and shall not exceed a maximum height of 20 inches from ground level.

H. The barrier shall be entrenched and backfilled. A trench shall be excavated the width of a sediment bale barrier and the length of the proposed barrier to a minimum depth of 4 inches. After bales are staked and chinked, the excavated soil shall be backfilled and compacted against the barrier. Backfill to ground level on the down slope side. On the upslope side of the sediment bale barrier backfill to 4 inches above ground level.

I. At least two wood stakes, “T” or “U” steel posts, or 1/2 inch rebar driven through at equidistance along the centerline of the barrier shall securely anchor each bale. The first stake in each bale shall be driven toward the previously laid bale to force the bales together. Stakes shall be driven a minimum 12-inches into the ground to securely anchor the sediment bale barriers.

J. Bales shall be installed so that bindings are oriented around the sides rather than along the tops and bottoms of the bales in order to prevent deterioration of the bindings.

K. Sediment bale barriers shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

L. Damaged or decomposed sediment bale barriers, any undercutting, or flow channels around the end of the sediment bale barriers shall be repaired.

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M. Sediment shall be properly disposed of once the deposits reach 1/2 the height of the sediment bale barrier.

N. Sediment bale barriers and anchoring devices shall be removed and properly disposed of when they have served their usefulness, but not before the upslope areas have been permanently stabilized.

O. Any sediment deposits remaining in place after the sediment bale barrier is no longer required shall be dressed to conform to the existing grade, prepared, and seeded.

3.08 CONSTRUCTION OF SEDIMENT CONTROL FENCE (SILT FENCE)

A. Silt Fence shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1056.

B. When installed as a stand-alone practice on a slope, silt fence shall be placed on the contour. The parallel spacing shall not exceed the maximum slope lengths for the appropriate slope as specified:

Slope	Fence Spacing
< 2%	100 feet
2 to 5%	75 feet
5 to 10%	50 feet
10 to 33%	25 feet
> 33%	20 feet
> 50%	Not Permitted

C. Silt fences shall not be placed perpendicular to the contour.

D. The ends of the fence shall be extended upslope to prevent water from flowing around the ends of the fence.

E. When attached to wooden posts the silt fence fabric shall be stapled, using at least 0.5-inch staples, to the upslope side of the posts in at least 3 places.

F. When attached to steel supports the silt fence fabric shall be attached in at least three places on the upslope side with 50 pound plastic tie straps or wire fasteners. To prevent damage to the fabric from fastener, the protruding ends shall be pointed away from the fabric.

G. The maximum spacing of posts for nonwoven silt fence shall be 3 feet and for woven fabric 8 feet.

H. Where joints are necessary, each end of the fabric shall be securely fastened to a post. The posts shall then be wrapped around each other to produce a stable, secure joint or shall be overlapped the distance between two posts.

I. On the terminal ends of silt fence the fabric shall be wrapped around the post such that the staples are not visible.

J. A minimum of 20 inches of the post shall extend into the ground after installation.

K. Anchoring – Silt fence shall be anchored by spreading at least 8 inches of the fabric in a 4 inch wide by 6 inch deep trench, or 6 inch deep V-trench on the upslope side of the fence. The trench shall be backfilled and compacted. Trenches shall not be excavated wider and deeper than necessary for proper installation.

L. Removal – Silt fences shall be removed once the disturbed area is permanently stabilized and no longer susceptible to erosion.

M. Silt fences shall at a minimum be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24 hour period.

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N. Damaged or decomposed fences, undercutting, or flow channels around the end of barriers shall be repaired or corrected.

O. Sediment shall be properly disposed of once the deposits reach 1/2 the height of the fence.

3.09 STONE TRACKING PAD

A. Stone Tracking Pads shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1057.

B. The tracking pad shall be installed prior to any traffic leaving the site.

C. The aggregate shall be placed in a layer at least 12 inches thick. On sites with a high water table, or where saturated conditions are expected during the life of the practice, stone tracking pads shall be underlain with a WisDOT Type R geotextile fabric to prevent migration of underlying soil into the stone.

D. Tracking pads and tire washing stations shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

E. The tracking pad performance shall be maintained by scraping or top-dressing with additional aggregate.

F. A minimum 12-inch thick pad shall be maintained.

3.10 STORM DRAIN INLET PROTECTION

A. Storm Drain Inlet Protection shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1060.

B. The contributing drainage area to the inlet protection device shall be one acre or less. In instances were a larger contributing drainage area exists, runoff shall be routed through a properly designed sediment trapping or settling device upstream of inlet.

C. Other than Type D inlet protection devices, no gaps shall be left in the material used that would allow the flow of water to bypass the inlet protection device.

D. Filter Fabric Barrier Criteria - See Inlet Protection Detail
   1. Inlet protection Type A devices shall be utilized around inlets and unpaved areas until permanent stabilization methods have been established. Type A devices shall be utilized on inlets prior to installation of curb and gutter or pavement, and where safety considerations are not compromised on the site.
   2. Type B shall be utilized after the casting and grate are in place.
   3. Type D shall be utilized in areas where other types of inlet protection are identified as incompatible with roadway and traffic conditions, causing possible safety hazards when ponding occurs at the inlet. Type D shall only be used after castings are in place on top of the inlet boxes.
   4. Type D inlet protection shall conform to the standard drawing as shown in the contract drawings. There shall be a three-inch space between the bag and the sides of the inlet to prevent the inlet sides from blocking the overflow; and shall only be used in inlets deeper than 30 inches from the top of grate to bottom of the inlet. If such clearance is not available, cinch or tie the sides of the bag (with rope or ties) to provide clearance.

E. Criteria Applicable to the Post-Paving/Curbing Phase of Construction
   1. Inlet protection Types B, C, and D are applicable to post paving construction. See Inlet Protection Detail.
      a. Type B shall be utilized on inlets without curb box.
      b. Type C shall be utilized on street inlets with curb heads. A 1½ inch x 3½ inch (37 mm by 87 mm) minimum, piece of wood shall be wrapped and secured in the fabric and placed in

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front of the curb head as shown in the contract drawings. The wood shall not block the entire opening of the curb box and be secured to the grate with wire or plastic ties.

c. Type D.

F. Remove inlet protection devices once the contributing drainage area is stabilized with appropriate vegetation or impervious area.

G. Inlet protection shall be at a minimum inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

H. Sediment deposits shall be removed and the inlet protection device restored to its original dimensions when the sediment has accumulated between 1/3 to 1/2 the design depth of the device, or when the device is no longer functioning as designed. Removed sediment shall be deposited in a suitable area and stabilized.

I. Any material falling into the inlet shall be removed.

3.11 DITCH CHECK (CHANNEL)

A. Ditch Checks for erosion and sediment control in drainage ditches and channels shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1062.

B. Ditch checks shall be utilized during rough grading and shall be removed once the final grading and channel stabilization is applied, unless intended to be part of a permanent storm water management plan.

C. Channel erosion mat or other nonerodible materials shall be placed at the base of a ditch check, and extended a minimum of 6 feet, to prevent scour and washing out the toe of the ditch check. DNR Conservation Practice Channel Erosion Mat (1053) contains criteria for the placement of erosion mat in this location.

D. Stone ditch checks may be underlain by a nonwoven geotextile fabric to ease installation and removal. If the geotextile fabric is extended, it can serve purpose specified in item 3.11 C above.

E. Chink or seal stone and rock ditch checks to minimize the flow through the ditch check.

F. For added stability, the base of a stone or rock ditch check shall be keyed into the soil to a depth of 6-inches.

G. Ditch checks shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24 hour period.

H. Unless incorporated into a permanent storm water management system, ditch checks shall be removed once the final grading and channel stabilization is applied.

I. Maintenance shall be completed as soon as possible with consideration to site conditions.

3.12 TEMPORARY SEDIMENT TRAPS

A. Temporary Sediment Traps shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1063.

B. Sediment traps shall be constructed prior to disturbance of up-slope areas and placed so they function during all phases of construction.

C. The depth of the sediment trap measured from the sediment trap bottom to the invert of the stone outlet, shall be at least three feet to minimize re-suspension and provide storage for sediment.

D. The sediment trap shall have a length to width ratio of at least 2:1. The position of the outlet to the inlet shall be as such to minimize short-circuiting of the water flow path.

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E. Side slopes shall be no steeper than 2:1.

F. Embankments of temporary sediment traps shall not exceed five feet in height measured from the downstream toe of the embankment to the top of the embankment. Construct embankments with a minimum top width of four feet, and side slopes of 2:1 or flatter. Earthen embankments shall be compacted.

G. Sediment traps shall be constructed with both a principal and emergency spillway. The stone outlet of a sediment trap shall consist of a stone section of embankment (stone outlet) located at the discharge point. The stone outlet section provides a means of dewatering the basin back to the top of the permanent storage between storm events, and also serves as a non-erosive emergency spillway for larger flow events.

H. The stone outlet shall have a minimum top width of 2 feet and a maximum side-slope of 2:1.

I. The stone outlet shall be protected from undercutting by excavating a keyway trench across the stone foundation and up the sides to the height of the outlet.

J. Sediment Traps shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period. Sediment may need to be removed more frequently.

K. Deposits of sediment shall be removed when they reach a depth of one foot.

L. If the outlet becomes clogged it shall be cleaned to restore flow capacity.

M. Maintenance shall be completed as soon as possible with consideration given to site conditions.

N. Sediment traps shall be removed and the location stabilized after the disturbed area draining to the sediment trap is stabilized and no longer susceptible to erosion.

3.13 TEMPORARY CONSTRUCTION SITE DIVERSION

A. Temporary Construction Site Diversions shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1066.

B. The minimum berm cross section shall have side slopes of 2:1 (horizontal:vertical) or flatter, a minimum top width of two feet and a minimum height of 1.5 feet.

C. Diversions that are to serve longer than 30 days shall be stabilized as soon as they are constructed.

D. Diversions shall, at a minimum, be inspected weekly and within 24 hours after every precipitation event that produces 0.5 inches of rain or more during a 24-hour period.

E. Maintenance shall be completed as soon as possible with consideration to site conditions.

F. Accumulated sediment shall be removed when it reaches one half the height of the diversion berm.

G. Diversions shall be removed and the area stabilized according to construction contract drawings.

3.14 DUST CONTROL

A. Dust Control measures shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1068.

B. Polymers may be used in areas that do not receive vehicle traffic. Dry applied polymers must be initially watered for activation to be effective for dust control. Polymers shall be utilized in accordance with the provisions of WDNR Conservation Practice Standard 1050 Erosion Control Land Application of Polymers.

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C. Tackifiers and Soil Stabilizers Type A – Products must be installed at rates conforming to the WisDOT Erosion Control PAL.

D. Chlorides shall be applied according to the most recent version of the WisDOT Standard Specifications for Highway and Bridge Construction.

E. Barriers - Barriers shall be placed at right angles to prevailing wind currents at intervals of about 15 times the barrier height.

F. Areas that have dust control practices shall at a minimum be inspected daily.

3.15 LAND APPLICATION OF ANIONIC POLYACRYLAMIDE (POLYMERS).

A. Land Application of Anionic Polyacrylamide (polymers) shall be installed and maintained in accordance with Wisconsin DNR Conservation Practice Standard 1050.

B. Application rates shall not exceed manufacturer's written application rate recommendations that shall not exceed the WDNR use restrictions.

C. Maximum application rates, in parts per million (ppm or mg/L or mg/kg), shall be determined by multiplying 1.4 by the number of pounds applied per acre. This number shall be less than or equal to the WDNR use restriction. Repeated applications of anionic PAM mixtures may be applied, if necessary, to ensure adequate effectiveness.

D. The application method shall provide uniform coverage to the target area and avoid drift to non-target areas.

E. When used on bare soil, without seed or mulch, anionic PAM mixtures shall be used on slopes 2.5:1 or flatter.

F. Anionic PAM mixtures shall not be applied to channel bottoms.

G. The applicator of anionic PAM mixture shall document, at the time of application, the following: name of applicator, application rate per acre, date applied, product type, weather conditions during application, and method of application. Copies of this documentation shall be entered into the contractor's monitoring log or project diary and made available upon request.

H. Unused liquid anionic PAM mixtures shall be minimized. Excess material shall not be applied at a rate greater than the maximum application rate. Disposal shall not occur in storm water conveyance systems (i.e., storm sewer manholes, storm sewer inlets, ditches, and culverts).

I. PAM shall not be used within 30 feet of surface waters of the state.

J. Maintenance will consist of reapplying anionic PAM mixtures to disturbed areas, including high use traffic areas, which interfere in the performance of this practice.

K. AnionicPAM mixtures should be reapplied in areas where wind or rill erosion is apparent and whenever an area has been graded, driven upon, or otherwise disturbed since the anionic PAM mixture was last applied.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Erosion and sedimentation controls shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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4.02 EROSION AND SEDIMENTATION CONTROLS

A. Erosion and Sedimentation Controls, Lump Sum. When so provided, payment for erosion and sedimentation controls shall be made at the contract lump sum price bid.

B. Erosion and Sedimentation Controls, Inclusive. When no quantity is provided, erosion and sedimentation controls shall be considered inclusive to payment for contract work related to the associated construction.

END OF SECTION

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SECTION 32 11 23
AGGREGATE BASE AND SUBBASE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material equipment and labor required to construct a dense compacted base course composed of one or more courses or layers of coarse aggregate, fine aggregate and binder or filler blended to produce an intimate mixture of the required gradation and stability, in accordance with Sections 301 and 305 of the State of Wisconsin, Department of Transportation, Standard Specifications. This work shall also consist of a furnishing all material equipment and labor required to place breaker run and select crushed material for this project in accordance with Sections 301, 311 and 312 of the State of Wisconsin, Department of Transportation, Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Subgrade Preparation - Division 31

C. Salvage Existing Pavement and Base - Division 32

1.05 SUBMITTALS (NONE)

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 DENSE GRADED BASE

A. Materials furnished and used in this work shall consist of coarse and fine aggregate with sufficient binder to produce a stable base for the surfacing. Base materials shall be free from vegetative or organic matter, shale and lumps of clay. Dense graded base shall be crushed stone or crushed gravel conforming to the gradations required in Section 305.2.2.1 of the State of Wisconsin, Department of Transportation, Standard Specifications, unless indicated otherwise in Special Procedures - Division 01 or on the contract drawings.

2.02 BREAKER RUN

A. Breaker Run shall be used when shown on typical sections or called for in Special Procedures - Division 01. Breaker run shall be free of organic matter, shale and lumps of clay. The material shall comply with Section 311 of the State of Wisconsin, Department of Transportation, Standard Specifications. If the cross section thickness of breaker run is less than 12 inches, the gradation for breaker run shall conform to 3-inch dense graded base as per Section 305.2.2.1 of the State of Wisconsin, Department of Transportation, Standard Specifications.

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2.03 SELECT CRUSHED MATERIAL

A. Select Crushed Material shall be used when shown on typical sections or called for in Special Procedures - Division 01. Select Crushed shall be free of organic matter, shale and lumps of clay. The material shall comply with Section 312 of the State of Wisconsin, Department of Transportation, Standard Specifications.

PART 3 EXECUTION

3.01 DENSE GRADED BASE

A. Each layer of base shall be compacted over the entire area per Section 301.3 and 305.3 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Each layer shall also be compacted and consolidated to the degree that there will be no appreciable displacement of it laterally or longitudinally under compaction equipment or a fully loaded tandem dump truck.

C. Where aggregate base is being placed on top of existing gravel, the existing gravel shall be scarified to a depth of three inches prior to placement of additional base.

D. Aggregate base course beneath and within 10 feet of a structure shall be compacted to 95 percent maximum dry density per modified proctor (ASTM D1557).

E. The aggregate base shall be graded, shaped and rolled to the finished cross section template shown on the contract drawings and to the satisfaction of the Engineer.

3.02 BREAKER RUN

A. Each layer of breaker run shall be compacted over the entire area per Section 301.3 and 305.3.2.3 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Each layer shall also be compacted and consolidated to the degree that there will be no appreciable displacement of it laterally or longitudinally under compaction equipment or a fully loaded tandem dump truck.

C. The breaker run shall be graded, shaped and rolled to the finished cross section template shown on the contract drawings and to the satisfaction of the Engineer.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Aggregate base course shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 DENSE GRADED BASE

A. Dense Graded Base, Square Yard. Measurement for dense graded base will be per square yard installed as measured in the field. The dense graded base shall be installed and compacted to the thickness stated on the contract drawings or in Special Procedures - Division 01. Payment shall be made at the contract unit price bid per square yard for dense graded base installed and compacted.

B. Dense Graded Base, Ton. Measurement will be per ton of dense graded base compacted in place. The Contractor shall supply the Engineer with load tickets to verify the amount of material used. Each load shall

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have its own load ticket showing weights, truck number, time, date, and placement location. Payment shall be made at the contract unit price bid per ton for dense graded base installed and compacted.

C. Dense Graded Base, Cubic Yard In Place. Measurement for dense graded base will be per cubic yard installed, computed from the square yards measured in the field multiplied by the compacted thickness stated on the contract drawings or in the Special Procedures – Division 01. Payment will be made at the contract unit price bid per cubic yard in place for dense graded base installed.

D. Dense Graded Base, Inclusive. When no quantity for dense graded base is provided, dense graded base shall be inclusive to payment for work associated with related infrastructure improvements.

4.03 BREAKER RUN

A. Breaker Run, Square Yard. Measurement for breaker run shall be per square yard installed as measured in the field. The breaker run shall be installed and compacted to the thickness stated on the contract drawings or in Special Procedures - Division 01. Payment shall be made at the contract unit price bid per square yard for breaker run installed and compacted.

B. Breaker Run, Ton. Measurement shall be per ton of breaker run compacted in place. The Contractor shall supply the Engineer with load tickets to verify the amount of material used. Each load shall have its own load ticket showing weights, truck number, time, date, and placement location. Payment shall be made at the contract unit price bid per ton for breaker run installed.

C. Breaker Run, Cubic Yards. Measurement for breaker run shall be per cubic yard installed as measured in the field. The breaker run shall be installed and compacted to the depth stated on the contract drawings or in Special Procedures - Division 01. Payment shall be made at the contract unit price bid per cubic yard for breaker run installed and compacted.

4.04 SELECT CRUSHED MATERIAL

A. Select Crushed Material, Square Yard. Measurement for select crushed material shall be per square yard installed as measured in the field. The select crushed material shall be installed and compacted to the thickness stated on the contract drawings or in Special Procedures - Division 01. Payment shall be made at the contract unit price bid per square yard for select crushed material installed and compacted.

B. Select Crushed Material, Ton. Measurement shall be per ton of select crushed material compacted in place. The Contractor shall supply the Engineer with load tickets to verify the amount of material used. Each load shall have its own load ticket showing weights, truck number, time, date, and placement location. Payment shall be made at the contract unit price bid per ton for select crushed material installed.

C. Select Crushed Material, Cubic Yards. Measurement for select crushed material shall be per cubic yard installed as measured in the field. The select crushed material shall be installed and compacted to the depth stated on the contract drawings or in Special Procedures - Division 01. Payment shall be made at the contract unit price bid per cubic yard for select crushed material installed and compacted.

END OF SECTION

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SECTION 32 12 13.16
ASPHALTIC TACK COAT

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section includes all materials, equipment, supervision, and labor necessary to apply asphaltic tack coat prior to paving asphaltic concrete pavement on an existing surface, as indicated on the Contract Drawings.

B. All work shall conform to the requirements specified in Section 455 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Asphaltic Concrete Pavement - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 ASPHALTIC TACK COAT

A. The materials furnished and used for asphaltic tack coat shall conform to the requirements of Section 455 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition.

PART 3 EXECUTION

3.01 GENERAL

A. All work shall conform to the requirements specified in Section 455 of the State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition, unless specified otherwise herein or in Special Procedures - Division 01.

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B. Apply asphaltic tack coat only when the air temperature is 32°F or more, unless the engineer approves otherwise in writing. Do not apply to surfaces with standing water, and do not apply if weather or surface conditions are unfavorable, or before impending rains.

C. Apply the asphaltic tack coat at 0.050 to 0.070 gallons per square yard or as otherwise designated by the Engineer to provide complete and uniform coverage.

D. Apply asphaltic tack coat to the vertical faces of adjacent curbs and pavement, as well as to the lower asphalt layer, unless the upper asphalt layer is installed the same day as the lower asphalt layer. Also apply asphaltic tack coat to existing pavement surfaces to be overlaid.

3.02 PREPARING THE EXISTING SURFACE

A. Immediately prior to applying the asphaltic tack coat to existing surfaces, remove all vegetation from the surface and sweep the surface to remove all dust, dirt, debris or other foreign or loose material.

3.03 MAINTAINING TACK COAT

A. Protect and repair the existing surface and the tack coat. Correct areas with excess or deficient tack material and any breaks, raveled spots, or other areas where bond might be affected.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Asphaltic tack coat shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

C. Payment for Asphaltic Tack Coat is full compensation for providing tack coat; for preparing the surface; and for maintaining the completed work.

4.02 ASPHALTIC TACK COAT

A. Asphaltic Tack Coat, Ton. Measurement for asphaltic tack coat shall be per ton based upon shipment net weight. Payment shall be made at the contract unit price bid per ton for asphaltic tack coat acceptably completed. The Contractor shall provide load tickets for verification of quantity used.

B. Asphaltic Tack Coat, Square Yard. Measurement for asphaltic tack coat shall be per square yard acceptably completed as measured in the field. Payment shall be made at the contract unit price bid per square yard for asphaltic tack coat acceptably completed.

C. Asphaltic Tack Coat, Gallon. Measurement for asphaltic tack coat shall be per gallon acceptably completed. Payment shall be made at the contract unit price bid per gallon for asphaltic tack coat acceptably completed. The Contractor shall provide volume documentation for verification of quantity used.

D. Asphaltic Tack Coat, Inclusive. When no quantity is provided, asphaltic tack coat shall be considered inclusive to payment for asphaltic concrete pavement.

END OF SECTION

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SECTION 32 12 16
ASPHALTIC CONCRETE PAVEMENT

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section includes all materials, equipment, supervision, and labor necessary to construct a plant-mixed asphaltic concrete pavement on the prepared foundation of base course or existing surface, as indicated on the contract drawings and specified herein.

B. All work shall conform to the requirements specified in the State of Wisconsin, Department of Transportation, Standard Specifications for the particular class, type and grade of material specified.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Subgrade Preparation - Division 31

D. Aggregate Base and Subbase - Division 32

E. Asphaltic Tack Coat - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Job Mix Formula. Contractor shall submit a Wisconsin Department of Transportation approved Job Mix Formula for the asphaltic mixture to be used to the Engineer prior to paving. If requested, the Contractor shall submit a history of recent testing results.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL

A. All materials shall conform to the requirements of the State of Wisconsin, Department of Transportation, Standard Specifications, unless specified otherwise herein or in Special Procedures - Division 01.

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B. Asphaltic concrete pavement shall be Asphaltic Concrete Pavement, Classification LT, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

2.02 ASPHALTIC MATERIAL

A. The asphaltic material for asphaltic concrete pavement, including overlays shall be asphalt, Type AC with an Asphaltic Binder Grade of PG 58-28 and a binder designation 'S' unless specified otherwise in the Bid Schedule or Special Procedures – Division 01.

PART 3 EXECUTION

3.01 GENERAL

A. All work shall conform to the requirements specified in the State of Wisconsin, Department of Transportation, Standard Specifications for the particular class, type and grade of material specified, unless specified otherwise herein or in Special Procedures - Division 01.

3.02 PREPARATION

A. All existing asphaltic concrete pavement removals, including driveway removals, shall be saw cut to the limits designated as pavement removal on the contract drawings or to the limits staked by the Engineer in the field. Typically, all pavement sawcuts shall be parallel or perpendicular to the centerline of the roadway.

B. Weeds shall be removed on all streets to be resurfaced prior to the application of the tack coat or construction of asphaltic concrete pavement. Prior to the application of the tack coat or construction of asphaltic concrete, the surface of the prepared foundation shall be cleaned by brooming all dust, dirt, debris or other foreign or loose material.

C. Apply tack coat as specified in Asphaltic Tack Coat - Division 32 to existing pavement and each layer of a plant-mixed asphaltic base or pavement that will be overlaid with asphaltic mixture.

D. The Contractor shall perform all final shaping and grading of aggregate bases necessary to produce the required roadway cross sectional contour. All valve boxes, manhole frames, and other utility appurtenances shall be adjusted to the final grade prior to the placement of the upper layer of asphalt.

3.03 PLACEMENT

A. Asphaltic concrete pavements shall be placed in reasonable conformity with the thickness shown on the contract drawings, Bid Schedule, or specified in Special Procedures - Division 01.

B. Upper layer paving. The upper layer of asphalt pavement shall not be paved when ambient air temperatures 3-feet above the paving surface is less than 40 degrees F.

C. Lower layer paving. The lower layer of asphalt pavement shall not be paved when ambient air temperatures 3-feet above the paving surface is less than 32 degrees F.

D. The following thickness limits shall apply unless specified otherwise:

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ASPHALT MIX GRADATION (Nmas)	NOMINAL AGGREGATE SIZE (inches)	MINIMUM LAYER THICKNESS (inches)	MAXIMUM LOWER LAYER (inches)	MAXIMUM UPPER LAYER (inches)
1	1.5	3.5	5	4.5
2	1.0	3.25	5	4
3	3/4	2.25	4	3
4	1/2	1.75	3	2.5
5	3/8	1.5	3	2

3.04 COMPACTION

A. Compaction methods and requirements shall conform to Sections 450.3.2.6 and 460.3.3 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. The Contractor shall perform field pavement density tests on projects requiring over 1000 tons of asphaltic mixture. Tests shall be performed to determine the necessary compaction methods to achieve the required minimum density. The Contractor shall not operate below the specified minimum density on a continuing basis.

C. Additional tests shall be performed as directed by the Engineer for varying paving conditions, such as different weather conditions, base conditions, job mix, layer thickness, and construction methods.

D. Documentation of all testing shall be provided to the Engineer.

3.05 QUALITY CONTROL

A. The Contractor shall provide and maintain a quality control program.

B. If requested by the Owner or Engineer, submit samples and sampling data of all proposed materials for test and analysis.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Asphaltic concrete pavement shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 ASPHALTIC CONCRETE PAVEMENT

A. Asphaltic Concrete Pavement, Square Yards. The measurement for asphaltic concrete pavement shall be by the square yard of the specified thickness of surface area constructed, as measured in the field. Payment shall be made at the contract unit price bid per square yard of asphaltic concrete pavement constructed, as measured or as specified in Special Procedures - Division 01.

1. Where the average thickness of a portion of asphaltic concrete pavement is deficient in thickness by more than 0.25 inch of compacted material, but not more than 1.00 inch, at the option of the Engineer, shall be either overlayed to the specified thickness or payment will be made at an adjusted price as specified as follows:

Deficiency in Thickness by Cores (inches)	Proportional Part of Contract Price Allowed
0.00 to 0.25	100%

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0.26 to 0.50	75%
0.51 to 1.00	50%
1.01 or greater	0%

2. Areas of pavement determined to be deficient in thickness by more than 1.00 inch shall be either removed and replaced or overlayed by the Contractor (with the Engineer's approval) to the specified thickness.
3. When the deficient area has been acceptably replaced or overlayed, payment shall then be made for 100 percent of the original contract unit price.

B. Asphaltic Concrete Pavement, Ton. Measurement shall be per ton of asphaltic binder course and surface course compacted in place. The Contractor shall supply the Engineer with load tickets to verify the amount of material used. Payment shall be made at the contract unit price bid per ton for asphaltic concrete pavement installed.

C. Asphaltic Concrete Pavement, Lump Sum. When so provided, payment for Asphaltic Concrete Pavement shall be made at the contract lump sum price bid.

D. Asphaltic Concrete Pavement, Inclusive. When no quantity for asphaltic concrete pavement is provided, asphaltic concrete pavement shall be inclusive to payment for work associated with related infrastructure improvements.

END OF SECTION

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SECTION 32 13 10
CONCRETE SIDEWALK, STEPS AND DRIVEWAYS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the concrete sidewalk, driveway and step work for this project.

B. This work shall be in accordance with Section 602 of the State of Wisconsin, Department of Transportation, Standard Specifications, and as indicated on the contract drawings and specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Concrete Quality Control - Division 01

C. Maintenance of Existing Conditions - Division 02

D. Cast-in-Place Concrete - Division 03

E. Subgrade Preparation - Division 31

F. Aggregate Base and Subbase - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts to relate the materials supplied to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 CONCRETE

A. Concrete for sidewalk, steps and driveways shall be as specified in Cast-in-Place Concrete - Division 03 of these specifications.

2.02 BASE MATERIAL

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A. Base material shall be as specified in Aggregate Base and Subbase - Division 32 of these specifications or conform with Section 305 of the State of Wisconsin, Department of Transportation, Standard Specifications.

2.03 DETECTABLE WARNING FIELDS

A. Detectable warning fields shall be included in the current WisDOT Prequalified Product List.

2.04 CURING COMPOUND

A. Curing compound shall be as specified in Cast-in-Place Concrete - Division 03 of these specifications.

PART 3 EXECUTION

3.01 BASE PREPARATION - GRADING

A. Prepare foundation by excavating to the lines, grades and cross section as required. All soft or unstable material shall be removed and replaced with sand or aggregate base course material compacted to a relative field density of 95%, based on the Modified Proctor Density, ASTM D1557. Proof-roll subbase to check for unstable areas needing additional compaction. Finish to a true and firm surface.

B. If not listed as a separate bid item, minor clearing and grubbing shall be considered incidental to the respective concrete work.

C. Disposal locations for all excess or unsuitable excavated material shall be subject to Owner approval.

3.02 BASE MATERIAL

A. A minimum thickness of 4 inches of compacted aggregate base course or granular subbase course material is required under sidewalks and steps, unless indicated otherwise on the contract drawings or Special Procedures - Division 01.

3.03 SIDEWALK

A. Sidewalks shall be constructed to a uniform depth of 4 inches except at alleys and driveways where they shall be constructed to a uniform depth of 6 inches unless otherwise noted.

B. Sidewalks shall slope toward the roadway at 1 foot vertical per 50 feet horizontal (2 percent).

C. The concrete shall be placed on a moist foundation, deposited to the required depth, and consolidated and spaded sufficiently to bring the mortar to the surface, after which it shall be struck off and finished to a true and even surface.

D. The final floating shall be done with a wooden float. Before the mortar has set, the surface shall be brushed or lightly broomed, perpendicular to the direction of travel or as shown on the contract drawings. Before the concrete is given the final surface finish, the surface of the walk shall be checked with a ten-foot straightedge, and any areas which show a variation or departure from the testing edge of more than 1/4 inch shall be corrected by adding or removing concrete as necessary while the concrete is still plastic.

E. Concrete sidewalks may be constructed with suitable, approved slip-form equipment when permitted by the Engineer. The wood floating may be omitted when a suitable finish is produced by the slip-form equipment.

F. Ramps for individuals with disabilities shall be constructed at the locations and in accordance with the details and dimensions shown on the contract drawings, these specifications and the Americans with Disabilities Act (ADA). Ramps shall include detectable warning fields installed per manufacturer's recommendations.

G. Where reinforcement is required, it shall conform to and be placed in accordance with the details shown on the contract drawings.

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H. Joints for sidewalks, including transverse joints, longitudinal joints, contraction joints, expansion joints and joint felts and filler materials shall conform to the requirements of Section 602.3.2.5 of the State of Wisconsin, Department of Transportation, Standard Specifications, except as modified herein.

1. Sidewalks shall be divided into sections not less than 3 feet nor more than 12 feet, unless otherwise indicated on the contract drawings. Transverse joints shall be spaced at 6 foot intervals.
2. Prefabricated expansion joint of 1/2-inch thickness shall be placed where steps or sidewalks abut curbs, pavements, steps, or existing sidewalk. Prefabricated expansion joint of 1 inch thickness shall be placed where sidewalk abuts buildings, retaining walls, or other rigid structures. Expansion joints shall be provided on each side of driveways and at uniform intervals of not more than 96 foot centers for sidewalk construction.
3. Extend joint fillers full-width and depth of joint and not less than 1/4-inch or more than 1/2-inch below finished surface. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Trim top edge of filler to conform to profile of concrete.

3.04 STEPS

A. Steps shall be constructed and placed as shown on the contract documents.

3.05 DRIVEWAYS

A. Driveways shall be constructed to a uniform depth of 6 inches. Driveways shall be constructed to the limits and slope shown on the contract drawings or as staked by the Engineer.

3.06 CURING COMPOUND

A. Curing compound shall be applied at the recommended coverage requirement and application rate of the manufacturer. The compound shall be applied by sprayer as soon as all free water has disappeared after finishing operations.

B. If the coating is damaged within 72 hours of its application, the damaged surfaces shall be resprayed immediately.

3.07 ADJUSTING UTILITY APPURTENANCES

A. Valves and curb stop boxes shall be adjusted to finished grade of new construction in a manner that the new construction will not interfere with the proper operation of the facility. Catch basins, manholes and inlet covers shall be adjusted to the required elevation by adjusting the top of the existing structure by removing or adding adjusting rings and reinstalling the fixtures firmly in place.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Concrete sidewalk, steps and driveways shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 CONCRETE SIDEWALK

A. Concrete Sidewalk, Square Foot. Measurement for concrete sidewalk shall be per square foot of a specific thickness installed. Payment shall be made at the contract unit price bid per square foot of the specific thickness of concrete sidewalk installed.

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B. Concrete Sidewalk, Inclusive. When no quantity for concrete sidewalk is provided, concrete sidewalk shall be inclusive to payment for work associated with related infrastructure improvements.

END OF SECTION

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SECTION 32 16 13
CONCRETE CURB AND GUTTER

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, equipment, and labor required to execute the construction of concrete curb and gutter for this project.

B. This work shall be in accordance with Section 601 of the State of Wisconsin, Department of Transportation, Standard Specifications, and as indicated on the contract drawings and these specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Cast-in-Place Concrete - Division 03

C. Subgrade Preparation - Division 31

D. Aggregate Base and Subbase - Division 32

E. Concrete Sidewalk, Steps, and Driveways - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 CONCRETE

A. Concrete for curb and gutter construction shall be as specified in Cast-in-Place Concrete - Division 03 of these specifications.

2.02 BASE MATERIAL

A. Base material for concrete curb and gutter construction shall be as specified in Aggregate Base and Subbase - Division 32 of these specifications.

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2.03 CURING COMPOUND

A. Curing compound for curb and gutter construction shall be as specified in Cast-in-Place Concrete - Division 03 of these specifications.

PART 3 EXECUTION

3.01 CONCRETE CURB AND GUTTER, GENERAL

A. All work shall be in accordance with Section 601 of the State of Wisconsin, Department of Transportation, Standard Specifications, and as otherwise indicated on the contract drawings and as specified herein.

3.02 GRADING

A. Prepare foundation by excavating to the lines, grades and cross section as required.

B. All soft or unstable material shall be removed and replaced with sand, gravel or crushed stone base course material compacted to a relative density of 95 percent, of the Modified Proctor density, ASTM D1557. Proof-roll subbase to check for unstable areas needing additional compaction. Finish to a true and firm surface.

C. Dispose of all excess or unsuitable excavated material, subject to Engineer's approval.

3.03 BASE MATERIAL UNDER CURB AND GUTTER

A. A minimum of 4 inches of compacted aggregate base course material is required under the curb and gutter, unless otherwise indicated on the contract drawings or Special Procedures - Division 01.

3.04 CONCRETE CURB AND GUTTER

A. This work shall consist of constructing combination curb and gutter of the type shown on the contract drawings and to the line and grade as staked in the field.

B. Driveway entrances shall be installed where shown on the contract drawings or at any other locations required by the Engineer.

C. Final brooming shall be done perpendicular to the curb.

3.05 JOINTS

A. Construct expansion, weakened-plane (contraction), and construction joints with face perpendicular to surface, unless otherwise shown. Construct traverse joints at right angles to curb, unless otherwise shown on the contract drawings or specifically designated in Special Procedures - Division 01.
   1. Provide expansion joints on each side of catch basins, inlets, structures, and other fixed objects; abutting to existing curb and gutter; at radius points; and at 300 foot centers, unless otherwise shown.
   2. Contraction joints shall be a slot or groove at least 1 inch in depth by 1/4 inch width at 20-foot maximum and 6-foot minimum intervals.

B. Extend joint fillers full-width and depth of joint, and not less than 3/4 inch or more than 1 inch below finished surface. Furnish joint fillers in one-piece lengths for the full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together. Trim top edge of filler to conform to profile of concrete.

3.06 CURING COMPOUND

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A. Curing compound shall be applied at the recommended coverage requirement and application rate of the manufacturer. The compound shall be applied by sprayer as soon as all free water has disappeared after finishing operations.

B. If the coating is damaged within 72 hours of its application, the damaged surfaces shall be resprayed immediately.

3.07 ADJUSTING UTILITY APPURTENANCES

A. Adjust valve and curb stop boxes to finished grade of new construction in a manner that the new construction will not interfere with the proper operation of the facilities.

B. Adjust catch basin, manhole and inlet frames and covers to the required elevation by adjusting the top of the existing structure by removing or adding concrete masonry and reinstalling the fixtures, supporting them in a collar of concrete mortar and brick constructed to hold then firmly in place.

3.08 SAWCUTTING

A. The existing curb and gutter shall be sawcut full-depth, where the existing curb and gutter sections will butt to the new sections.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Concrete curb and gutter shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 CONCRETE CURB AND GUTTER

A. Concrete Curb and Gutter, Lineal Foot. Measurement shall be per lineal foot of concrete curb and gutter installed as measured in the field along the flow line of the gutter. Payment shall be made at the contract unit price bid per lineal foot of concrete curb and gutter installed.

B. Concrete Curb and Gutter, Inclusive. When no quantity for concrete curb and gutter is provided, dense concrete curb and gutter shall be inclusive to payment for work associated with related infrastructure improvements.

END OF SECTION

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SECTION 32 91 19.13
TOPSOIL PLACEMENT AND GRADING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all material, equipment, and labor required to salvage and/or furnish, haul, place, and prepare topsoil for this project in accordance with Section 625 of the State of Wisconsin, Department of Transportation Standard Specifications.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Erosion and Sedimentation Controls - Division 31

C. Grading - Division 31

D. Subgrade Preparation - Division 31

E. Seeding - Division 32

F. Sodding - Division 32

1.05 SUBMITTALS

A. Submit a sample of the topsoil material prior to placement. Topsoil material shall be approved by the Owner or Engineer prior to placing on the project.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 TOPSOIL

A. Topsoil shall conform to Section 625 of the State of Wisconsin, Department of Transportation, Standard Specifications.

2.02 SALVAGED TOPSOIL

A. Topsoil salvaged from the project site may be used to replace planned quantities of topsoil.

B. Salvaged topsoil shall conform to Section 625 of the State of Wisconsin, Department of Transportation, Standard Specifications.

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PART 3 EXECUTION

3.01 PRESERVATION OF TREES AND SHRUBS

A. Trees and shrubs to be preserved shall be thoroughly protected from scarring or other injury during placement and grading operations. Excavation operations shall not disturb the original ground around trees within a distance of one foot or twice the diameter of the tree, whichever is greater. Exposed roots resulting from excavation shall be cut cleanly and covered with humus-bearing soil.

B. When necessary or required by the Contract Documents, trees or shrubs around which embankment is placed shall be protected by tree wells built in accordance with Detailed Drawings or as laid out in the field by the Owner or Engineer.

3.02 REMOVING AND SALVAGING TOPSOIL

A. General. Topsoil shall be stripped and salvaged or removed in accordance with Subsection 625.3 of the State of Wisconsin, Department of Transportation Standard Specifications.

B. Salvaged Topsoil. Topsoil shall be stripped to full depth, or a minimum depth of 6 inches (whichever is less), in all areas of cut or fill, except within proposed roadway limits topsoil shall be stripped full depth. Stockpile topsoil in storage piles in areas shown, or where otherwise directed. Construct storage piles to freely drain surface water. Cover or sprinkle water on storage piles if required to prevent windblown dust. Any appreciable volume left in the stockpile after properly placing shall become the property of the Owner and left in the pile. In any event, the pile shall be smoothed and seeded. All piles, which are to be left for seven or more days, shall be stabilized as indicated in the Erosion and Sedimentation Controls - Division 31.

3.03 PLACEMENT AND GRADING

A. General. Topsoil shall be placed in accordance with Subsection 625.3 of the State of Wisconsin, Department of Transportation Standard Specifications.

B. smooth surface and a 4:1 maximum slope unless shown otherwise on the plan. Graded surfaces shall be covered with topsoil to finished grade as shown on the typical sections.

C. Utility Adjustment. The Contractor shall adjust all valve boxes, manhole frames, and other utility appurtenances to within 1 inch of the final grade as shown on the contract drawings or as staked in the field by the Engineer.

D. All areas disturbed by the Contractor's activities and intended for seeding or sodding shall be topsoiled to the depth of 4-inches unless shown otherwise on the Contract Drawings or specified in Special Procedures - Division 01.

E. All areas disturbed by the Contractor's activities and intended for cultivation of vegetation other than turf shall be topsoiled to the depth of the original topsoil, unless shown otherwise in the Contract Drawings.

F. Construction in and adjacent to flowing streams shall be performed to avoid washing, sloughing or deposition of materials into the channel which may obstruct or impair stream flow, or which may result in contamination and/or silting of the stream.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Topsoil placement and grading shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. No measurement will be made of corrective actions necessary to address erosion and/or settlement of topsoil.

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C. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 SALVAGED TOPSOIL

A. Salvaged Topsoil. Where salvaged topsoil from the project site is used to replace planned quantities of topsoil, no additional payment shall be made for removal and processing of salvaged topsoil. All work to remove, stockpile, process, place and grade salvaged topsoil shall be considered inclusive to Topsoil Placement and Grading.

4.03 TOPSOIL PLACEMENT AND GRADING

A. Topsoil Placement and Grading, Square Yard. Measurement for topsoil placement and grading will be per square yard installed to the depth specified within the limits of construction designated on the plans, or in the contract, or as directed by the Engineer. Payment shall be made at the contract unit price bid per square yard.

B. Topsoil Placement and Grading, Acre. Measurement for topsoil placement and grading will be per acre installed to the depth specified within the limits of construction designated on the plans, or in the contract, or as directed by the Engineer. Payment shall be made at the contract unit price bid per acre.

C. Topsoil Placement and Grading, Lump Sum. The payment for this item shall be at the contract lump sum price bid for topsoil placement and grading.

D. Topsoil Placement and Grading, Inclusive. When no quantity is provided, topsoil placement and grading shall be considered inclusive to unclassified excavation.

END OF SECTION

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SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to execute the seeding for this project. All areas disturbed by the construction and not covered with pavement, aggregate base course, sod, or other structures shall be seeded, fertilized and mulched.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Subgrade Preparation - Division 31

D. Trenching and Backfilling - Division 31

E. Erosion and Sedimentation Controls - Division 31

F. Topsoil Placement and Grading - Division 32

G. Sodding - Division 32

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to these specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 SEED

A. Seed shall conform to Section 630 of the State of Wisconsin, Department of Transportation, Standard Specifications.
   1. Mixture. Unless specified otherwise, the Contractor utilize the following seed mixtures:
      a. Lawn areas shall be No. 40
      b. Slope areas shall be No. 20
      c. Native areas and pond slopes shall be No. 75 unless otherwise specified.

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2. Nurse crop shall be annual oats prior to September 1. Nurse crop shall be winter wheat or annual ryegrass for the remainder of the year.

2.02 FERTILIZER

A. Fertilizer shall contain the following percentages by weight:

Nitrogen	(N)	20%
Phosphorus	(P)	10%
Potash	(K)	10%

B. If local ordinances restrict the use of phosphorus in fertilizer, the local restrictions shall supercede the above percentages.

2.03 MULCH

A. Mulching shall consist of any straw, hay, wood excelsior fiber or other suitable material of a similar nature, which is substantially free of noxious weed seeds and objectionable foreign material.

2.04 WATER

A. Water shall be clean and free of impurities or substances that might injure the seed or grass.

PART 3 EXECUTION

3.01 SEEDING

A. Seeding shall be done in conformance with Subsection 630.3 of the State of Wisconsin, Department of Transportation, Standard Specifications. Seed shall be sown at a rate of four pounds per 1,000 square feet unless otherwise specified.

B. A nurse crop shall be sown with the seeding at a rate of four pound per 1000 square feet of area.

3.02 FERTILIZER

A. Apply fertilizer in conformance with Section 629 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Deliver fertilizer to site in original unopened containers showing manufacturer's name, guaranteed analysis and weight. Store in a weatherproof location and use only when dry and free flowing. Apply fertilizer at rate of 10 pounds per 1000 square feet and evenly mix into top 2 inches of topsoil.

C. At the Contractor's option, the Contractor may perform soil tests and apply fertilizer based on the results.

3.03 MULCHING

A. This work shall consist of furnishing, placing, and anchoring a mulch cover over seeded areas.

B. Construction shall be done in conformance with Section 627 of the State of Wisconsin, Department of Transportation, Standard Specifications.

C. In existing developed areas, mulching shall be done in such a manner to prevent dust and mulch from being deposited on non-seeded areas. Acceptable methods are by hand or a small chopper/mulcher with a controlled discharge.

3.04 ACCEPTANCE

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A. The work will be considered acceptable after a 3-inch uniform stand of grass is attained and all gullies, rivulets, and washouts have been repaired to the satisfaction of the Engineer. The Contractor shall request the Engineer's inspection and acceptance will be made in writing when the above conditions have been complied with. Contractor shall make all corrective actions necessary to attain acceptance.

3.05 WATERING

A. If weather conditions are not suitable establishing turf, the seeded areas shall be watered twice weekly. Water shall be applied uniformly and in such a manner as not to waterlog the topsoil, dislodge the seed, or cause erosion.

B. If water is provided by a water utility, the Contract shall maintain a record of the amount of water obtained and provide it to the utility.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Seeding shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. No measurement will be made of corrective actions necessary to address erosion or non-establishment of vegetation.

C. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 SEEDING

A. Seeding, Square Yard. Payment shall be made at the contract unit price bid per square yard for seeding installed. Measurement shall be per square yard installed as measured in the field.

B. Seeding, Acre. Payment shall be made at the contract unit price per acre for seeding installed. Measurement shall be per acre installed as measured in the field.

C. Seeding, Lump Sum. Payment shall be made at the contract lump sum price bid. Measurement shall be to the extent shown on the contract drawings and described in Special Procedures - Division 01.

D. Seeding, Inclusive. When no quantity is provided, payment for seeding shall be considered inclusive to other portions of the work.

4.03 WATERING

A. Watering, MGAL. Payment shall be made at the contract unit price bid per MGAL (1000 gallon unit) for watering completed. Measurement shall be per MGAL used for watering purposes. The Contractor shall provide load tickets for the water used.

B. Watering, Each. Payment shall be made at the contract unit price bid per each for watering. Measurement shall be per each watering completed on the entire project restoration area.

C. Watering, Inclusive. When no quantity is provided, payment for watering shall be considered inclusive to payment for seeding.

END OF SECTION

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SECTION 33 05 16.13
PRECAST CONCRETE UTILITY STRUCTURES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM A82 - Specification for Steel Wire, Plain, for Concrete Reinforcement, Current Edition.
      b. ASTM A496 - Specification for Steel Wire, Deformed, for Concrete Reinforcement, Current Edition.
      c. ASTM A615 - Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement, Current Edition.
      d. ASTM A668 - Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use, Current Edition.
      e. ASTM A730 - Specification for Forgings, Carbon and Alloy Steel, for Railway Use, Current Edition.
      f. ASTM C76 - Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Current Edition.
      g. ASTM C478 - Specification for Precast Reinforced Concrete Manholes Sections, Current Edition.
      h. ASTM C913 - Specification for Precast Concrete Water and Wastewater Structures, Current Edition.
      i. ASTM C1227 - Specification for Precast Concrete Septic Tanks, Current Edition.
   2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.
   3. Federal Specifications (FS), Specifications and Standards, Current Edition.
   4. State Department of Commerce (DOC), Administrative Code of Rules and Regulations, Current Edition.
   5. State Department of Natural Resources (DNR), Administrative Code of Rules and Regulations, Current Edition.
   6. State Standard Specifications (SSS), for Sewer and Water Construction, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover the furnishings of all materials, equipment, tools, labor and supervision necessary to provide precast concrete structures as shown on the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Vault Doors - Division 08

D. Structural Excavation for Structures - Division 31

E. Granular Fill - Division 31

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F. Trenching and Backfilling - Division 31

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Contractor shall submit such submittals and details required for the construction and installation of the materials. Submittals and details shall indicate the intended materials arrangement, dimensions, major support requirements, and intricate or detailed construction requirements.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 GENERAL

A. All precast concrete utility structures shall be watertight.

B. Compressive strength of the concrete shall be 5,000 psi. Minimum concrete thickness shall be 6 inches for walls and 8 inches for floors and ceilings.

C. Reinforcing steel shall meet ASTM A82,ASTM A496, ASTM A615 or ASTM A668, GR60. Minimum concrete cover over reinforcing steel shall be 1 inch. Lap of reinforcement at splices shall be a minimum of two cross wires for wire mesh.

D. Each piece of a structure shall be cast from a one piece mold. The use of connecting form ties which may result in corrosion or leakage points is not acceptable.

E. All joints shall be bell and spigot connections in conformance with ASTM C478.

F. Joint materials shall be plastic gasket material or butyl rubber gasket material. Plastic gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips conforming to Federal Spec SS-S-00210, Type I, Rope Form; Ram-Nek by K.T. Snyder Company, Inc.; Kent Seal No. 2 or equal. Butyl rubber gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips, conforming to Federal Spec SS-S-210A, Rope Form; CPS-210 by Press Seal Gasket Corporation or equal.

G. Waterstop seals shall be flexible, watertight, rubber wedge ring or O-ring compression seals for pipe entrance holes. Wedge ring type shall be Press-Wedge II by Press-Seal Gasket Corporation, PSX Boot by Press Seal Gasket Corporation, Boot Coupling by KOR-N-SEAL or equal. O-ring type shall have cast iron compression flange, Res-Seal by Scales Manufacturing Corporation or equal.

2.02 CIRCULAR PRECAST CONCRETE UTILITY STRUCTURES

A. Wall thicknesses of structures will vary with diameter in conformance with ASTM C76 for CLASS B concrete tongue and groove joint pipe. Larger diameter circular precast concrete utility structures (7 feet +) shall have wall thickness a minimum of one twelfth the inside diameter of the structure as specified in ASTM C478.

B. Steel reinforcement (sq. in./lin. ft.) shall not be less than 0.0025 times the inside diameter of the structure in inches.

2.03 RECTANGULAR PRECAST CONCRETE UTILITY STRUCTURES

A. Tanks shall meet all the requirements of ASTM C913 and ASTM C1227.

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PART 3 EXECUTION

3.01 INSTALLATION

A. Install all equipment in accordance with manufacturer's instructions and reviewed Submittals.

B. The bottom of the excavation shall be dry and firm. Dewater as necessary to provide these conditions.

C. The precast concrete utility structures shall sit on a layer of 12 inch washed stone wrapped in geotextile fabric Type SAS. Backfill material shall be as specified in Granular Backfill - Division 31.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Precast concrete utility structures shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 PRECAST CONCRETE STRUCTURES

A. Precast Concrete Utility Structures, Lump Sum. When so provided, payment shall be made in accordance with the price bid for the precast concrete utility structures complete and shall include all labor and materials necessary to install.

B. Precast Concrete Utility Structures, Inclusive. When no quantity is provided, precast concrete utility structures shall be considered inclusive to payment for associated work.

END OF SECTION

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SECTION 33 05 26.16
TRACER WIRE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS (NONE)

1.03 DESCRIPTION OF WORK

A. Contractor shall install tracer wire in conjunction with buried, non-metallic piping in accordance with the contract drawings and the requirements of the Engineer.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Low Pressure Utility Sewerage - Division 33

C. Sanitary Utility Sewerage Force Main - Division 33

D. Public Sanitary Utility Sewerage Pipe – Division 33

E. Water Utilities - Division 33

F. Utility Horizontal Directional Drilling – Division 33

G. Wastewater Process Piping System - Division 40

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to these specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 TRACER WIRE

A. For direct burial installations, tracer wire shall be No. 12 gauge, ASTM D 1248, solid insulated copper wire rated for wet conditions.

B. Tracer wire directionally drilled installations shall be No. 12 gauge, copper clad, steel core, hard drawn, extra high strength wire, 1,150 pound average tensile break load, 45 mil HDPE coated, 30 volt rating. A minimum of two (2) wires is required to be installed.

C. Tracer wire for pipe bursting installations shall be 7 x7 stranded copper clad steel wire with a 4,700 pound average tensile break load, 50 mil HDPE coating, 30 volt rating. A minimum of two (2) wires is required to be installed

D. Tracer wire for sanitary sewerage utilities installation shall have green colored insulator.

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E. Tracer wire for water utilities applications shall have blue colored insulator.

2.02 TERMINAL LOCATION BOXES

A. Tracer wire terminal location boxes shall be Valvco or equal, with a cast iron lockable top. Cast iron tops shall be appropriately labeled, “WATER” or “SEWER” .

PART 3 EXECUTION

3.01 INSTALLATION

A. Tracer wire shall be installed in conjunction with all PVC and HDPE utilities and installed continuous to the greatest extent possible and in accordance with the contract drawings and the requirements of the Engineer.

B. For open cut installations, wire shall be placed along the top of the entire length of the pipe, and taped to the pipe, including hydrant barrels, at intervals not exceeding 10-feet.

C. Wire shall surface at all hydrants. Wire may also surface at valve boxes, above laterals at the property line, or manholes. Where spacing of these appurtances exceeds 400 feet; terminal location boxes shall be installed. Terminal location boxes shall be located by the Contractor to meet the maximum spacing or as called out in Special Procedures, Division 1 or as shown on the Contract Drawings.
1. Within valve boxes, the wire shall be installed in ½-inch PVC conduit beginning below the valve nut terminating six inches below the finished grade.
2. At manholes, the wire transition from outside to inside the manhole shall be watertight.
3. Adjacent to hydrants, the wire shall terminate in a terminal location box.

D. Eighteen inches of extra wire shall be provided at all terminations.

E. Splices in the wire shall be held to a minimum. Where splices are necessary, they shall be made with underground rated mechanical wire connectors or by twisting the wires a minimum of 4 times and soldering, then wrapping with two layers of polyethylene tape to 6-inches beyond the stripped wire. Splicing with wire nuts shall not be allowed.

3.02 TESTING

A. All tracer wire must pass a locating test. Locates shall be done in the presence of the Engineer prior to acceptance of respective pipe installation. All equipment necessary to make the test shall be provided by the Contractor.

PART 4 MEASUREMENT AND PAYMENT

4.01 TRACER WIRE

A. General. Tracer wire shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 1.
1. Tracer Wire, Lump Sum. When so provided, payment for tracer wire shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 1.
2. Tracer Wire, Lineal Foot. When so provided, payment for tracer wire shall be made at the contract unit price bid or as specified in Special Procedures - Division 1.
3. Tracer Wire, Inclusive. When no quantity is provided, tracer wire shall be considered inclusive to payment for work scheduled under this contract.

B. Tracer Wire Testing, Inclusive. All testing shall be inclusive to the payment for the respective utility. Payment for utilities requiring tracer wire will not be issued until an accepted locate has been performed and accepted by the Engineer.

4.02 TRACER WIRE TERMINAL LOCATION BOXES

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A. General. Tracer wire terminal location boxes shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 1.

1. Tracer Terminal Location Boxes, Each. When so provided, payment for tracer wire terminal boxes shall be made at the contract bid price for each box or as specified in Special Procedures - Division 1.
2. Tracer Wire Terminal Box, Inclusive. When no quantity is provided, tracer wire terminal boxes shall be considered inclusive to payment for work scheduled under this contract.

END OF SECTION

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SECTION 33 10 00
WATER UTILITIES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American National Standards Institute (ANSI) and American Water Works Association (AWWA), Specifications and Standards:
   a. ANSI/AWWA C104/A21.4 - American Water Works Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings, Current Edition.
   b. ANSI/AWWA C105/A21.5 – American National Standard for Polyethylene Encasement for Ductile-Iron Pipe Systems, Current Edition.
   c. ANSI/AWWA C110/A21.10 - American National Standard for Ductile-Iron and Gray-Iron Fittings for Water, Current Edition.
   d. ANSI/AWWA C111/A21.11 - American National Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings, Current Edition.
   e. ANSI/AWWA C151/A21.51 - American National Standard for Ductile-Iron Pipe, Centrifugally Cast, Current Edition.
   f. ANSI/AWWA C153/A21.53 - American National Standard for Ductile-Iron Compact Fittings for Water Service, Current Edition.
   g. ANSI/AWWA C502- American Water Works Association Standard for Dry-Barrel Fire Hydrants, Current Edition.
   h. ANSI/AWWA C504 - American Water Works Association Standards for Rubber-Seated Butterfly Valves, Current Edition
   i. ANSI/AWWA C509- American Water Works Association Standard for Resilient-Seated Gate Valves for Water Supply Service, Current Edition.
   j. ANSI/AWWA C515 – American Water Works Association Standard for Reduced-Wall, Resilient-Seated Gate Valves for Water Supply Service, Current Edition.
   k. ANSI/AWWA C600 – American Water Works Association Standard for Installation of Ductile-Iron Water Mains and Their Appurtenances, Current Edition.
   l. ANSI/AWWA C605 – Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water, Current Edition.
   m. ANSI/AWWA C651 – American Water Works Association Standard for Disinfecting Water Mains, Current Edition.
   n. ANSI/AWWA C800 – American Water Works Association Standard for Underground Service Line Valves and Fittings, Current Edition.
   o. ANSI/AWWA C900 – American Water Works Association Standard for Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4-inch through 60-inch, for Water Transmission and Distribution, Current Edition.
   p. ANSI/AWWA C901 – American Water Works Association Standard for Polyethylene (PE) Pressure Pipe and Tubing, ½-inch through 3 inches for Water Service, Current Edition.
   q. ANSI/AWWA C906 – American Water Works Association Standard for Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for Water Distribution and Transmission, Current Edition.
2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
   a. ASTM A536 – Standard Specification for Ductile Iron Castings.
   b. ASTM C578 – Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation, Current Edition.
   c. ASTM D1598 – Standard Test Method for Time-to-Failure of Plastic Pipe Under Constant Internal Pressure, Current Edition.

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d. ASTM D1599 – Standard Test Method for Resistance to Short-Time Hydraulic Pressure of Plastic Pipe, Tubing, and Fittings, Current Edition.
e. ASTM D1785 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80 and 120, Current Edition.
f. ASTM D2239 – Standard Specification for Polyethylene (PE) Plastic Pipe (SIDR-PR) Based on Controlled Inside Diameter, Current Edition.
g. ASTM D2241 – Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series), Current Edition.
h. ASTM D2321 – Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications, Current Edition.
i. ASTM D2464 – Standard Specification for Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80, Current Edition.
j. ASTM D2466 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40, Current Edition.
k. ASTM D2467 – Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80, Current Edition.
l. ASTM D2513 – Standard Specification for Thermoplastic Gas Pressure Pipe, Tubing, and Fittings, Current Edition.
m. ASTM D2737 – Standard Specification for Polyethylene (PE) Plastic Tubing
n. ASTM D2837 – Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products
o. ASTM D2855 – Standard Practice for Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings, Current Edition.
p. ASTM D3035 – Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter, Current Edition.
q. ASTM D3139 – Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals, Current Edition.
r. ASTM D3261 – Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, Current Edition.
s. ASTM D3350 – Standard Specification for Polyethylene Plastics Pipe and Fittings Material, Current Edition.
t. ASTM F714 – Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter, Current Edition.
u. ASTM F1055 – Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene Pipe and Tubing, Current Edition.
v. ASTM B88 – Standard Specification for Seamless Copper Water Tube

3. Factory Mutual Research (FM), Specification and Standards, Current Edition.
4. National Fire Protection Agency (NFPA 24).
5. Underwriters Laboratories, Inc. (UL) Specifications and Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing all materials, equipment, labor and supervision required for water main, water service and other appurtenant materials, installed for the transmission and/or distribution of potable water, as shown on the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Removal, Salvage and Abandonment – Division 02

D. Geosynthetics for Earthwork - Division 31

E. Trenching and Backfilling - Division 31

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F. Erosion and Sedimentation Controls - Division 31

G. Tracer Wire – Division 33

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Contractor shall submit such submittals and details required for the construction and installation of the materials. Submittals and details shall indicate the intended materials arrangement, dimensions, major support requirements, plot area and intricate or detailed construction requirements.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 PIPE

A. All water main 3 inches in diameter or larger shall meet the following minimum requirements:

1. Ductile Iron Pipe. Shall be Thickness Class 52 meeting the requirements of ANSI/AWWA C151/A21. Standard cement-mortar lining shall meet the requirements of ANSI/AWWA C104/A21.4. Pipe shall have minimum of 1 mil asphaltic outside coating in accordance with ANSI/AWWA C151/A21.51. Spotty or thin seal coating, shall be cause for rejection.

2. Polyvinyl Chloride Pipe. (Not available in 3-inch diameter) PVC pipe 4 inches to 12 inches in diameter shall be manufactured in accordance with ASTM D2241 and meet the requirements of ANSI/AWWA C900-16 or latest edition. Pipe shall be Pressure Class (PC) 235 psi minimum; or Pressure Rating (PR) 250 minimum; and have a Dimension Ration (DR) 18 or less. PVC pipe 14 inches to 60 inches in diameter shall meet the requirements of ANSI/AWWA C900 Pressure Class (PC) 235, minimum and have a Dimension Ratio (DR) of 14 or less.

3. High Density Polyethylene Pipe (HDPE). Polyethylene pipe shall meet or exceed the requirements of ANSI/AWWA C906-15, Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch for Water Distribution and Transmission. The furnished pipe shall be approved for potable water and marked with a continuous blue stripe. PE4710, HDPE Pressure Class 200, DR11 and DR11. Pipe shall have outside diameters similar to ANSI/AWWA C151/A21.51 ductile iron pipe (DIPS). Ends shall be plain for butt fuse joining.

B. All water main 2-inches in diameter or less shall meet the following minimum requirements:

1. Copper pipe shall be Type K copper tubing, ASTM B88, and shall conform to the sizing requirements of ANSI/AWWA C800.
2. High Density Polyethylene Pipe (HDPE) shall meet the requirements of ASTM D2239, D2737 or D3035 and shall have a minimum working pressure of 160 psi.

2.02 FITTINGS

A. All fittings for water main 3 inches in diameter or larger shall meet the following minimum requirements:

1. Ductile Iron Pipe. Full body fittings shall conform to ANSI/AWWA C110/ A21.10 and ANSI/AWWA C111/A21.11 with bituminous coating. Compact fittings shall conform to ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/21.11 with bituminous coating. All fittings shall be provided with cement mortar lining conforming to ANSI/AWWA C104/A21.4.
2. Polyvinyl Chloride Pipe. (Not available in 3-inch diameter) Full body fittings shall conform to ANSI/AWWA C110/ A21.10 and ANSI/AWWA C111/A21.11 with bituminous coating. Compact fittings shall conform to ANSI/AWWA C153/A21.53 and ANSI/AWWA C111/21.11 with bituminous

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coating. All fittings shall be provided with cement mortar lining conforming to ANSI/AWWA C104/A21.4.

3. All DI fittings shall be manufactured in North America
4. High Density Polyethylene (HDPE). All fittings shall be molded polyethylene fused-type, PE3408, HDPE Class 160, DR11 or PE4710, HDPE Class 160, DR 13.5, DIPS and have outside diameters similar to ANSI/AWWA C151/A21.51 ductile iron pipe. Ends shall be plain for butt fuse joining.

B. All fittings for water main 2 inches or less in diameter shall meet the following minimum requirements:

C. High Density Polyethylene Pipe (HDPE). All fittings shall be molded polyethylene fused-type, PE3408, HDPE Class 160, DR11 or PE4710, HDPE Class 160, DR 13.5, and have outside diameters similar to ANSI/AWWA C151/A21.51 ductile iron pipe. Ends shall be plain for butt fuse joining.

D. Bolts shall be stainless steel, Cor-Blue.

2.03 JOINTS

A. All joints for water main 3 inches in diameter or larger shall meet the following minimum requirements:
1. Ductile Iron Pipe. Joints shall be either push-on or mechanical joint conforming to ANSI/AWWA C111/A21.11 unless specified otherwise. All joints, fittings, etc., shall be equipped to provide electric continuity. The continuity must be provided through the use of a trademarked, well-established method acceptable to the Engineer.
2. Polyvinyl Chloride Pipe. (Not available in 3-inch diameter). Joints shall be push-on type employing rubber gaskets which conform with ASTM F477 and joints which conform with ASTM D3139.
3. High Density Polyethylene (HDPE). Joints shall be butt fusion meeting the requirements of ASTM D3261. Electrofusion meeting the requirements of ASTM F1055 shall be used where necessary for pipe coupling or where approved by the engineer.

B. All joints for water main 2 inches in diameter or less shall meet the following minimum requirements:
1. High Density Polyethylene (HDPE). Joints shall be butt fusion meeting the requirements of ASTM D3261. Electrofusion meeting the requirements of ASTM F1055 shall be used where necessary for pipe coupling or where approved by the engineer.

C. All joints for water main requiring joint restraint shall meet the following minimum requirements:
1. Mechanical Joints. Mechanical joints shall be installed with wedge action restraining glands, Mega-Lug by EBAA Iron Sales, Inc. or equal.
2. Push-on Joints. Restrained push-on joints for straight pipe shall be as shown on the plans or as recommended by Pipe Manufacturer. Restrained joint retainer rings shall be manufactured of ductile iron compatible with pipe. All nuts, bolts, and tie rods shall be stainless steel or with a corrosion-resistant coating. Restraints shall be Mega-Lug by EBAA Iron Sales, Inc. or equal.
3. All restrained joints shall have a pressure rating equal to that of the pipe.

2.04 VALVES

A. All valves for water main 3 inches thru 12 inches in diameter shall meet the following minimum requirements:
1. Valves shall be resilient-seated gate valves, mechanical joint conforming to ANSI/AWWA C509 or ANSI/AWWA C515 unless specified otherwise.
2. Valves shall have non-rising stem, with 2 inch operating nut opening counter-clockwise.
3. The valve wedge shall be ductile iron fully encapsulated with EPDM rubber, shall be symmetrical and seal equally well with flow in either direction.
4. Operating nut extensions shall be provided.
5. Valves shall be Mueller or American Flow Control.

B. All valves for water main 2 inches in diameter or less shall meet the following minimum requirements:
1. Mueller Mark II Oriseal, or equal

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C. All valves for water main larger than 12 inches in diameter shall meet the following minimum requirements:
   1. Valves shall be rubber-seated butterfly valves, mechanical joint conforming to ANSI/AWWA C504 unless specified otherwise.
   2. Valves shall have non-rising stem, with 2 inch operating nut opening counterclockwise.

D. Valves shall be installed with the following accessories:
   1. Valve Box. Valve box shall consist of a top section, bottom section, base, drop lid, and necessary extensions and all shall be cast iron. Lid shall have the word "WATER" cast on the lid.
   2. Valve Box Adaptor.
      a. Gate Valves: All gate valves 4 inch or larger shall be installed with a Gate Valve Adaptor as manufactured by Adaptor Inc., or equal.
      b. Butterfly Valves: All butterfly valves between 6 inch and 36-inch in diameter shall be installed with a Butterfly Valve Adapter as manufactured by Adaptor Inc., or equal.

2.05 HYDRANTS

A. Hydrants shall be a Waterous Pacer, Model WB67 meeting the following requirements unless noted otherwise in Special Procedures - Division 01.

B. All hydrants for water main shall meet the following minimum requirements:
   1. Hydrants shall be dry barrel fire hydrant, dry top design, conforming to ANSI/AWWA C502 with mechanical joint base connection.
   2. Hydrants shall be traffic design with protective groundline coupling (traffic flange) which assures reliable fracture at traffic impact. This coupling shall also allow hydrant rotation to any position after hydrant installation.
   3. Hydrant to be furnished as standard 3-way style with two 2-1/2 inch and one 4-1/2 inch standard hose nozzles (chains on nozzle caps are required). Hydrants shall have 5-1/4 inch main valve openings.
   4. Hydrant operating nut shall be a standard two-piece pentagon (5 sided). Operating assembly shall include, as a minimum, thrust washer, revolving nut with seal for dry top design, and lifetime lubrication.
   5. Hydrant base shall contain a barrel drain operated by hydrant activator.
   6. All hydrants shall be connected to the main with a 6-inch diameter (minimum) water main pipe conforming to the requirements of this section.
   7. Upper barrel section shall be a minimum 22 inches.
   8. National standard thread, operating nut will be a standard 1-1/2 inch pentagon, CCW open
   9. Mechanical joint connections.
   10. Painted red.
   11. Maintain electrical continuity.
   12. Resilient wedge main seat.
   13. Bronze to bronze fittings.
   14. Incorporated bronze drainage system.

C. Hydrants shall be furnished having bury depth consistent with surface grades and water main depth as shown on the Contract Drawings or as defined in Special Procedures - Division 01.

2.06 WATER SERVICES

A. All water service lines shall be 1 inch unless shown otherwise on the contract drawings or as specified in Special Procedures – Division 01. All service lines for water main shall meet the following minimum requirements:
   1. Copper.
      a. Service lines shall be Type K copper tubing and shall conform to ASTM B88.
   2. High Density Polyethylene (HDPE).
      a. Service lines shall be polyethylene CTS (copper tube size) meeting the requirements of ASTM D2737 and AWWA C901. Line shall be rated for use with water at 73.4ºF, have a

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pressure class of 250 psi, and be NSF/ANSI 61 and NSF/ANSI 14 approved. Service line tubing shall be Polyflex (CTS), DriscoPlex 5100, Ultraline (SDR 9) or approved equal.

b. All HDPE services shall have stiffeners for connection to compression type fittings per manufacturer's recommendations.

B. All corporations for water services shall meet the following minimum requirements:

1. Ductile iron water mains
   a. Corporation stops shall conform to ANSI/AWWA C800 for copper service lines.
   b. Corporations larger than 1 inch and for pipe smaller than a 6-inch diameter shall be furnished and installed with service saddles.
   c. Service saddles shall be rated for 250 psi, have a coated ductile iron body, 304 stainless steel strap and nitrile O-ring gasket. Service saddles shall meet all applicable parts of ANSI/AWWA C800.
   d. Corporation stops shall be Mueller Ground Key Conductive Compression, or equal, or as specified in Special Procedures - Division 01.
2. PVC water mains
   a. Service line connection to PVC pipe shall be made using a saddle type connection. A simple threaded connection shall not be acceptable.
   b. Service saddles shall be rated for 250 psi, have a coated ductile iron body, 304 stainless steel strap and nitrile O-ring gasket. Tapping saddles shall meet all applicable parts of ANSI/AWWA C800.
   c. Corporation stops shall be Mueller Ground Key Conductive Compression or equal, as specified in the Special Procedures – Division 01. Stainless steel stiffeners are required for compression fitting connections.
3. High Density Polyethylene (HDPE) water mains
   a. Service line connection to HDPE pipe shall be made using a saddle type connection. A simple threaded connection shall not be acceptable.
   b. Service saddles
      1) Service saddles shall be rated for 250 psi, have a coated ductile iron body, 304 stainless steel dual strap, nitrile O-ring gasket, and spring washers specifically designed for use on HDPE pipe. Service saddles shall meet all applicable parts of ANSI/AWWA C800.
      2) Service saddles shall be Smith-Blair 317, or equal for use on HDPE pipe.
   c. Corporation stops shall be Mueller Ground Key Conductive Compression, or equal, or as specified in the Special Procedures – Division 01. Stainless steel stiffeners are required for compression fitting connections.

C. All curb stops for water services shall meet the following minimum requirements:

1. Copper water services
   a. Curb stops shall be designed for use with copper service lines and shall conform to ANSI/AWWA C800.
   b. Curb stops shall be Mueller Mark II Oriseal, or equal, with conductive compression fittings or as specified in Special Procedures - Division 01.
2. High Density Polyethylene (HDPE) water services
   a. Curb stops shall be Mueller Mark II Oriseal, or equal, with threaded connections or as specified in Special Procedures - Division 01.
   b. Threaded stainless steel by HDPE transition fittings shall be supplied for each curb stop. Transition fittings shall be butt fused to the service pipe. Transition fittings shall be manufactured by Central Plastics.

D. All curb boxes for water services shall be Mueller, Minneapolis pattern, or equal, 1-1/4 inch upper, pentagon nut opening or as specified in Special Procedures - Division 01.

E. Curb boxes shall be furnished having bury depth consistent with water main depth as shown on the Contract Drawings or as defined in Special Procedures - Division 01.

2.07 HDPE BY MECHANICAL JOINT ADAPTERS

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A. The HDPE by MJ Adapters shall be manufactured by Central Plastics Company or equal. The adapter shall comply with ANSI/AWWA C906 and be manufactured for use on pipe conforming ASTM D2513, D3035, F714. The adapter shall be molded from a PPI and NSF listed pre-blended virgin resin in accordance with the material specifications listed in ASTM D3350 with a cell classification of 345464C and be compatible for heat fusion with any pipe manufactured from a like or similar resin.

1. Adapters shall be tested according to ASTM D1599 and ASTM D1598.
2. HDPE Adapters shall be sized for use with ductile iron pipe size HDPE pipe.
3. Adapters shall be used for all transitions from HDPE to valves or ductile iron pipe.
4. HDPE by MJ Adapters for pipe 12 inch or greater must be designed for use with butterfly valves. Submittals shall specifically indicate this feature.
5. Adapters must provide thrust restraint.

2.08 INSULATION

A. Insulation shall be extruded polystyrene insulation (25 psi) conforming to ASTM C578, Type IV in 4 foot x 8 foot sheets with minimum thickness of 2 inches.

PART 3 EXECUTION

3.01 GENERAL

A. All construction shall be done in conformance with ANSI/AWWA C600 unless otherwise specified.

3.02 EXCAVATION

A. Excavation shall conform to Trenching and Backfilling - Division 31 of these specifications except as modified herein.

3.03 FIELD INSPECTION OF MATERIALS

A. Before lowering and while suspended, the pipe or fittings shall be inspected for defects. All materials used in the work must pass field inspection. Contractor shall inspect each segment of pipe for the presence of foreign matter, rough edges or projections within the pipe. Contractor shall take care to prevent any foreign material from entering pipe prior to installation.

3.04 DIRECTION OF LAYING

A. Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of laying. When the grade exceeds 30 feet of rise per one hundred feet of trench, the bells shall be face upgrade.

3.05 INSTALLATION

A. The Contractor shall have sufficient and adequate equipment on the site of the work for unloading and lowering pipe and fittings into the trench.

B. Extreme care shall be exercised by the Contractor in handling all pipe, fittings, and special castings so as to prevent breakage. Under no circumstances shall they be dropped into the trench or so handled as to receive hard blows or jolts when being moved.

C. The Contractor shall supply and install pipe fittings, couplings, bends, and appurtenances as required to complete the project.

D. All tees, crosses, bends, and reducers shall be cast or ductile iron. No PVC appurtenances will be allowed.

E. Contractor shall install temporary water service to all users where water service will be interrupted for more than 4 hours. Contractor shall coordinate interruption to business and commercial users so the interruption

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will not cause a disruption of business or commercial activities. All users shall be given 24 hour notice of service interruption, except during emergencies.

F. Abandonment and/or removal of existing water mains shall be completed in accordance with Section 02 42 00 “Removal, Salvage and Abandonment” in Division 02.

G. All existing water mains being replaced are to remain in service until the new water mains are tested and accepted. The Contractor shall make arrangements with the Owner and the Engineer to sequence connection and operation of new mains and abandonment of existing mains. A minimum of 24 hours notice to residents shall be provided prior to shutting off their water.

H. Unless pre-approved by the Owner and Engineer, the maximum allowable duration of water service interruption to water utility customers shall be typically be 4 hours. Customers to whom water service is critical, shall have service interruption limitations and accommodation needs determined on a case by case basis.

3.06 JOINING OF PIPE

A. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line. If the crew cannot put the pipe into the trench and in place without getting earth into it, the Engineer may require that before lowering the pipe into the trench, a heavy, tightly woven canvas bag of suitable size shall be placed over each end and left there until the connection is to be made to the adjacent pipe.

B. During laying operations, no debris, tools, clothing, or other materials shall be placed in the pipe.

3.07 Transite Pipe (Asbestos-Concrete)

A. If transite pipe is encountered during construction, contractor shall not disturb pipe and leave in the ground, if possible.

B. If transite pipe must be disturbed during the course of the project, Contractor shall follow all applicable Federal and State laws along with all OSHA requirements for handling and disposing of pipe. Contractor shall apply for all applicable Federal and State permits for removing and handling asbestos containing material.

3.08 CUTTING OF PIPE

A. Pipe shall be cut at right angles to the centerline of the pipe. Cutting shall be done in a neat workmanlike manner without damage to the pipe and so as to leave a smooth end.

B. All pipes shall be cut with an approved mechanical cutter. The cut end of a pipe to be used with rubber gasket joints shall be tapered by grinding or filing about 1/8 inch back at an angle of approximately 30 degrees with the centerline of the pipe, and any sharp or rough edges shall be removed.

3.09 OBSTRUCTIONS IN LINE OR GRADE

A. Whenever it becomes necessary to lay a main over, under or around a known obstruction, the Contractor will furnish and install the required fittings.

B. If an unknown underground structure interferes with the work to such an extent that an alteration of the plan is required, the Contractor shall notify the Engineer.

3.10 THRUST RESTRAINT

A. Thrust restraint is required for all bends, caps, plugs, tees, and valves adjacent to tees. Thrust restraint shall be provided by use of concrete buttresses and wedge action restraining glands.

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B. Concrete buttresses shall be poured against firm, undisturbed ground. When concrete buttresses cannot be placed against undisturbed ground they shall be placed against fill material of composition conforming to the requirements of ASTM C12 or ASTM D2321 as applicable for rigid and flexible pipe respectively, compacted to 95 percent of the modified proctor density for the material. The buttresses shall be constructed to the minimum dimensions as shown on the contract drawings or as required by the Engineer. All buttresses shall be formed to keep the joints free of concrete.

C. Solid precast concrete blocks may be used in lieu of the poured buttresses when approved by the Engineer. When concrete blocks are used, they shall be stepped-out to match the minimum dimensions required for poured concrete buttresses.

D. Ductile iron or PVC pipe connecting to HDPE pipe must be restrained a sufficient distance upstream to prevent joint separation due to contraction of the HDPE pipe. The minimum length of restrained pipe required shall be as shown on the contract drawings or as specified in Special Procedures - Division 01. If no minimum length for restrained joints is specified, the Contractor shall submit the restrained joint calculations to the Engineer for review prior to construction.

E. Restrained joint fittings shall be used in conjunction with concrete buttresses. When restrained joint fittings are used, a sufficient length of pipe on each side of the fitting shall be restrained to resist the thrust forces. The minimum length of restrained pipe required shall be as shown on the contract drawings or as specified in Special Procedures - Division 01.

F. Thrust restraint is not required for HDPE water mains with HDPE fittings except where transitioning to other pipe materials.

3.11 JOINT DEFLECTION

A. The maximum allowable deflection for ductile iron pipe will be as given in ANSI/AWWA C600. If excess deflection is required, special bends shall be furnished to provide angular deflections.

B. The maximum deflection shall be as specified by the manufacturer.

3.12 DEPTH

A. The water main shall be placed at a depth as to prevent freezing. This depth shall provide eight feet (8'-0") of cover over iron/copper pipe and one-half foot more for other materials unless otherwise shown on the contract drawings or required by Special Procedures - Division 01 of these specifications.

B. Insulation shall be installed if ground cover is less than eight feet (8'-0") or utility crossing effectively removes earthen freeze protection. Insulation shall be installed as shown on the contract drawings or as directed by the Engineer in the field.

3.13 UNSTABLE SOIL

A. If in the opinion of the Engineer the trench bottom is of unstable material, the Engineer may direct the Contractor to excavate the unstable material and replace same with 3/4 inch washed stone. Washed stone used in such cases shall be considered incidental and included in the price bid for water main unless bid or specified otherwise. Where the condition of unstable material is unusually severe, the Engineer may order the placement of a concrete cradle. Materials used for concrete cradles, when not called for in the Contract Documents, shall be paid for by Change Order at a negotiated price.

3.14 EMBEDMENT/BEDDING

A. Class B bedding and initial backfill shall be used for all ductile iron or HDPE pipe installed under this contract in accordance with the contract drawings and ASTM C12, or as indicated in Special Procedures - Division 01 of these specifications.

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B. Class II embedment shall be used for all PVC pipe installed under this contract in accordance with the contract drawings and ASTM D2321, or as indicated in Special Procedures - Division 01 of these specifications.

3.15 SETTING VALVES

A. Valves in water mains shall be provided and installed in locations as shown on the contract drawings. A valve box and valve box adaptor shall be provided for every valve unless otherwise specified. The valve box shall not transmit shock or stress to the valve and shall be centered and plumb over the wrench nut of the valve. The box cover shall be 1/4 inch to 1/2 inch lower than the surface of the finished pavement.

B. HDPE by mechanical joint adapters must be used at all valves installed on HDPE pipe.

3.16 SETTING HYDRANTS

A. Hydrants shall be located as shown on the contract drawings or as directed by the Engineer. All hydrants shall stand plumb and shall have the pumper nozzle facing the curb. Hydrants shall be set to the established grade, which shall be hereinafter considered as with nozzles at least 18 inches above the ground such that the following one or more conditions apply:

1. Nozzle center is 18-24 inches above the top of proposed curb.
2. Nozzle center is 18-24 inches above the existing ground line.
3. Nozzle center is 18 inches above the proposed ground surface elevation for that hydrant location.

The above hydrant vertical placement may be accomplished by adding hydrant extensions. The unit price bid for the hydrant shall include the cost of extensions.

B. All hydrant drainport shall be plugged in the following conditions:

1. Hydrant drainport would be installed below groundwater table.
2. Hydrant is placed in area with known soil contamination.
3. Soil materials and coloration indicate groundwater may be above hydrant drainport.
4. Plugging is shown on the contract drawings or is directed by the Engineer the field.

C. Wherever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing coarse gravel or crushed stone mixed with coarse sand, from the bottom of the trench to at least 6 inches above the waste opening in the hydrant and to a distance of 1 foot around the elbow. The drainage material shall be wrapped with non-woven geotextile fabric Type SAS conforming to the requirements of Geosynthetics for Earthwork - Division 31 of these specifications.

D. All hydrants shall be provided with drainage at the base of the hydrant by placing compacted coarse gravel or compacted crushed stone mixed with coarse sand, under and around the elbow of the hydrant to a level of 6 inches above the waste opening in the hydrant and to a distance 3 feet along the trench back toward the main.

E. All hydrants shall be constructed with a minimum of eight feet (8'-0") of cover over the lead, or as shown on the contract drawings or specified in Special Procedures - Division 01, and be set on a solid concrete block.

F. All hydrants shall be installed with thrust restraint utilizing concrete buttresses and joint restraint, see thrust restraint this section.

3.17 INSTALLING SERVICES

A. All corporations shall have proper sized tapping saddle furnished with them if used with PVC/plastic water main. All costs related to tapping saddles shall be included in the corporation unit price. Taps shall be cut-in using a "shell cutter" tapping device to capture all loose materials. All services taps shall be made "hot" or with the main under pressure unless authorized by the Engineer and Owner.

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B. Contractor shall connect to existing services with a proper manufactured fitting. Contractor shall have various sized fittings/coupling in order to connect existing services with different sizes and materials.

3.18 TRACER WIRE

A. Trace wire shall be installed in conjunction with all PVC, HDPE, or non-conductive water main and services in accordance with Tracer Wire – Division 33 and with the Contract Drawings and the Special Procedures – Division 01.

3.19 DISINFECTING WATER MAIN

A. All water main and services shall be disinfected in conformance with ANSI/AWWA C651. The main will not be accepted or placed in service until two consecutive satisfactory tests are taken 24 hours apart from samples from the new main following the final flushing.

B. At least one set of samples shall be collected from every 1,200 feet of the new water main, plus one set of samples from the end of the main and a minimum of one set from each water main branch.

C. The testing lab shall furnish copies of lab results from the bacteriological tests run on the water mains to the Engineer.

3.20 WATER SUPPLY DECHLORINATION

A. Chlorinated water discharged directly or indirectly to surface waters as a result of flushing newly installed water mains, discharging water tanks or reservoirs, hydrant flushing, test pumping wells, or any other circumstance shall be dechlorinated in accordance with the current "Hydrostatic Test Water or Water Supply System Water General Permit, WPDES Permit No. WI-0057681". The free chlorine residual of discharged water shall be reduced to 0.1 parts per million or less, or to the normal operating concentration of the chlorine residual maintained in the water supply system.

B. The concentration of free chlorine residual shall be measured at the point of surface water entrance.

3.21 TESTING

A. All equipment required for hydrostatic testing shall be furnished and operated by the Contractor subject to the approval of the Engineer. This equipment shall include all sampling taps and necessary flushing appurtenances.
   1. Hydrostatic tests shall consist of pressure and leakage test in accordance with ANSI/AWWA C600, Hydrostatic Testing. The hydraulic tests shall be conducted at 150 percent of normal operating pressure or 150 psi, whichever is greater.
      a. Water shall not be added during the pressure test. No pipe section will be accepted if the test pressure drops more than 5 psi within the two-hour test duration.
      b. The leakage is the amount of water required to bring the pressure back up to the starting pressure once the pressure test passes. Contractor shall know and follow the procedures in AWWA C600 for the leakage test and have all required material and equipment necessary to complete this test.
   2. Hydrostatic tests shall be conducted on sections of water main recommended as ready by the Contractor and approved by the Engineer. No section shall be less than one block (approximately 400 feet) of water main unless conditions warrant such testing of smaller sections.
   3. Where water services are installed to facilities which may include fire sprinkler systems, a pressure test and leakage test shall be performed on the water service in accordance with NFPA 24.

B. Where ductile iron water main is installed, a random section of completed main will be selected by the Engineer for a continuity test. This random section shall be subjected to 300 amps DC for 15 minutes. All equipment necessary to make the test and to establish a closed circuit with the test section of water main providing one leg of the circuit shall be provided by the Contractor at no additional cost to the Owner. The

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Contractor shall take whatever precautions he deems necessary such as filling the water main with water prior to testing to protect the gaskets and building the amperage up slowly while watching an ammeter.

1. If the random section passes the test, the electrical continuity for the entire water main installation will be considered acceptable.
2. Should the random section fail the test, it shall be repaired by and at the expense of the Contractor until it can pass the test. Also, the remainder of the project will be divided into test sections by the Engineer and tested for compliance by and at the expense of the Contractor.

C. All tracer wire must be tested for electrical continuity. All equipment necessary to make the test and to establish continuity of all tracer wire shall be provided by the Contractor.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Water main shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 WATER MAIN

A. Water Main, Size, Type, Lineal Foot. Measurement for water mains shall be per lineal foot of a specific diameter water main installed. Payment shall be made at the contract unit price bid per lineal foot of the respective diameter for furnishing, installing and testing of water main.

B. Water Main, Inclusive. When no quantity is provided, water main shall be considered inclusive to payment for other work associated with this contract.

4.03 APPURTENANCES

A. Fittings (Type), Size, Each. Measurement for fittings shall be for each size and type installed as indicated in the Bid Schedule or Special Procedures - Division 01. Payment shall be made at the contract price bid per each size and fitting installed.

B. Fittings, Inclusive. If no bid items are included with the project, all fittings shall be included in a related bid item. Contractor is responsible for verifying types and numbers of fittings required for the project to include in the bid.

C. Valves (Type), Size, Each. Measurement for valves shall be for each size as indicated in the Bid Schedule or Special Procedures - Division 01. Payment shall be made at the contract price bid per each size valve installed. All costs for HDPE by mechanical joint adapters shall be incidental for valve installation.

D. Valves, Inclusive. When no quantity is provided, valves shall be considered inclusive to payment for other work associated with this contract.

E. Hydrants, Each. Measurement for hydrants shall be for each installed. Payment shall be made at the contract price bid per each hydrant installed. All hydrant extensions and appurtenances required to set hydrants to the established grade per this Specification shall be included in the contract price bid per each hydrant installed.

F. Hydrants, Inclusive. When no quantity is provided, hydrants shall be considered inclusive to payment for other work associated with this contract.

G. Water Services, Size, Lineal Foot. Measurement for services shall be per lineal foot of a specific size services installed. Payment shall be made at the contract unit price bid per lineal foot of each size services installed.

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H. Water Services, Inclusive. When no quantity is provided, water services shall be considered inclusive to payment for other work associated with this contract.

I. Corporation, Curb Box, and Stop, Size, Each. Measurement for these items are included as one bid item and shall be paid per each set of these items installed. The bid price for this item shall include; corporation stop, curb stop, curb box, stationary rod (when required) and all costs necessary to connect new services to the existing curb stop or to connect to the existing water service.

J. Corporation, Curb Box and Stop, Inclusive. When no quantity is provided, corporation, box and stop shall be considered inclusive to payment for other work associated with this contract.

K. Insulation, Square Foot. Measurement for insulation shall be per square foot of insulation installed. Payment shall be made at the contract unit price bid per square foot of insulation installed.

L. Insulation, Inclusive. When no quantity is provided, insulation shall be considered inclusive to payment for other work associated with this contract.

M. Connect to Existing Water Main, Each. All costs related to connection to existing water mains shall be included in the contract unit price bid per each connection. When a cut-in tee is required, only one connection to the existing main will be paid. The other connection shall be included under a related item and considered inclusive to the project. Valves will be paid separately unless otherwise specified. When HDPE by mechanical joint adapters are required, the cost for the adapters shall be incidental to this item.

N. Connect to Existing Water Main, Inclusive. When no quantity is provided, connect to existing water main, shall be considered inclusive to payment for other work associated with this contract.

4.04 TESTING

A. Mains shall be installed and pass test for pressure, leakage and safe sample before any water main installation payments shall be made.
   1. The Contractor is responsible for furnishing and operating all water main testing equipment including sampling taps and necessary flushing appurtenances.
   2. After removal, any temporary fittings, valves, and plugs shall become the Contractor's property.

B. Payment for water main requiring tracer wire will not be issued until an accepted continuity test has been performed and approved by the Engineer.

END OF SECTION

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SECTION 33 21 13.10
ROCK-WALLED WELL CONSTRUCTION

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 1 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. Wisconsin Administrative Code, Chapter NR 809, 811, and 812.
   2. Ten States Standards - Recommended Standards for Water Works, Current Edition.
   3. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   4. American Water Works Association (AWWA) Standards, Current Edition.
   5. American National Standard Institute (ANSI) Standards, Current Edition.
   6. American Petroleum Institute (API) Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover the construction of a sand-free potable water supply rock-walled well, including all related drilling, materials, test pumping, water sampling, and laboratory analysis.

B. The work also includes the abandonment of the existing 6-inch test well located at the site.

C. The work to be done hereunder includes but is not limited to, the furnishing of all labor, material, transportation, tools, equipment, and appurtenances, as shown in these contract drawings and specifications, unless hereinafter specifically excepted, for the complete and satisfactory construction, development, testing, televising, and disinfection of the proposed well.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements – Division 00 (All Sections)

B. General Requirements – Division 01 (All Sections)

C. Erosion and Sedimentation Controls - Division 31

1.05 SHOP DRAWINGS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Contractor shall submit details of the proposed well drilling and grouting methods prior to commencing work. Information shall be in conformance with requirements of the Submittals - Division 1 of these specifications.

1.06 CONTRACTOR AND WORKMEN QUALIFICATIONS

A. The Contractor shall be a licensed well driller capable of doing all work in accordance with rules and regulations of the Wisconsin Department of Natural Resources. A Contractor shall employ only competent workmen for the execution of his work and all such work shall be performed under the direct supervision of an experienced well driller licensed in the State of Wisconsin.

B. Each bidder must have experience in constructing wells of this type and as evidence of this experience shall submit with his bid a list of at least three similar installations in this area. The following data must be given for each well listed: Owner and location; year drilled; construction method; depth; diameter; capacity; present specific yield; original specific yield.

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C. The Owner reserves the right to disregard or reject the bid of any Contractor who, in the judgment of the Owner, does not fulfill these qualifications.

1.07 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

1.08 PERMITS, CERTIFICATES AND LICENSES

A. The Contractor shall, at the Contractor's own expense, procure all permits, certificates and licenses required of him by law for his work. The Contractor shall comply with all Federal, State and local laws, ordinances or rules and regulations relating to the performance of the work.

B. The Owner shall be responsible for the fee associated with obtaining a high-capacity well permit.

1.09 DEPARTMENT OF NATURAL RESOURCES NOTIFICATION

A. The Contractor shall notify the State of Wisconsin Department of Natural Resources Water Supply Engineer a minimum of seven (7) days prior to initiating drilling operations, 48 hours prior to grouting, and 48 hours prior to test pumping. DNR contact is Sony Zentner, Water Supply Engineer, 715-928-1624

PART 2 PRODUCTS AND MATERIALS

2.01 CONSTRUCTION CRITERIA

A. The well is expected to have the following characteristics:

1.	Surface drill hole:	24 inch diameter	39 feet
2.	Surface casing:	24 inch O.D.	40 feet
3.	Upper drill hole:	23 inch diameter:	111 feet
4.	Casing pipe:	18 inch diameter:	153 feet
5.	Neat cement grout seal:		300 bags
6.	Lower drill hole:	17 inch diameter	215 feet
7.	Total well depth:		365 feet
8.	Anticipated static water level		30
9.	Anticipated final pump setting (top of bowls):		145 feet
10.	Anticipated final pumping rate:		approx. 900 gpm
11.	Proposed test pump setting:		165 feet
12.	Maximum test pumping rate:		900 gpm

2.02 CASING

A. Permanent casing shall be new pipe produced to and meeting the requirements of Wisconsin Administrative Code, Chapter NR 811
   1. Primary casing pipe shall be 16-inch O.D. having not less than a 0.375-inch wall thickness.
      a. Primary casing shall be ASTM A312 Type 304 schedule 40 stainless steel. No previously used or reclaimed pipe shall be used.
   2. Temporary outer casing pipe shall be 20-inch O.D. having not less than 0.375-inch wall thickness.
      a. ASTM A-53, Grades A or B; ASTM A-106; ASTM A-589, Type I, Grades A or B, Type II, Grade A, or; API 5L.

B. Centering guides shall be welded to the outside of the casing, as required by Wisconsin Administrative Code, Chapter NR 811.12(7)f.

2.03 WATER FOR DRILLING

A. The Owner will furnish water through its existing facilities for all necessary drilling operations at no cost to the Contractor. The Contractor, however, shall furnish his own equipment and means of transportation to obtain such water from the present system. The Contractor shall also record the amount of water used and provide this information to the Owner.

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B. The Contractor shall provide appropriate means for backflow prevention when obtaining water from the Owner's facilities.

C. The Contractor shall not operate Owner's valves and hydrants unless specifically authorized by the Owner. Provide Owner with sufficient advance notice when water supply is required.

D. The test well is located approximately 50 feet south of the final well location and is capped. Contractor may use this for water source, however, all costs for uncapping, chlorinating, purging, pumping, and sealing after use are at the expense of the Contractor.

2.04 NEAT CEMENT GROUT

A. Neat cement grout shall consist of a mixture of cement and water in the proportion of one bag of ASTM C150, Type I or IL Portland cement (94 lbs) to 6 gallons of clean water. The resulting mixture shall have a unit weight of not less than 15.0 pounds/gallon. Additives, such as bentonite to increase fluidity, may be added only with prior approval by the Engineer and WDNR.

2.05 FIELD LABORATORY EQUIPMENT

A. The Contractor shall furnish all field laboratory equipment to make and conduct analysis of the water samples taken. Any partial tests shall be at the Contractor's expense. Complete tests and analysis of the water shall be made at intervals designated by the Engineer. The unit price bid for "Field Chemical Tests" shall be for each complete test and shall include the furnishing of the equipment and the labor and any materials incidental thereto.

2.06 POWER SUPPLY

A. The Contractor shall be responsible for providing a generator or a temporary electric service and all necessary controls and equipment, including service entrance and utility coordination to power the pump during the test pumping. Where the test pump is powered by temporary electric service, all costs for power, service entrance equipment needed and utility coordination shall be included in the price bid for test pumping.

PART 3 EXECUTION

3.01 GENERAL

A. All construction shall be done in conformance with the Wisconsin Administrative Code NR 811, ANSI 21.00 (AWWA A100), Current Edition, and as specified herein.

B. A chlorine residual shall be maintained at all times during the well construction.

3.02 DRILLING METHOD

A. No drilling muds or clays will be permitted in the construction of the well below the casing depth.

B. Drilling of the upper and lower drill hole shall be by the dual wall reverse circulation method.

3.03 WELL DESIGN AND LOCATION

A. The exact location of the well will be staked by the Engineer in the field. Any discrepancy with the proposed location shall immediately be brought to the attention of the Engineer.

B. Well design shall be as shown on the contract drawings included as part of the Contract Documents, or as shown in the Appendices of this project manual.

C. The well design represents the proposed well design based on the best available information. The Contractor is responsible to contact the Engineer and WDNR with any additional information pertinent to the anticipated well profile based on conditions met in the field prior to completing any grouting operations.

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3.04 BOUNDARIES OF WORK

A. The Owner will provide land and/or rights-of-way to access the site for the work specified in this contract. The Contractor shall not enter on or occupy with personnel, tools, equipment or materials any ground outside the boundaries of the property of the Owner without written consent of the Owner of such ground.

B. Other Contractors and employees or agents of the Owner may, for all necessary purposes, enter upon the work and premises used by the Contractor, and the Contractor shall conduct his work so as not to impede unnecessarily any work being done by others on or adjacent to the site.

3.05 ACCESS TO WELL SITE

A. The well site is accessible from John Russell Road. The site is accessible via an existing parking lot south of the Menomonie City Park Maintenance building, continuing west onto the grassy area.

B. The existing asphalt road and asphalt parking lot to the east of the site shall be protected from damage from drilling equipment accessing the site.

C. The site is part of Wakanda Park and has Ball Diamond #7 on-site. No temporary access driveway or culvert is anticipated.

D. No clearing and grubbing is anticipated.

E. All costs for providing access to the well location shall be included in the lump sum bid for Access to Well, Complete.

3.06 PROTECTION OF SITE AND WELL

A. Except as otherwise provided herein, the Contractor shall protect all structures, walks, pipelines, trees, shrubbery, lawns, etc., during the progress of his work, and shall remove from the site all construction materials at completion of job. The Contractor shall be liable for damage to any underground structures, which are correctly shown on the Plans or are indicated to be protected.

B. Throughout the construction of the well, due precaution shall be taken by the Contractor to maintain the premises in a sanitary condition and to avoid the entrance of contaminated water into waterbearing formations.

C. During all operations of drilling, development and test pumping, the Contractor shall make every reasonable effort to limit the effects of drilling and test pumping, including sedimentation and erosion control to control the release of drilling foam, sediment, erosion products and cuttings into area drainage ways and maintain the site in its existing condition. Comply with the provision of Section 31 25 00 - Erosion and Sedimentation Controls regarding responsibility and methods to be implemented.

D. The location for discharge water produced during drilling, development, and test pumping shall be the existing storm inlet east of the site on John Russel Road. Temporary discharge piping shall be routed east to the existing storm sewer inlet on John Russell Rd., and water shall be discharged into this storm inlet. The Contractor shall set the necessary length of piping and erosion control measures to direct the discharge to the specified discharge location. Discharge of water to an area other than the specified storm inlet will not be acceptable.

E. <u>All</u> sediment in the water shall be retained on the well site. Water discharged during drilling shall be controlled in such a way that traffic is not jeopardized. The Contractor shall provide whatever means necessary to eliminate situations deemed hazardous by the Owner or Engineer.

F. All costs necessary to control water, drilling foam, sediments, and cuttings, during drilling, development, and test pumping shall be included in the related bid items.

3.07 LOG/RECORDS/REPORTS

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A. Log of Well. The Contractor shall keep a log of the well in a State Geological Drillers Book obtained from the Wisconsin Geologic and Natural History Survey (WG&NHS).

B. Record of Casing. The Contractor shall keep an accurate record, as assembled, of the size and lengths of the individual pieces of pipe installed in the well, including the manufacturer's markings on the pipe.

C. Daily Reports. The Contractor shall keep a continuous record of the nature of material encountered and make and keep available at the job site a daily report describing the work done during each day including the items of work accomplished, such as the depth drilled, the casing set, the water level in the well at the beginning of each shift, and such other pertinent data as requested by the Engineer.

D. Water Quality Testing Results. See Paragraph below.

E. Test Pumping. See Paragraph below.

F. Depth Measurements. See Paragraph below.

G. Plumbness and Alignment Data. See Paragraph below.

H. Well Construction Report. Contractor shall submit a Well Construction Report to WDNR, Owner, and Engineer.

3.08 NEAT CEMENT GROUT

A. Application of grout shall be in accordance with Wisconsin Administrative Code NR811. The grouting of the well shall be conducted in the presence of the Engineer and Wisconsin Department of Natural Resources representatives.

B. All grout shall be installed by pumping.

C. The Contractor shall have standby grout pumping equipment, including a spare grout pump, available on-site prior to commencing grouting operations.

D. Prior to grouting, the Contractor shall circulate a bentonite slurry, recirculating as necessary to seal formation crevices. Circulate and thicken the slurry until it reaches the ground surface.

E. All grout shall be placed from the bottom of the annular opening to the surface in one continuous operation.

F. When a conductor pipe is used, it shall be kept submerged in grout. Grout conductor, or tremie, pipes shall be metal pipe or a rubber covered, fiber or steel braided, reinforced hose with a minimum pressure rating of 300 psi.

G. The Contractor shall supply sufficient surplus grout so that as the annular space between the casing and the wall of the drill hole is filled, it will overflow. The application of grout must be continued until the density of the grout overflow is the same as that being injected into the annular space from the truck. The Engineer shall determine when the continued application of grout to the annular space will be stopped.

H. Alternate grouting methods shall be approved by the WDNR and Engineer prior to commencing.

I. No further work shall be performed on the well until the cement grout has been allowed to cure for a minimum of 72 hours.

J. Payment.
1. Grout setup shall be paid for at the lump sum price bid, which shall include all costs necessary for mobilization, and equipment set up including backup grouting equipment.
2. Grout materials required shall be paid for by the unit price bid for grout installed (per 94 pound bags of cement).

3.09 WELL DEVELOPMENT

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A. Prior to test pumping, the well shall be developed by the following methods:
   1. Air jetting and air lift pumping, as the drill stem is being removed. (4 hours estimated, and incidental to a related bid item)
   2. If more aggressive development is warranted, development of the well shall be by rawhiding using air injection. The Contractor shall install a sealed cap on the top of the casing, with a 2-inch ball valve on the cap. The casing shall be pressurized with air through to 30 psi, then quickly releasing pressure by opening the ball valve. Ten pressurizations shall be completed in succession. After waiting 10 minutes, the contractor shall tag the bottom of the well. At the end of this development effort, Contractor shall bail material at the bottom of the well.

B. Well development by rawhiding shall be paid for at the unit price per hour as provided in the Bid Schedule.

C. An alternative development method may be proposed, but must be submitted to the Engineer five days prior to well development

3.10 GEOLOGICAL SAMPLES

A. Geological Samples shall be taken at not more than 5 feet intervals and at all distinctive changes in the strata. The samples shall be placed in closed, labeled, one-pint jars or sacks of equivalent size. The Contractor shall submit a copy of the drilling log to the Engineer and Owner, and submit the drilling log along with the samples to the Wisconsin Geologic and Natural History Survey, Madison, Wisconsin.

3.11 SAMPLES AND TESTING

A. General. Water samples for chemical analysis shall be taken by pumping the well. All lab tests shall be performed by a State certified SDWA lab. The Contractor shall provide a smooth-end sampling tap for collecting water samples. Location and time of sampling shall be as directed by the Engineer. Analytical test results of well water samples collected during the test pumping shall be determined for the parameters listed below.

B. Contractor shall be prepared to expedite water quality analysis if necessary to meet the final completion deadline.

C. Water Samples and Laboratory Analysis, All Parameters. Analytical test results of well water samples collected during the test pumping shall be determined for the following parameters. Coordinate all testing with the Engineer. All tests shall be performed by a WDNR certified laboratory.
   1. BACTERIA (Total Coliform) (two samples required)
      Two “safe” samples with respect to total coliform bacteria required. Samples shall be taken a minimum of 8 hours apart during the test pumping , or on consecutive days.
   2. INORGANICS (two samples required)
      One sample shall be taken after 4 hours of continuous pumping, and a second sample taken at the end of the pumping test.
      Parameters listed on WDNR Inorganic Form 3300-219
   3. RADIOACTIVITY (one sample required)
      One sample shall be taken at the end of the pumping test.
      Parameters listed on WDNR Radioactivity Form 3300-220.
   4. VOLATILE ORGANIC CHEMICALS (one sample required)
      One sample shall be taken at the end of the pumping test.
      Full scan analysis for parameters included on WDNR VOC Form 3300-218.
   5. SYNTHETIC ORGANIC CHEMICALS (one sample required)
      One sample shall be taken at the end of the pumping test.
      Parameters listed on WDNR Synthetic Organic Form 3300-216.
   6. PER/POLY-FLUROALKYL (PFAS) COMPOUNDS (one sample required)
      One sample shall be taken at the end of the pumping test.
      Analysis shall utilize EPA Method 537.1 or EPA Method 533
      Parameters listed on WDNR PFAS Analysis Form 5744
   7. AMMONIA, PHOSPHORUS, AND TOTAL ORGANIC CARBON (one sample estimated)
      This sample to be collected in the final hour of the test pumping event.

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D. Additional Lab Tests for Nitrate, Iron, and Manganese

1. Additional During Test Pumping (one sample estimated)
   a. These samples are additional to the "Water Samples and Laboratory Analysis, All Parameters," and shall be paid as a separate bid item.
   b. Sample to be collected at 4-hour interval after the start of the test pump event.

E. Water samples shall be field tested for iron, hardness, pH, nitrate (NO_3), chloride and manganese using test kits by the Hach Company or approved equal. Complete reports of such tests and analysis shall be made to the Engineer in writing. Additional samples of water may be taken during test pumping by the Engineer. The Contractor shall provide a smooth-end sampling tap for collecting water samples.

F. All sampling and analytical methods shall be in conformance with the current requirements of NR 809. Prior to sampling, the Contractor shall submit information outlining the procedures to be followed, including name of lab, listing of sample bottles, and quality control/quality assurance procedures. All test results shall be submitted to the Engineer upon the determination of results. Contractor shall enter the laboratory results on the WDNR forms included in this Project Manual (see Section 01 31 3 - Available Project Information). Payment for the above sampling, transportation of samples to laboratory, and analysis work shall be made at the lump sum price bid for "Water Sampling and Laboratory Analysis".

3.12 TEST PUMPING

A. Pumping Test. A suitable arrangement of the discharge pipe and an orifice plate and alternate approved method of metering discharge shall be provided for accurate measurement of the pumping rate. The Contractor shall provide all equipment necessary to complete the pumping test. The pumping test shall be conducted as directed by the Engineer. Test pumping shall be continuous. If the test pumping is interrupted for any reason, the test shall be started over after the well has completely recovered. Contractor shall not be compensated for the additional time of pumping required due to any interruption caused by his equipment failure or any other reason.

B. Contractor shall provide Engineer with log of the pumping test including rate of pumpage, static and dynamic water levels, and other pertinent data taken at intervals as necessary to completely define the drawdown time curve for each test pumping rate. This data shall be recorded at intervals of not more than one minute for the first 15 minutes of test pumping, 5 minutes for the next 45 minutes of test pumping, 30 minutes for the next 4 hours of the test pumping, and every hour thereafter that the Contractor is on-site for test pumping, as directed by the Engineer.

C. The proposed test pumping discharge route is shown in the contract drawings. Contractor shall provide discharge piping extending from the well site to the discharge location. Contractor shall also be responsible for preventing all erosion which results from test pump discharge, or refinishing ground to match existing conditions.

D. Test pumping shall be paid for at the per hour price bid for "Test Pumping."

E. The final well shall be pumped at a target rate of 900 gpm for up to 48 hours (or as directed by the Engineer).

1. Note: The Contractor's bid shall be based on the specified target rate and duration stated above. This target rate and duration exceeds NR 811 minimum pumping test requirements for a period of not less than 12 consecutive hours with a minimum of 4 hours at the target pumping rate.

F. Extended Pump Test. If extended test pumping of the wells is required, the Contractor shall provide all power supply and equipment necessary, and be paid according to the supplemental unit bid item. Extended pumping shall be assumed to be "unmanned"; however, Contractor shall provide all labor necessary to ensure continuous operation of the equipment and power supply.

G. Monitoring. During the test pumping phase, the neighboring test well shall be monitored by the Contractor to obtain additional recharge area information. Water levels prior to, during, and after test pumping shall be

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collected at the same general intervals as those listed for the new well using a level transducer and data logger.

1. 6-inch test well located at the site.

3.13 DEPTH MEASUREMENTS

A. Accurate depth of drawdown and static levels of groundwater shall be determined by the Contractor using a transducer and data logger (set to collect a data pint every 1 minute), and the air-line method as secondary verification during every manned hour of the test pumping event. Measurements shall be determined to the nearest one inch.

B. Data loggers at the well and monitoring sites shall be installed 24 hours before test pumping begins and remain installed until 24 hours after the test pumping ends.

C. All costs associated with furnishing and installing transducer and datalogger, and monitoring the water level in the well being pumped, shall be included in the unit price bid for test pumping.

3.14 PLUMBNESS AND ALIGNMENT

A. The procedure for testing plumbness and alignment shall be in accordance with the ANSI 21.00 (AWWA A100). The well shall allow free passage of a 40-foot section of pipe or a dummy to the bottom of the well. The outside diameter of the pipe or dummy used shall 1/2 inch smaller than the diameter being tested.

B. The well shall be of such plumbness and alignment that an 8-inch pump with 6 bowl sections and 8-inch column pipe installed at the final pump setting, plus 25 percent for pump length, shall hang plumb without any part of the pump or column contacting the side of the well. Variance from the vertical as described above will be sufficient reason for rejection of the entire well construction. The portion of the well above the anticipated final pump setting plus 25 percent shall meet the plumbness requirements of ANSI/AWWA A100/A21.00 (i.e., variance of the vertical shall not exceed 2/3 the smallest inside diameter of that part of the well being tested per 100 feet of depth, or the plummet fails to move freely in the well). Variance from the vertical as described above for the portion of the hole above the final pump setting plus 25 percent shall be corrected by the Contractor at his own expense.

C. The plummet used for the plumbness test shall have an outside diameter 1/2 inch smaller than the diameter of the section of the well being tested. The plummet shall be of sufficient weight to maintain a tight plumb line. The plumb line shall be the minimum size possible to positively retrieve the plummet and shall be free of kinks, bends, etc., which would affect the test results.

D. The Contractor shall check alignment at each of the following:

1. After temporary installation of primary casing.
2. After grouting of primary casing.

3.15 TELEVISION REPORT

A. Upon completion of the well construction, development and test pumping, and after the plumbness and alignment test results have been approved by the Engineer, the well shall be televised throughout its entire depth. The Contractor shall supply the Engineer a report of the televising which shall consist of a written log and three color DVD recordings of the well. The DVD recording shall contain the well images (both down-hole and sidewall views) and an inset indicating well depth.

B. Upon completion of the televising, the well shall be disinfected as specified herein.

3.16 DISINFECTION

A. The well shall be disinfected each time the test pump is installed and after all test pumping has been completed. The well shall be disinfected with a chlorine solution. The chlorine solution used for disinfecting the well shall be of such volume and strength and shall be so applied that a concentration of at least 100 ppm of chlorine shall be obtained in all parts of the well. This solution shall remain in the well for a period of

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at least 24 hours. Each time the test pump is installed, all exterior parts of the test pump shall be disinfected with a chlorine compound.

B. Either of the following methods may be used, at the Contractor's option, to disinfect the well:

1. Method "A": Where practical, the chlorine solution of standard concentration used to disinfect the well should be prepared on the surface in containers having a volume equal to at least twice the volume of water contained in the well. This prepared solution should then be rapidly discharged into the well, care being taken to flush the walls of the well above the water level.
2. Method "B": In lieu of the preparation of the solution of standard concentration in containers, a stock chlorine solution of 1,500 ppm shall be added to a continuous flow of water into the well to provide the standard chlorine concentration.
3. Two bacteriological samples shall be collected by the Contractor during the test pumping period as described previously. If the bacteriological samples are not safe, the Contractor shall repeat the disinfection procedure, at no additional compensation, until safe samples are obtained.

3.17 WATER SUPPLY DECHLORINATION

A. Chlorinated water discharged directly or indirectly to surface waters as a result of flushing newly installed water mains, discharging water tanks or reservoirs, hydrant flushing, test pumping wells, or any other circumstance shall be dechlorinated in accordance with "Hydrostatic Test Water or Water Supply System Water General Permit, WPDES Permit No. WI-0057681-04". The free chlorine residual of discharged water shall be reduced to 0.1 parts per million or less, or to the normal operating concentration of the chlorine residual maintained in the water supply system.

B. The concentration of free chlorine residual shall be measured at the point of surface water entrance.

3.18 TEMPORARY CAPPING

A. At all times during the progress of the work, the Contractor shall use all reasonable precautions to prevent either tampering with the well or the entrance of foreign matter into it and, upon its completion, he shall provide a substantial welded cap.

3.19 COMPLETION

A. The completed test well shall be disinfected and cleaned, and free of all cuttings and foreign materials. The casing shall be cut off as directed by the Engineer and fitted with a welded cap.

B. Upon completion of all work, the well drilling Contractor shall extend the well casing as directed by the Engineer. The cost for extending the casing shall be included in the linear foot price bid for well casing.

C. Upon completion of the well casing extension, the well drilling Contractor shall fill any voids in the annular space around the well casing up to a point one foot above the ground surface with neat cement grout.

3.20 LOST TOOLS

A. When tools are lost, the Contractor will be given a reasonable period of time not to exceed 10 days to recover lost tools. If not recovered within that time, the Contractor shall drill a new well at a location selected by the Engineer and abandon the original drill hole as per Wisconsin Department of Natural Resources requirements. There shall be no cost to the Owner for construction or abandonment of the abandoned well.

3.21 ABANDONMENT OF WELL

A. In the event that the Contractor shall fail to complete the well according to contract or should he abandon the well because of loss of tools or for any other cause, the contractor shall, at their own expense and as directed by the Engineer and in accordance with Wisconsin Department of Natural Resources requirements, fill the abandoned hole and, if possible, remove the casing.

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B. Salvaged materials furnished by the Contractor shall remain the Contractor's property for re-use in completing the contract, providing the material is useable.

C. In the event that the Engineer decides that the well is no longer usable after test pumping and desires the well to be abandoned, the Engineer or WDNR may require the Contractor to abandon the well at the cost included as a supplementary bid item. The well shall, as above, be abandoned in accordance with the Wisconsin Department of Natural Resources requirements.

D. A DNR Well Abandonment Report shall be filed by the driller with copies sent to the DNR, Owner, and Engineer.

3.22 ABANDONMENT OF TEST WELL

A. Upon completion of the new well construction, test pumping, and receipt of water chemistry results, the Contractor shall abandon the existing test well according to the WDNR approval and per NR811 requirements.
   1. The casing shall be cut off to a point three (3) feet below existing ground surface.
   2. The test well consists of a 6-inch casing from surface to a depth of 132 feet, and a 6-inch open borehole from 132 feet to 385 feet. Contractor shall abandon the existing test well from 385 feet to the surface.
   3. All costs of abandonment of the test well shall be included in the unit price bid for Test Well Abandonment, Complete.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Rock-walled well construction shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Conditions - Division 1.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Condition - Division 1.

4.02 ROCK-WALLED WELL CONSTRUCTION

A. Rock-Walled Well Construction, Unit Prices. When so provided, payment for rock-walled well construction including the drill hole, casing, grouting and well development/test pumping shall be made at the contract unit price bid or as indicated in Special Conditions - Division 1.

B. Grouting
   1. Grout setup shall be paid for at the lump sum price bid, which shall include all costs necessary for mobilization, and equipment set up including backup grouting equipment.
   2. Grout materials required shall be paid for by the unit price bid for grout installed (per 94 pounds bags of cement).

END OF SECTION

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SECTION 33 31 13
PUBLIC SANITARY UTILITY SEWERAGE PIPE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing all pipe and fittings for the sanitary sewer as shown on the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Removal, Salvage and Abandonment – Division 02

C. Trenching and Backfilling - Division 31

D. Erosion and Sedimentation Controls - Division 31

E. Sanitary Sewer Televising - Division 33

F. Sanitary Sewer Manholes - Division 33

G. Tracer Wire – Division 33

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

B. Contractor shall submit such submittals and details required for the construction and installation of the materials. Submittals and details shall indicate the intended materials arrangement, dimensions, major support requirements, plot area and intricate or detailed construction requirements.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 PIPE

A. PVC Pipe. Four inch to 15-inch diameter pipe shall be Type PSM SDR-35 or Type PSM SDR-26 and meet the requirements of ASTM D3034. Pipe over 15-inch diameter shall meet the requirements of ASTM F679, PS 46 or PS 115. Pipe shall be of the bell and spigot type.

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B. Ductile Iron Pipe. Pipe shall conform to the requirements of ANSI A21.51 (AWWA C151) for bituminous coated, Class 52 ductile iron pipe unless specified otherwise. Standard cement mortar lining shall meet the requirements of ANSI A21.4 (AWWA C104).

2.02 PIPE JOINTS

A. General. Manufacturer's instructions for making joints shall be followed. The use of joints as specified herein shall not relieve the Contractor of the responsibility of meeting testing specifications.

B. PVC Pipe. Pipe joints shall be elastomeric seals (rubber gaskets) conforming to ASTM F477 and joint assembly conforming to ASTM D3212.

C. Ductile Iron Pipe. Pipe joints and fittings shall be push-on type or mechanical joint type conforming to ANSI A21.11 (AWWA C111).

2.03 SEWER LATERALS

A. PVC Pipe. Four inch to 15-inch diameter laterals shall be Type PSM SDR-35 or Type PSF SDR-26 and meet the requirements of ASTM D3034. Pipe joints shall be elastomeric seals (rubber gaskets) conforming to ASTM F477 and joint assembly conforming to ASTM D3212.

B. Ductile Iron Pipe. Pipe shall conform to the requirements of ANSI A21.51 (AWWA C151) for bituminous coated, Class 52 ductile iron pipe unless specified otherwise. Standard cement mortar lining shall meet the requirements of ANSI A21.4 (AWWA C104). Pipe joints and fittings shall be push-on type or mechanical joint type conforming to ANSI A21.11 (AWWA C111).

C. Coupling. Connection to existing laterals shall be made with a stainless steel reinforced rubber connection, Fernco Strongback coupling or equal in accordance with State and/or local plumbing code requirements. Where pipes of differing diameters are connected, eccentric couplings are required.

D. Saddle wyes shall be used when connecting a lateral to an existing sanitary sewer main. Saddle wye shall be one of the following or Engineer approved equal.
   1. Geneco SEALTITE® Type "8C" multi-range sewer saddle.
   2. ROMAC CB Sewer Saddle.

PART 3 EXECUTION

3.01 LINES AND GRADES

A. All lines and grades will be given on the contract drawings, as directed by the Engineer or as indicated in Special Procedures - Division 01 of these specifications. The Contractor shall be responsible for the preservation of line and grade stakes when set. The Contractor shall keep the Engineer informed reasonably in advance of the times and places that stakes will be required in order that the work may be done without inconvenience to the Engineer or delay to the Contractor.

B. The Contractor shall at his own expense, furnish and place in position, as directed by the Engineer, all necessary equipment and material for locating the work from the line and grade stakes provided by the Engineer. It shall be the Contractor's responsibility to check grade stakes in advance of the excavation reporting any discrepancies to the Engineer.

C. Sanitary sewer pipe shall be laid at a constant grade and alignment between manholes with no sags or bends in the pipe. Contractor assumes responsibility for the vertical and horizontal alignment of the installed pipe (i.e. sags and bends) and shall correct these deficiencies as his expense.

3.02 EXCAVATION

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A. Excavation shall conform to both Trenching and Backfilling and Structural Excavation for Structures - Division 31 except as modified herein.

3.03 UNSTABLE SOIL

A. If in the opinion of the Engineer the trench bottom is of unstable material, the Engineer may direct the Contractor to excavate the unstable material and replace same with 3/4 inch washed stone. Washed stone used in such cases shall be considered incidental and included in the price bid for sanitary sewer unless bid or specified otherwise.

B. Where the condition is unusually severe, the Engineer may order the placement of a concrete cradle, which shall be paid for at the unit price bid.

3.04 EMBEDMENT

A. Embedment for the sewer pipe shall depend upon whether the pipe is rigid, semi-rigid or flexible.

B. Rigid pipe, including clay, concrete, and ductile iron pipes, shall be embedded in accordance with ASTM C12, Class B embedment, unless specified otherwise in the Special Procedures or as shown on the Contract Drawings. The Class B embedment material shall be placed in maximum lifts of 6 inches and extend a minimum of 12 inches above the top of the pipe.

C. Flexible and semi-rigid pipe, including PVC, shall be embedded in accordance with ASTM D2321, Class II embedment, unless specified otherwise in the Special Procedures or as shown on the Contract Drawings. The Class II embedment material shall be placed in maximum lifts of 6 inches and extend a minimum of 12 inches above the top of the pipe.

3.05 INSTALLATION

A. The Contractor shall have sufficient and adequate equipment on the site of the work for unloading and lowering pipe into the trench. Extreme care shall be exercised by the Contractor in handling all pipe so as to prevent breakage. Under no circumstances shall they be dropped into the trench or so handled as to receive hard blows or jolts when being moved.

B. Plastic pipe shall be installed in accordance with ASTM D2321.

C. Before lowering and while suspended, the pipe or fittings shall be inspected for defects. All materials used in the work must pass field inspection.

D. Unless otherwise ordered, pipe shall be laid with the bell ends facing upgrade.

E. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the line.

F. Joints shall be lubricated, cemented, or otherwise made in strict conformance with these specifications and manufacturer's instructions.

G. Sewers to be stubbed out from new manholes shall end with a pipe bell end and have the end plugged to prevent the entrance of soil and water. The cost of plugs shall be included in the unit price bid of the sanitary sewer.

3.06 CONNECTION TO EXISTING

A. The Contractor shall verify the location, size, depth and material of the existing sanitary sewer or lateral and shall provide all necessary materials and labor to make a watertight connection. The contractor shall report any discrepancies between contract drawings and field conditions to the Engineer.

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3.07 LATERALS OR CONNECTIONS

A. Wyes or tee branches for lateral service connections shall be placed to service each building site as directed by the Engineer. All wyes, tees or the end of lateral service lines shall be closed with a stopper until all testing has been completed. Plugs/caps shall be tested against with the maximum air pressure to be used in testing. All deep connections shall be fitted with riser pipes when ordered by the Engineer. Risers shall not exceed a 1:1 slope and shall be paid for per foot of pipe length as sanitary lateral.

1. All laterals shall be installed up to the right-of-way line and be embedded in materials in accordance with ASTM C12 or ASTM D2321 for rigid, semi-rigid or flexible pipe as specified.
2. Minimum grade of lateral shall be 1/8 inch per foot. Maximum grade of lateral shall be 1/2 inch per foot.
3. All unconnected sanitary laterals shall be capped and have the ends marked by a metal fence post buried vertically, flush with the ground directly over the end of the lateral. The cost of the fence post and cap shall be included in the unit price bid for sanitary lateral.
4. All sanitary laterals must be insulated if the depth of cover is 6-feet or less when rock is present. If the depth of hard rock is 5-feet or less, the rock shall be removed to at least 6-feet of cover and the service insulated.

B. Where new sewer is to be installed to replace existing sanitary sewer, service laterals shall be extended from the old sanitary lateral and connected to the new main. Minimum grade of lateral extensions shall be 1/8 inch per foot. Maximum grade of lateral extensions shall be 1/2 inch per foot. Lateral extensions which require a grade in excess of 1/2 inch per foot to connect new sewers to existing service laterals shall be installed with a riser section.

C. Approximate locations of existing laterals are shown on the contract drawings. The Contractor shall verify the size and location of all existing laterals. The Contractor shall coordinate, with the Engineer, verification that existing laterals that are encountered are live and that all live laterals are connected to the new sewer main.

1. Where existing lateral size does not match the size of the new sewer lateral size the Contractor shall inform the Engineer prior to connection. In no case shall the Contractor connect a larger existing lateral to a smaller proposed downstream lateral.

D. A complete and accurate tabulation of the length, location, depth, etc., of each lateral installed shall be kept by the Contractor. This record shall be the property of the Owner.

3.08 WATER/SEWER LINE CROSSING

A. Wherever the sewer crosses above water main with less than a clear vertical separation of 18 inches (outside of pipe to outside of pipe) or below the water main with less than a clear vertical separation of 6 inches (outside of pipe to outside of pipe), the sewer shall be constructed equal to water main pipe. One full pipe length shall be centered on the water main crossing and shall be pressure tested.

B. The type of pipe material and/or joints shall not change between manholes.

3.09 STRUCTURE SEALS

A. Plastic pipe shall be provided with approved water stops where encased in the walls of manholes.

3.10 PIPES TO BE CLEANED

A. The interior of all pipes shall be carefully freed from all dirt, concrete and superfluous material of every description as the work progresses. If, in the opinion of the Engineer, the pipe contains an excess of material, the pipe shall be cleaned by the Contractor at no additional expense to the Owner.

3.11 TESTING

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A. General. The following tests shall be performed by the Contractor in the presence of the Engineer. The Contractor shall be responsible for providing all labor, materials and equipment for the testing.

B. Infiltration Test. The sanitary sewer and all connections and laterals shall be measured for infiltration at points designated by the Engineer. The tests for infiltration shall be conducted in a manner as approved by and under the direction of the Engineer. Infiltration shall be measured using either the water test or the low pressure air test. The sewer and connections shall have a rate of infiltration less than 200 gallons per inch of pipe diameter per mile per day.

1. Water Test. The test shall be performed using a minimum positive head of 2 feet of water. Maximum allowable exfiltration shall be 200 gallons per inch of pipe diameter per mile per day.
2. Low Pressure Air Test. Sewer lines shall be air tested in accordance with ASTM F1417, entitled "Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air". The air test shall be made in the presence of the Engineer. All equipment necessary for said air test shall be provided by the Contractor and approved by the Engineer.

C. Televising. All new sanitary sewer main and connections shall be televised in accordance with Section 33 01 30.16 for alignment and other deficiencies. Televising and repair if needed shall be done prior to placement of subbase materials. When sewer line flows are above the minimum requirements (generally not more than 1/4 of the pipe diameter) or inspection of the complete periphery of the pipe is necessary to effectively conduct the inspection and sealing operations, one or more of the following methods of flow control shall be used at no extra cost to the Owner:

1. Plugging or Blocking: A sewer line plug shall be inserted into the line at a manhole upstream from the section to be inspected, tested and/or sealed. The plug shall be so designed that all or any portion of the sewage flows can be released. During the inspection portion of the operation, flows shall be shut off or substantially reduced in order to properly inspect the pipe at the invert. After the inspection is complete, flows shall be restored to normal or not more than 1/3 of the pipe diameter during the joint testing and joint sealing operation.
2. Pumping and Bypassing: Where pumping is required, in the opinion of the Engineer, to assure completion of the inspection and sealing work, the Contractor will be required to furnish pumping equipment, conduits, etc. All costs for flow control, temporary pumping, etc., shall be inclusive to testing and shall be included in the unit price bid for the related sanitary sewer item. No bypassed wastewaters will be allowed to be discharged to surface drainage facilities.
3. Liability: Contractor shall be liable for damages to private or public property which may result from sewer flow control operations.

D. Deflection Test. All polyvinyl chloride pipe installations shall be tested for deflection by using a rigid ball or mandrel and shall be performed in accordance with ASTM D2321 and without the use of mechanical pulling devices. Deflection may not exceed 5 percent if tested within 30 days of placement of final backfill or 7.5 percent if tested more than 30 days after final backfill is placed. Final backfill must be in place prior to testing.

E. Acceptance. If any of the tests are not met, the Contractor shall, at his own expense, determine the source of the problem and repair or replace all defective work.

3.12 ABANDONMENT AND REMOVALS

A. Abandonment and/or removal of existing sewers shall be completed in accordance with Section 02 42 00 "Removal, Salvage and Abandonment" in Division 02.

3.13 MAINTAINING SANITARY SEWER SERVICE

A. The Contractor shall provide adequate equipment and facilities to provide bypass pumping for all elements of work requiring interruption to flow in the sanitary sewer. Provide backup or standby capabilities satisfactory to the Owner. The Contractor shall be responsible for damages to private or public property due to sewer backup while controlling sewage flow.

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B. Under no circumstances will bypassing of untreated wastewater to any storm drainage facility or surface water course be allowed.

C. The Contractor shall notify the Owner seven (7) days in advance of sewer sections which will not be useable in order to allow time for the Owner to notify residents. Interruptions shall then be verified at least 24 hours in advance.
   1. Interruptions of service shall be limited to eight (8) hours.
   2. All existing sanitary laterals shall be permanently reconnected within two days after initial disconnection of the main line sewer bypass. These existing sanitary laterals shall be temporarily reconnected if the permanent reconnection cannot be accomplished immediately after disconnection.

D. All costs for flow control, temporary pumping, etc., shall be inclusive to the unit price bid for sanitary sewer.

3.14 REPAIR OF DEFECTIVE PIPE FOR SANITARY SEWER REHABILITATION PROJECTS

A. General. The work includes furnishing all materials, equipment and labor to excavate and repair leaking joints, shears, cracked pipe, etc., for the purpose of eliminating existing or previously observed infiltration of groundwater. All sewer defects shall be repaired watertight and to the satisfaction of the Engineer. All applicable sections of these specification shall apply except as specified below. The Contractor shall locate or make arrangements for locating all structures and underground utilities prior to beginning any excavations. Where existing wyes, tees, risers or service connections are encountered in sewer to be replaced, they shall be replaced with new fittings and piping within the limits of the excavation at no change in the contract price. Where piping is to be removed, excavations shall extend to a depth below the bottom of the pipe, suitable for placement of new bedding.

B. Pipe Repair. All defective pipe shall be removed. Where the length of defective pipe is noted in the contract drawings, the Contractor shall remove the length of pipe shown along with any other pipe observed to be defective after excavation. The Contractor shall generally remove the entire length of pipe in which the defect occurred. Where joints are to be repaired, a minimum of one-half of the upstream pipe and one-half of the downstream pipe shall be removed. Where pipe shears are located near joints and where shear displacement has occurred, both upstream and downstream sections of sewer shall be replaced.

C. Existing pipe 16 inches in diameter and less shall generally be repaired by cutting and removing existing pipe between joints. All cuts shall be made perpendicular to the direction in which the pipe is laid. New sanitary sewer shall be connected to existing sanitary sewer with stainless steel reinforced rubber connection, Fernco Strongback or equal. Adjustable stainless steel shear rings shall be provided wherever available. New piping shall be air tested prior to placement of backfill.

D. Existing pipe larger than 16 inches in diameter shall generally be repaired by removing existing piping at existing joints. Sections of piping shall be removed by cutting off the existing upstream spigot end. The upstream bell end of the pipe shall be removed and the downstream bell end shall remain. Any jointing material shall be removed from the downstream bell. A new plain end piece of pipe shall then be inserted in the existing bell and the pipe joint sealed with Daubert 301, Mastik or equal as per manufacturer's recommendations. The new upstream plain end piece of pipe shall be jointed to existing piping with an external pipe joint wrapping equal to MacWrap as manufactured by the MarMac Manufacturing Company, Inc.; Cadilloc as manufactured by Cadilloc, Inc.; or equal. Whenever any portion of existing concrete cradle or concrete backfill must be removed, piping shall be replaced to the inside of the manhole wall.

E. Existing pipe that is laid in concrete cradle shall be repaired by cutting and removing existing pipe between joints. Concrete cradle below the repaired pipe shall be removed. The new pipe shall be butted against the existing pipe and repaired as indicated on the detail drawings.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

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A. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01. Contractor shall furnish and install all bedding, fittings, caps, couplings, and appurtenances required to complete the project. All costs for said items shall be included in the respective sanitary sewer bid items.

B. Public sanitary utility sewerage pipe shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 PUBLIC SANITARY UTILITY SEWERAGE PIPE

A. Sanitary Sewer, (Material), (Diameter), Lineal Foot. Measurement for Public Sanitary Utility Sewerage Pipe shall be per lineal foot of a specific diameter sewer installed. Payment shall be made at the contract unit price bid per lineal foot of the respective diameter.

B. Sanitary Sewer, Inclusive. When no quantity is provided, sanitary sewer shall be considered inclusive to payment for other work associated with this contract.

C. Sanitary Lateral, (Material), (Diameter), Lineal Foot. Measurement for laterals shall be per lineal foot of a specific size lateral installed. Payment shall be made at the contract unit price bid per lineal foot of each size lateral installed.

D. Sanitary Lateral, Inclusive. When no quantity is provided, sanitary lateral shall be considered inclusive to payment for other work associated with this contract.

E. Insulation, Square Foot. Measurement for insulation shall be per square foot of insulation installed. Payment shall be made at the contract unit price bid per square foot of insulation installed.

F. Insulation, Inclusive. When no quantity is provided, insulation shall be considered inclusive to payment for other work associated with this contract.

G. Connect to Existing Sanitary Sewer, Each. Measurement for sanitary sewer connections shall be per each connection made to an existing sanitary manhole or sanitary sewer main. All costs for the connecting to existing sanitary sewer mains/manholes, including but not limited to fittings, appurtenances, materials, equipment and labor required, shall be included in the unit price bid for “Connect to Existing Sanitary Sewer.” No separate payment shall be made for connections to existing laterals.

H. Connect to Existing Sanitary Sewer, Inclusive. When no quantity is provided, connect to existing shall be considered inclusive to payment for other work associated with this contract.

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SECTION 33 39 13
SANITARY SEWER MANHOLES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.

1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
   a. ACI 318 – Building Code Requirements for Structural Concrete.
   b. ASTM A48 - Specification for Gray Iron Castings, Current Edition.
   c. ASTM A240 - Specification for Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet and Strip for Pressure Vessels and General Applications, Current Edition.
   d. ASTM A615 - Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement, Current Edition.
   e. ASTM A668 - Specification for Steel Forgings, Carbon and Alloy, and for General Industrial Use, Current Edition.
   f. ASTM C76 - Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe, Current Edition.
   g. ASTM C478 - Specification for Precast Reinforced Concrete Manhole Sections, Current Edition.
   h. ASTM C497 – Standard Test Methods for Concrete Pipe, Manhole Sections, or Tile.
   i. ASTM C890 – Standard Practice for Minimum Structural Design Loading for Monolithic or Sectional Precast Concrete Water and Wastewater Structures.
   j. ASTM C913 - Specification for Precast Concrete Water and Wastewater Structures, Current Edition.
   k. ASTM C923 - Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals, Current Edition.
   l. ASTM D4101 - Specification for Polypropylene Injection and Extrusion Materials, Current Edition.
   m. ASTM F593 - Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs, Current Edition.
   n. ASTM F783 - Specification for Staple, Handgrab, Handle, and Stirrup Rung, Current Edition.
2. Code of Federal Regulations (CFR), Title 29, Chapter XVII - Occupational Safety and Health Administration (OSHA), Department of Labor, Part 1926 Regulations, Current Edition.
3. Federal Specifications (FS), Specifications and Standards, Current Edition.
4. Department of Safety and Professional Services (DSPS), Administrative Code of Rules and Regulations, Current Edition.
5. State Department of Natural Resources (DNR), Administrative Code of Rules and Regulations, Current Edition.
6. State Standard Specifications (SSS), for Sewer and Water Construction, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing standard manholes constructed of precast concrete sections, circular in horizontal section set on a concrete base and fitted with standard manhole covers, frames, waterproofing, and steps in accordance with the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

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B. Submittals - Division 01

C. Removal, Salvage and Abandonment – Division 02

D. Trenching and Backfilling - Division 31

E. Erosion and Sedimentation Controls - Division 31

F. Public Sanitary Utility Sewerage Pipe - Division 33

G. Sanitary Utility Sewerage Force Main - Division 33

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied. Information shall be in conformance with requirements of Submittals - Division 01 of this specification.

B. Contractor shall submit shop drawings and details required for the construction and installation of the materials. Submittals and details shall indicate the intended materials arrangement, dimensions, major support requirements, plot area and intricate or detailed construction requirements.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. The products listed are intended to establish a basis for comparison of products of other manufacturers. Substitutions will be permitted but only with the prior written approval of the Engineer. Catalogue reference numbers stated are those of Neenah Foundry Company and are intended to establish a basis for comparing the products of other manufacturers.

2.02 PRECAST MANHOLE SECTIONS

A. Precast concrete manhole sections shall have a minimum inside diameter of 48-inches. Clear opening shall match dimensions of castings. The cone section shall be the eccentric type with a minimum clear opening of 24 inches. Compressive strength of the concrete shall be 4000 psi and shall conform to ASTM C478 for round structures and ASTM C913 for square or rectangular structures. Wall thicknesses of round manholes will vary with diameter in conformance with ASTM C76, Class B concrete tongue and groove joint pipe. Larger diameter manholes (7 feet +) shall have wall thickness a minimum of one-twelfth the inside diameter of the manhole as specified in ASTM C478.

B. Steel reinforcement (sq. in./lin. ft.) shall not be less than 0.0025 times the inside diameter of the manhole in inches.

C. Flat top slabs and reduction flat top slabs shall be designed in accordance with ACI 318 and designed to withstand the anticipated loads from riser sections, soil and hydrostatic loads, surcharge loads, live loads, and impact loads. Required site specific slab thickness shall be determined by the aforementioned calculations with the following minimum requirements:
   1. Minimum slab thickness for structures shall be 8 inches or as necessary as required by design calculations

D. All other design elements for structures shall comply with ASTM C478 and C497 for round structures, and ASTM C913 and ASTM C890 for square or rectangular structures.

E. The Contractor shall verify size, invert elevation, and location of all pipes in existing manholes and inform Engineer of any discrepancies before the replacement manhole is constructed.

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2.03 STEPS

A. Steps shall be constructed of a 1/2 inch diameter, Grade 60 reinforcing steel bar conforming with ASTM A615 completely encased in polypropylene conforming with ASTM D4101 to obtain a minimum thickness of 1-1/8 inch and minimum width of 12 inches. They shall be securely and permanently set in the manhole wall. Steps shall be set at 16 inches on center and have a 5-3/4 inch projection from the wall. Steps shall conform with ASTM C478.

2.04 FRAMES, COVERS AND GRATINGS

A. Frames, covers and gratings shall be of the type and duty as shown in the Contract Documents. Iron castings shall conform to ASTM A48, Class 20. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blow holes, and other defects affecting their strength.

B. The standard castings for sanitary sewer manholes shall be, R-1642, Type B with concealed pick holes, self-sealing gasketed non-rocking lids as listed below except as designated otherwise on the contract drawings or in Special Procedures - Division 01.

C. Where bolted lids are specified on the contract drawings or in Special Procedures - Division 01, they shall be Neenah R-1916-F, watertight manhole frames with bolted lids.

D. Where low profile castings are specified on the contract drawings or in Special Procedures - Division 01, they shall be Neenah R-1689 (4-inch casting) with Type B self-sealing gasketed, non-rocking lid.

2.05 SANITARY SEWER MANHOLE JOINT MATERIALS

A. Sanitary sewer manhole joint materials shall be plastic gasket material or butyl rubber gasket material. Plastic gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips conforming to Federal Spec SS-S-00210, Type I, Rope Form; Ram-Nek by K.T. Snyder Company, Inc.; Kent Seal No. 2 or equal. Butyl rubber gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips, conforming to Federal Spec SS-S-210A, Rope Form; by Press Seal Gasket Corporation or equal.

B. Joint Wrap - Each manhole joint shall be sealed with an external rubber sleeve (9-inch min. width) Infi-Shield Gator Wrap as manufactured by Sealing Systems Inc. or approved equal. The seal shall be made of a stretchable, self-shrinking, intra-curing halogenated based rubber with a minimum thickness of 30 mils. The back side of each unit shall be coatec with a cross linked re-enforded butyl adhesive. The butyl adhesive shall be non-hardening sealant with a minimum thickness of 30 mils. The seal shall be designed to stretch around the joint and then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive.

2.06 WATERSTOP SEALS

A. All pipes connecting to a sanitary manhole shall include an approved watertight rubber boot connection meeting ASTM C-923, and secured to the pipe with a stainless steel band. Waterstop seals shall be PSX: Direct Drive by Press Seal Corporation, Kor-N-Seal I 106 or 406 Series (pipe O.D. less than 15”), Kor-N-Seal II 206 Series (pipe O.D. 15” and greater), QUIK-LOK or Z-LOK connectors by A-LOK Products, Inc. or equal.

2.07 ADJUSTMENT RINGS

A. Polypropylene Adjustment Rings
   1. Adjustment rings shall be manufactured from Expanded Polypropylene (EPP), compliant with ASTM D4819 and tested according to ASTM D3575.
   2. Rings shall be available in heights (thicknesses) which will allow final adjustment of the frame and cover or grate to within ¼” (one quarter inch) to ½” (one half inch) of the specified final elevation.

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3. "Finish" Rings shall be provided with grooves on the lower surface and flat upper surface. "Finish" rings may also have a keyway on the upper surface of the inner diameter to facilitate installation of an "Angle" ring, where "Angle" ring is required.
4. "Angle" rings may either have an upper and lower keyway (tongue and groove) for vertical alignment and/or an adhesive trench on the underside.
5. Any adhesive or sealant used for watertight installation of the manhole grade adjustment rings shall meet manufacturers specifications and the requirements of ASTM C-920, Type S, Grade NS, Class 25, Uses NT, T, M, G, A and O Federal Specification TT-S-00230-C Type II, Class A .
6. Adhesive sealant shall be used between the precast concrete and adjustment rings as well as between the adjustment rings and manhole casting. Adhesive sealant shall bond to concrete

2.08 SANITARY SEWER MANHOLE CHIMNEY SEALS

A. Sanitary sewer manhole chimney seal shall be internal or external type, rubber sleeve, unless indicated otherwise in the Special Procedures - Division 01 or the Contract Documents. The sleeve and extension shall have a minimum thickness of 3/16 inches and shall be extruded or molded from a high grade rubber compound conforming to the applicable requirements of ASTM C923, with a minimum 1,500 psi tensile strength, maximum 18 percent compression set and hardness (durometer) of 48±5. The sleeve shall be doubled pleated with a minimum unexpanded vertical height of 8 inches and be capable of vertical expansion of not less than 2 inches when installed.

B. The bands used for compressing the sleeve and extension against the manhole shall be fabricated from 16 gauge stainless steel conforming to ASTM A240 Type 304. All screws, bolts or nuts used on this band shall be stainless steel conforming to ASTM F593 and 594, Type 304.

C. Sanitary sewer manhole chimney seal shall provide a watertight seal from 2 inches above the bottom of the casting to 2 inches below the top of the manhole cone section or flat top.

PART 3 EXECUTION

3.01 MANHOLES, GENERAL

A. All lift holes on sanitary sewer manholes shall be sealed watertight.

B. Manholes shall be installed so that the elevation at the top of the structure allows for a minimum of 4-inches and a maximum of 12-inches of adjustment rings.

3.02 INVERTS AND BENCHES

A. Invert channels shall be smooth and accurately shaped and in accordance with the contract drawings.

B. No horizontal surfaces shall be left on the inside of the manhole. The bench shall be shaped to drain into the floor channel.

3.03 ADJUSTMENT RINGS, FRAMES AND COVERS

A. Adjustment Rings shall be installed so that the frame and cover, when placed, will be at the required grade. A minimum of 4-inches and a maximum of 12-inches of adjustment shall be allowed.

B. Prepare surface and install adjustment rings in accordance with manufacturer's recommendations.

1. For polypropylene rings, mortar shall not be used under the frame.

3.04 JOINT WRAP

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A. Expose the area to be sealed and clean the entire area around the joint with a wire brush and whisk broom. Remove any sharp protruding edges around the joint with an abrasive tool. When finished cleaning the entire area must be dry and free of any dirt.

B. Remove the first foot of paper backing from the mastic. Center and place the joint wrap around the joint. Continue to remove paper backing as you apply joint wrap to the entire structure.

C. Seal the overlapping area with a 6-inch minimum overlap. Be sure not to stretch material at the overlap area.

D. Cut excess material using a utility knife. Using a rubber mallet or hand roller, firmly flatten the joint wrap 360 degrees around the joint

3.05 PROVISION FOR FUTURE CONNECTION

A. Connections for future sewers, when specified, shall consist of a short piece of sewer terminating with a bell end and stopper or bulkhead not more than one full pipe length outside the manhole wall unless otherwise shown. If no elevation is given for future connections, set the invert 1/2 inch above the main sewer invert.

B. ABS and PVC pipe shall be fitted with rubber waterstop seals where they pass through the manhole wall.

3.06 DROP CONNECTIONS

A. Sanitary sewer manhole drop connections shall be outside drops constructed according to detail drawings and the following provisions.
   1. The drop assembly shall consist of a tee or wye connecting to the inflowing sewer, a drop pipe of the same diameter as the inflowing sewer, and a 90-degree bend at the bottom, all encased in concrete.
   2. Ductile iron pipe used for the drop connection need not be encased in concrete if the drop is free of joints between the 90-degree bend and the tee.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Sanitary sewer manholes shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 SANITARY SEWER MANHOLES

A. Sanitary Sewer Manholes, Each. The unit price for sanitary sewer manholes shall include all materials and labor to provide the complete manhole in accordance with the contract drawings and specifications.

B. Sanitary Sewer Manholes, Inclusive. When no quantity is provided, sanitary sewer manholes shall be considered inclusive to payment for other work associated with this contract.

END OF SECTION

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SECTION 33 41 13
PUBLIC STORM UTILITY DRAINAGE PIPING

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Association of State Highway and Transportation Officials (AASHTO), Standard Specifications, Latest Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   3. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.

1.03 DESCRIPTION OF WORK

A. The work covered under this section shall consist of furnishing all material, equipment, and labor required to install the public storm utility drainage piping for this project.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Removal, Salvage and Abandonment – Division 02

C. Structural Excavation for Structures - Division 31

D. Dewatering - Division 31

E. Trenching and Backfilling - Division 31

F. Storm Drainage Manholes, Frames, and Covers - Division 33

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 REINFORCED CONCRETE PIPE (RCP)

A. Reinforced concrete pipe shall conform to the requirements of Section 608 of the State of Wisconsin, Department of Transportation, Standard Specifications.

B. Reinforced concrete apron endwalls shall confirm to the requirements of Section 522 of the State of Wisconsin, Department of Transportation, Standard Specifications. All endwalls 24-inches and larger in diameter require trash guard.

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2.02 CORRUGATED METAL PIPE (CMP)

A. Steel corrugated metal pipe and steel apron endwalls shall conform to the requirements of Sections 520 and 521 of the State of Wisconsin, Department of Transportation, Standard Specifications. All endwalls 24-inches and larger in diameter require trash guard.

B. Aluminum corrugated metal pipe and aluminum apron endwalls shall conform to the requirements of Sections 520 and 525 of the State of Wisconsin, Department of Transportation, Standard Specifications. All endwalls 24-inches and larger in diameter require trash guard.

2.03 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

A. High density polyethylene pipe shall conform to the requirements of Section 530 of the State of Wisconsin, Department of Transportation Standard Specifications. Pipes which are between 42 inch diameter and 48 inch diameter shall meet the requirements of AASHTO M252 and M294, Type D.

B. Couplings and fittings for 4-36 inch pipe shall be suitable for the specific project application and as recommended by the pipe manufacturer. The joint for 42-48 inch pipe shall consist of a bell and spigot, integrally welded to the barrel of the pipe, utilizing a suitable profile gasket located on the spigot end.
   1. The fittings shall not reduce or impair the overall integrity or function of the pipe line. Fittings may be either molded or fabricated. Common corrugated fittings include in-line joint fittings, such as couplers and reducers, and branch or complimentary assembly fittings such as tees, wyes, and end caps. These fittings may be installed by various methods, such as snap-on, screw-on, bell and spigot, and wrap around.
   2. Couplings shall provide sufficient longitudinal strength to preserve pipe alignment and prevent separation at the joints.
   3. Only fittings supplied or recommended by the pipe manufacturer shall be used. Where designated on the contract drawings, a neoprene or rubber gasket shall be supplied.

2.04 POLYVINYL CHLORIDE PIPE (PVC)

A. Four-inch to 15-inch diameter pipe shall be Type PSM SDR-35 and meet the requirements of ASTM D3034. Pipe over 15-inch diameter shall meet the requirements of ASTM F679. Pipe shall be of the bell and spigot type.

2.05 TRASH GUARDS FOR ENDWALLS

A. Trash guards shall be constructed of painted or galvanized steel bars and pipes, spaced no more than 8-inches on center and welded into the configuration shown on the contract drawings. Fasteners shall be zinc-coated stainless steel.

2.06 CONCRETE BRICK OR BLOCK

A. Concrete brick and block masonry units shall conform to the requirements of Section 519 of the State of Wisconsin, Department of Transportation, Standard Specifications.

PART 3 EXECUTION

3.01 GENERAL

A. Construction of the public storm utility drainage piping shall include all excavation, backfilling, compacting of trenches and breaking into existing manholes, inlets or storm sewers required to provide a completed storm sewer at the locations shown on the contract drawings.

3.02 PROTECTION OF EXISTING UTILITIES

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A. Utility locations shown on contract drawings are approximate. Contractor shall contact all utility companies at least three working days prior to excavation for locations of all buried utilities owned by them. Should utilities be unexpectedly encountered during excavation, consult Engineer immediately for directions as to procedure. Cooperate with the Owner and public and private utility companies in keeping their respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner. Contractor shall be responsible for the cost of repairing damaged utilities.

3.03 CONCRETE STORM SEWER

A. Concrete storm sewer shall be constructed as shown on the contract drawings and in accordance with Section 608 of the State of Wisconsin, Department of Transportation, Standard Specifications, with the following exceptions and additions:
   1. Joints shall be of flexible watertight rubber gaskets installed as per manufacturer's instructions and in accordance with Section 608 of the State of Wisconsin, Department of Transportation Standard Specifications.
   2. Joints for elliptical storm sewer shall be mortar, gasket, mastic or combination in accordance with Section 608 of the State of Wisconsin, Department of Transportation Standard Specifications.
   3. Backfill shall be as indicated on the contract drawings and specified in Trenching and Backfilling - Division 31 and Special Procedures - Division 01. Backfill shall be incidental to storm sewer construction.
   4. If no embedment class is specified, then Class B embedment with a shaped subgrade shall be used.
   5. Joint ties shall be installed on apron endwall joints and the adjacent two pipe joints.

3.04 CORRUGATED METAL PIPE (CMP) STORM SEWER

A. Corrugated metal pipe shall be constructed as shown on the contract drawings and in accordance with the Special Procedures and Sections 520, 521, and 529 of the State of Wisconsin, Department of Transportation, Standard Specifications, with the following exceptions and additions:
   1. Joints shall be of watertight bolted bands installed as per manufacturer's instructions.
   2. Backfill and embedment shall be as noted in the Special Procedures and shall be incidental to storm sewer construction.
   3. Basis of payment will be per lineal foot in place. Miscellaneous bends, fittings and bands shall be included in the unit bid price of the associated pipe. The footage to be paid for shall not include the construction into or through catch basins, manholes, and inlets.

3.05 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

A. High density polyethylene pipe shall be constructed as shown on the contract drawings and, in accordance with the Special Procedures - Division 01 and Section 608 of the State of Wisconsin, Department of Transportation, Standard Specifications, and in accordance with "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications" (ASTM D 2321) with the following exceptions and additions:
   1. Joints for sewer pipe shall be sealed to be watertight in accordance with AASHTO Standard Specifications for Highway Bridges, Division II, Section 30.4.2.1
   2. Embedment shall be Class II or as indicated in Special Procedures - Division 01 and shall be incidental to storm sewer construction.
   3. Backfill shall be Type II as specified in Trenching and Backfilling - Division 31 or as indicated in Special Procedures - Division 01. Backfill shall be incidental to storm sewer construction.

3.06 POLYVINYL CHLORIDE PIPE (PVC)

A. PVC pipe shall be constructed as shown on the contract drawings and in accordance with the Special Procedures – Division 01 and in accordance with "Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications" (ASDM D2321) with the following exceptions:
   1. Joints for sewer pipe shall be sealed to be water tight in accordance with AASHTO Standard Specifications for Highway Bridges, Division II, Section 30.4.2.1

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2. Embedment shall be Class II or as indicated in Special Procedures - Division 01 and shall be incidental to storm sewer construction.
3. Backfill shall be Type II as specified in Trenching and Backfilling - Division 31 or as indicated in Special Procedures - Division 01. Backfill shall be incidental to storm sewer construction.

3.07 LAYING SEWER PIPE FOR CURVES

A. Sewers laid on curves shall be one of the following types:
1. Deflection of pipe joints will be permitted when the joint opening is less than 1/2 the length of the tongue for mortar joints or 1/4 the length of the tongue with rubber gasket joints; otherwise use cut-off pipe or miter pipe.
2. Cut-off pipe shall be molded with the difference between the longest and shortest sides, measured along the outside of the pipe, conforming to the values given in Table 1. Lengths of pipe other than that shown may be used only with approval of the Engineer.
3. Miter pipe shall be manufactured by the removal of a wedge from the center of the pipe to provide for the required angle of deflection. Sufficient additional reinforcement shall be added at the spring lines and top and bottom of the pipe to prevent shearing after installation. Repairs to complete the pipe shall be such that the concrete shall have the same strength as that of the remainder of the pipe barrel and shall not spall or separate. Miter pipe shall be used for all elliptical pipe laid on a curve. Miter pipe for circular sewers shall be used only with the approval of the Engineer.

Table 1
Cut-Off of Pipe for Curved Sewer (inches)
(4-foot long pipe sections)

Pipe I.D. Inches	Radius of Curve in Feet							
	40	50	57.3	60	70	80	90	100
21	2-5/8	2-1/8	1-3/4	1-3/4	1-1/2	1-3/8	1-1/4	1/1/8
24	2-7/8	2-3/8	2	2	1-3/4	1/1/2	1-3/8	1-1/4
27	3-1/4	2-5/8	2-1/4	2-1/8	1-7/8	1-5/8	1-1/2	1-3/8
30	3-1/2	2-7/8	2-1/2	2-3/8	2-1/8	1-7/8	1-5/8	1-1/2
36	4-1/4	3-3/8	3	2-7/8	2-1/2	2-1/8	1-7/8	1-3/4
42	--	3-7/8	3-3/8	3-1/4	2-7/8	2-1/2	2-1/4	2
48	--	4-3/8	3-7/8	3-3/4	3-1/4	2-7/8	2-1/2	2-1/4
54	--	--	4-3/8	4-1/8	3-5/8	3-1/8	2-7/8	2-1/2
60	--	--	--	--	4	3-1/2	3-1/8	2-3/4
66	--	--	--	--	4-3/8	3-3/4	3-3/8	3-3/8
72	--	--	--	--	--	4-1/8	3-5/8	3-3/8
78	--	--	--	--	--	4-3/8	4	3-5/8
84	--	--	--	--	--	4-3/4	4-1/4	3-7/8
96	--	--	--	--	--	--	4-7/8	4-3/8

3.08 TESTING

A. Leakage Testing. All storm sewers shall be tested for excessive infiltration and sand leakage. All sand leaks shall be repaired by the Contractor at his expense. If in the judgment of the Engineer the infiltration will cause a continued maintenance problem, the sewer shall be repaired by the Contractor at his expense.

B. Alignment and Grade shall be checked by lamping method to detect poor alignment, offset joints, sags, kinks, or open joints; defects shall be corrected by the Contractor before final acceptance. If closer inspection is warranted, the Owner may arrange for a televised inspection. The Owner will assume the cost of televised inspection if no serious defect is found. If defects are found which the Engineer attributes to the failure of proper installation or sound materials, the Contractor shall pay for the test. Defects shall be promptly corrected.

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C. Deflection Limitation. Deflections in corrugated metal pipe shall be limited to 5 percent of the nominal pipe diameter. If visual inspection indicates a greater deflection, the Contractor shall supply and pull a rigid ball or mandrel with a diameter 5 percent less than the nominal pipe size through the sewer. Failure of the ball to freely pass through shall be cause for rejection of the sewer.

D. Deflection Test. All HDPE and PVC pipe installations shall be tested for deflection by using a rigid ball or mandrel and shall be performed in accordance with ASTM D2321 and without the use of mechanical pulling devices. Deflection may not exceed 5 percent if tested within 30 days of placement of final backfill or 7.5 percent if tested more than 30 days after final backfill is placed. Final backfill must be in place prior to testing.

E. Acceptance. If any of the tests are not met, the Contractor shall, at his own expense, determine the source of the problem and repair or replace all defective work.

3.09 PROTECTING OPENINGS

A. Fences shall be provided around all openings and whenever required for the protection of the public. They shall be neat and substantial. All openings, fences, and surface obstructions shall be guarded and shall be indicated at night by suitable flashers.

PART 4 MEASUREMENT AND PAYMENT

4.01 GENERAL

A. Public storm utility drainage piping shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein shall be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 PUBLIC STORM UTILITY DRAINAGE PIPING

A. Storm Sewer, (Material), (Diameter), Lineal Foot. Measurement for the public storm utility drainage piping shall be for the lineal foot of storm sewer installed, measured to the center of inlets, catch basins and manholes. Payment shall be made at the contract unit price bid per lineal foot of storm sewer installed. Contractor shall furnish and install all bedding, fittings and appurtenances required to complete the project. All said costs shall be included in the respective storm sewer bid items.

B. Storm Sewer, Inclusive. When no quantity is provided, storm sewer shall be considered inclusive to payment for other work associated with this contract.

C. Apron Endwalls, Each. Measurement for apron endwalls will be for each endwall installed in accordance with the contract drawings and specifications. Endwall will not be included in lineal foot measurement of storm sewer pipe. Payment will be made at the contract price bid per each.

D. Apron Endwalls, Inclusive. When no quantity is provided, apron endwalls shall be considered inclusive to payment for other work associated with this contract.

END OF SECTION

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SECTION 33 49 13
STORM DRAINAGE MANHOLES, FRAMES AND COVERS

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   2. Federal Specifications (FS), Specifications and Standards, Current Edition.
   3. State of Wisconsin, Department of Transportation, Standard Specifications for Highway and Structure Construction, Current Edition at time of bid opening.
   4. American Concrete Institute, Annual Book of ACI Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover design, furnishing and installing catch basins, storm manholes, inlets and similar structures constructed of precast concrete sections, or solid concrete block, set on a concrete base and fitted with standard structure covers, frames and steps, in accordance with the contract drawings and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Removal, Salvage and Abandonment – Division 02

D. Trenching and Backfilling - Division 31

E. Erosion and Sedimentation Controls - Division 31

F. Public Storm Utility Drainage Piping - Division 33

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied. Information shall be in conformance with requirements of Submittals - Division 01 of this specification.

B. Contractor shall submit submittals and details required for the design, construction and installation of the materials. Submittals and details shall indicate the intended materials arrangement, dimensions, major support requirements, plot area and or detailed construction requirements.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS (NONE)

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

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A. The products listed are intended to establish a basis for comparison of products of other manufacturers. Substitutions will be permitted but only with the prior written approval of the Engineer. Catalogue reference numbers stated are those of Neenah Foundry Company and are intended to establish a basis for comparing the products of other manufacturers.

2.02 STRUCTURES

A. The minimum compressive concrete strength for all structures shall be 4000 psi and shall conform to ASTM C478 for round structures and ASTM C913 for square or rectangular structures. Wall thicknesses of round manholes will vary with the diameter in conformance with ASTM C76, Class B concrete tongue and groove joint pipe. Larger diameter round manholes (7 feet +) shall have wall thickness a minimum of one-twelfth of the inside diameter of the manhole as specified in ASTM C478. Flat top slabs and reduction flat top slabs shall be designed in accordance with ACI 318 and designed to withstand the anticipated loads from riser sections, soil and hydrostatic loads, surcharge loads, live loads, and impact loads. Required site specific slab thickness shall be determined by the aforementioned calculations with the following minimum requirements:

1. Minimum slab thickness for structures shall be 8 inches or as necessary as required by design calculations.

B. All other design elements for structures shall comply with ASTM C478 and C497 for round structures, and ASTM C913 and ASTM C890 for square or rectangular structures.

C. Materials furnished and used in this work shall conform to the requirements of Section 611 of the State of Wisconsin, Department of Transportation, Standard Specifications and details in the contract drawings.

D. The Contractor shall verify size, invert elevation, and location of all pipes in existing manholes and inform Engineer of any discrepancies before the replacement manhole is constructed.

2.03 STEPS

A. Steps shall be constructed of a 1/2 inch diameter, Grade 60 reinforcing steel bar conforming with ASTM A615 completely encased in polypropylene conforming with ASTM D4101 to obtain a minimum thickness of 1-1/8 inch and minimum width of 12 inches. They shall be securely and permanently set in the manhole wall. Steps shall be set at 16 inches on center and have a 5-3/4 inch projection from the wall. Steps shall conform with ASTM F783.

2.04 FRAMES, COVERS AND GRATINGS

A. Frames, covers and gratings shall be of the type and duty as shown on the contract drawings. Iron castings shall conform to ASTM A48, Class 20. All castings shall be true to pattern in form and dimensions, free from faults, sponginess, cracks, blow holes, and other defects affecting their strength.

B. The standard castings for storm sewer manholes shall be, R-1642, Type B with non-rocking lids as listed below except as designated otherwise on the contract drawings or in Special Procedures - Division 01.

C. Where bolted lids are specified on the contract drawings or in Special Procedures - Division 01, they shall be Neenah R-1916-F, manhole frames with bolted lids.

D. Where low profile castings are specified on the contract drawings or in Special Procedures - Division 01, they shall be Neenah R-1689 (4-inch casting) with Type B non-rocking lid.

E. The standard casting for inlet structures located in curb lines shall be Neenah R-3067 inlet casting, or equal, except as designated on the contract drawings or in the Special Procedures - Division 01. Grate shall be as designated on the contract drawings or in the Special Procedures - Division 01. If none is indicated, provide as follows:

1. Type R, or equal – Low points
2. Type L, or equal – On grade

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2.05 JOINT MATERIALS

A. Joint materials shall be plastic gasket material or butyl rubber gasket material. Plastic gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips conforming to Federal Spec SS-S-00210, Type I, Rope Form; Ram-Nek by K.T. Snyder Company, Inc.; Kent Seal No. 2 or equal. Butyl rubber gaskets shall be preformed, high adhesion material, packaged ready for use between protective paper strips, conforming to Federal Spec SS-S-210A, Rope Form; by Press Seal Gasket Corporation or equal.

2.06 ADJUSTMENT RINGS

A. The manholes shall be built so that a minimum of four inches is allowed for adjustment. A maximum of 12 inches of adjustment will be allowed.

B. Polypropylene Adjustment Rings

1. Adjustment rings shall be manufactured from Expanded Polypropylene (EPP), compliant with ASTM D4819 and tested according to ASTM D3575.
2. Rings shall be available in heights (thicknesses) which will allow final adjustment of the frame and cover or grate to within ¼" (one quarter inch) to ½" (one half inch) of the specified final elevation.
3. "Finish" Rings shall be provided with grooves on the lower surface and flat upper surface. "Finish" rings may also have a keyway on the upper surface of the inner diameter to facilitate installation of an "Angle" ring, where "Angle" ring is required.
4. "Angle" rings may have an upper and lower keyway (tongue and groove) for vertical alignment and/or an adhesive trench on the underside.
5. Any adhesive or sealant used for watertight installation of the manhole grade adjustment rings shall meet manufacturers specifications and the requirements of ASTM C-920, Type S, Grade NS, Class 25, Uses NT, T, M, G, A and O Federal Specification TT-S-00230-C Type II, Class A .
6. Repair mortar and cementitious grout shall meet manufacturer's specifications.

PART 3 EXECUTION

3.01 STORM DRAINAGE MANHOLES, FRAMES AND COVERS, GENERAL

A. All lift holes on structures shall be sealed watertight.

3.02 ADJUSTMENT RINGS

A. Surface preparation and installation shall be in accordance with manufacturer's recommendations.

3.03 FRAMES AND COVERS

A. Structures shall be built up so that the frames and cover, when placed, will be at the established required grade.

3.04 PROVISION FOR FUTURE CONNECTION

A. Connections for future sewers, when specified, shall consist of a short piece of sewer terminating with a bell end and stopper or bulkhead not more than one full pipe length outside the structure wall unless otherwise shown. Other structure components and requirements are indicated on detail drawings. If no elevation is given for future connections, set the invert 1/2 inch above the main sewer invert.

3.05 ABANDONMENT OF STORM SEWER AND STRUCTURES

A. Abandonment and/or removal of existing storm sewer and structures shall be completed in accordance with Section 02 42 00 "Removal, Salvage and Abandonment" in Division 02.

PART 4 MEASUREMENT AND PAYMENT

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4.01 GENERAL

A. Storm drainage manholes, frames and covers will be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

B. All work specified herein will be considered in each of the measurement and payment method(s) stipulated, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

4.02 STORM DRAINAGE MANHOLES, FRAMES AND COVERS

A. Storm Manholes, Frames and Covers, Complete. The unit price for storm manholes, frames and covers shall include all materials and labor to provide the complete storm sewer structure, for each type of structure, in accordance with the contract drawings and specifications. Payment will be made for each type of structure at the respective contract price bid per each.

B. Storm Drainage Manholes, Frames and Covers, Unit Price.
   1. Vertical Foot. Payment will include base and poured inverts, all risers, steps, cone or flat top, and appurtenances and will be measured from the lowest pipe invert to the top of adjustment.
   2. Storm Sewer Structure Casting and Base. Payment will include the frame and lid, set flush at final grade.

C. Storm Manholes, Frames and Covers, Inclusive. When no quantity is provided, storm manholes, frames and covers shall be considered inclusive to payment for other work associated with this contract.

END OF SECTION

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SECTION 40 23 23
PROCESS PIPING, VALVES AND SPECIALTIES

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American National Standards Institute (ANSI) Standards, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards, Current Edition.
   3. American Water Works Association (AWWA) Standards, Current Edition.
   4. Commercial Standards (CS) U.S. Department of Commerce Standards, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover the furnishing of all materials, equipment, supervision and labor necessary to install all process piping, valves and specialties. This section shall not apply to electrical conduit or piping for heating and ventilating or plumbing.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. High Performance Coatings - Division 09

D. Electrical – Division 26

E. Trenching and Backfilling - Division 31

F. Chemical Metering System - Division 44

1.05 SUBMITTALS

A. Contractor shall submit such product literature and catalog cuts of materials to be supplied to relate these materials to the specifications. Information shall be in conformance with requirements of Submittals - Division 01 of these specifications.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

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A. Manufacturer of water/wastewater processing piping shall have a minimum of 10 years experience in the construction of municipal and industrial piping and appurtenances and shall conform to the required ratings and certifications as indicated.

2.02 PIPE, GENERAL

A. All piping shall conform to the sizes shown on the contract drawings and shall be of the type and quality as scheduled, unless otherwise designated on the contract drawings.

2.03 PROCESS PIPE

A. Exposed Process Pipe 3 inches and larger

1. Ductile Iron (DI). Pipe shall meet the requirements of ANSI A21.15 (AWWA C115); Class 53. Joint construction shall be flanged type with required bolts and full-face gasket, meeting the requirements of ANSI A21.11 (AWWA C111). Fittings shall be ductile iron, meeting the requirements of ANSI 21.10 (AWWA C110). Standard cement mortar lining shall meet the requirements of ANSI 21.04 (AWWA C104). All exposed ductile iron pipe shall be factory primed in accordance with High Performance Coatings - Division 09 of these specifications.

B. Exposed Process Pipe 2 1/2 inches and smaller

1. Copper (CU). Pipe shall meet the requirements of ASTM B88, ASTM B585, and ASTM B641 for rigid seamless tubing. The name or trademark of the manufacturer, and type shall be permanently and plainly marked on the pipe at intervals not greater than 1-1/2 feet. Fittings shall be cast brass meeting the requirements of ASTM B62 and ASTM B687 having an alloy composition of 85 percent copper, 5 percent tin, 5 percent zinc and 5 percent lead, having uniformity in wall thickness and strength, and free of any defects. Installation shall be in accordance with governing plumbing codes.
2. Stainless Steel (SST): Pipe shall be Schedule 40 or Schedule 80 wall thicknesses and meet requirements of ASTM A-312. Pipe shall be Type 316/316L, welded or threaded. Flange type shall be compatible with connecting piping/equipment flanges. Fittings shall be Type 316/316L Schedule 40 wall thickness, meeting the requirements of ASTM A403 and ANSI B16.9.
3. Polyvinyl Chloride (PVC). Pipe shall meet the requirements of ASTM D1785, for Schedule 40 or Schedule 80 as shown on the Contract Drawings. Joint construction shall be threaded or solvent welded. Joints constructed of threated couplings and fittings shall meet the requirements of ASTM D2464, ASTM D2466, and ASTM D3915 as they apply. Joints constructed of socket-type couplings and fittings and solvent welded shall meet the requirements of ASTM D2467, ASTM D2564, ASTM D2672, and ASTM D2855 as they apply.

C. Buried Process Pipe 3 inches and larger

1. Ductile Iron (DI). Pipe shall meet the requirements of ANSI A21.51 (AWWA C151); Class 52. Fully body fittings shall be ductile iron, meeting the requirements of ANSI 21.10 (AWWA C110). Compact fittings shall be ductile iron, meeting the requirements of ANSI A21.53 (AWWA C153). Standard cement mortar lining shall meet the requirements of ANSI 21.04 (AWWA C104). Joint construction shall be either push-on type or mechanical joint type (meeting the requirements of ANSI A21.11 (AWWA C111). Push-on type shall be rubber gasket type slip joint; “Fastite”, “Bell-Tite”, “Tyton”, or equal. Mechanical joints shall have plain rubber gaskets. Water pipe and other piping as designated shall receive conductivity straps. Metal wedges are not acceptable.

D. Buried Process Pipe 2 1/2 inches and smaller

1. Copper (CU). Pipe shall meet the requirements of ASTM B88, ASTM B585 and ASTM B641 for Type “K” soft annealed seamless tubing. The name or trademark of the manufacturer, and type shall be permanently and plainly marked on the tubing at intervals not greater than 1-1/2 feet. Fittings shall be cast brass meeting the requirements of ASTM B62 and ASTM B687 having an alloy of 85 percent copper, 5 percent tin, 5 percent zinc and 5 percent lead, having uniformity in wall thickness and strength, and free of any defect which may affect serviceability. Connections shall be made with flared flanged joints or compression type joints. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer.

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2.04 VALVES

A. All valves 4 inch and larger shall be designed so that they can be repacked without removing the bonnet. The packing shall be adjustable. Valves shall conform to the sizes shown on the contract drawings and shall be of the type and quality as follows, unless otherwise designated on the contract drawings.

B. Valve boxes shall be provided for all buried valves. The boxes shall be of the cast iron adjustable type conforming to AWWA requirements. The cover shall not be labeled.

C. All exposed valves shall be furnished with operating nut, unless specified otherwise. Furnish one valve operating lever for every five valves with the same size operating nut and the same required lever length, minimum two levers of each type required.

D. All buried valves shall be furnished with a 2 inch operating nut. Furnish one valve operating key with the same required key length per every ten buried valves.

E. All buried valves shall be furnished with extension stems which extend to within one foot of the finished grade elevation. The extension stem shall have a 2-inch operating nut and be mechanically connected to the valve operator. Furnish one valve operating key with the same required key length per every ten buried valves.

F. Butterfly Valves

1. Wafer style butterfly valves, conforming to AWWA C504, of the sizes shown on the Contract Drawings.
2. One piece through-stem direct drive requiring no disc screws or pins to connect stem to disc, ASTM A126 Class B, polyester coated, for mounting between two bolted flanges without the need for gaskets.
3. Resilient seats shall be tongue and groove design with primary hub seal and secondary seal, to prevent line media from contacting stem or body, and a molded O-ring suitable for weldneck and slip-on flanges. Seats shall be EDPM.
4. Disc construction shall be aluminum bronze ASTM B148-954 or ductile iron ASTM A536 Gr. 65-45-12 with Nylon 11 coating.
5. Valve shaft shall be one piece stainless steel, supported on non-corrosive, heavy duty acetal bushing, and be mechanically retained in body neck, with no part of stem or body exposed to line media.
6. Valves shall have bi-directional pressure ratings of 175 psi and tested to 110% of full rating.
7. Butterfly valves shall be Bray Series 31, or Engineer-approved equal.

G. Gate Valves

1. Gate valves shall be iron body, resilient-seated with non-rising stem conforming to ANSI 25.09/AWWA C509.
2. Valves shall fully comply with AWWA C509 for body thickness and provide 150 psig pressure rating.
3. Stainless steel stem and thrust collar.
4. Valve interior and exterior shall be coated with fusion-bonded epoxy conforming to AWWA C550 and NSF61 requirements.
5. Gate valves at interior locations shall be flanged connections and wheel operated unless a motorized actuator is shown on the Contract Drawings.
6. Gate valves smaller than 2 inches shall be either brass or bronze bodies, bronze or nickel-bronze solid wedge, full port opening, threaded connections, and be rated for 300 psig.
7. Acceptable manufacturers: Mueller Company, or Engineer-approved equal.

H. Flex Check Valve – High Head (High Lift Pumps)

1. The check valve shall be a full-body flanged type flexible disc check valve with a domed access cover. Flanges shall be ANSI B16.1, Class 125. The seated surface shall be on a 45-dgree angle to

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minimize disk travel. The top access port shall be full sized to allow removal of the disc without removing the valve from the line.

2. The disc shall be of one-piece construction, precision molded with an integral o-ring type sealing surface and contain steel and nylon reinforcement in the hinge. The flex portion of the disc shall be warranted for 25 years. Non-Slam closing characteristics shall be provided through a short 35-degree disc stroke and a memory disc return action.
3. The valve body shall be constructed of ASTM A536 ductile iron, or ASTM A126 Class B cast iron. The disc shall be precision molded Buna N, ASTM D2000 BG.
4. A mechanical indicator shall be provided to indicate open/closed valve position.
5. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure. A seat closure test at the valve rating shall be conducted to demonstrate zero leakage.
6. The exterior of the valve shall be coated with a universal alkyd primer. The valve interior shall be coated with an epoxy coating.
7. The valve shall have a minimum cold working pressure rating of 175 psi.
8. The valve shall have a surge buster plate on the backside of the rubber flapper.
9. Check valves shall be Val-Matic Series 7200MI; Cla-Val Series 587, or equal.

I. Flex Check Valve (Well 9)

1. The check valve shall be a full-body flanged type flexible disc check valve with a domed access cover. Flanges shall be ANSI B16.1, Class 125. The seated surface shall be on a 45-dgree angle to minimize disk travel. The top access port shall be full sized to allow removal of the disc without removing the valve from the line.
2. The disc shall be of one-piece construction, precision molded with an integral o-ring type sealing surface and contain steel and nylon reinforcement in the hinge. The flex portion of the disc shall be warranted for 25 years. Non-Slam closing characteristics shall be provided through a short 35-degree disc stroke and a memory disc return action.
3. The valve body shall be constructed of ASTM A536 ductile iron, or ASTM A126 Class B cast iron. The disc shall be precision molded Buna N, ASTM D2000 BG.
4. A mechanical indicator shall be provided to indicate open/closed valve position.
5. The valves shall be hydrostatically tested at 1.5 times their rated cold working pressure. A seat closure test at the valve rating shall be conducted to demonstrate zero leakage.
6. The exterior of the valve shall be coated with a universal alkyd primer. The valve interior shall be coated with an epoxy coating.
7. The valve shall have a minimum cold working pressure rating of 175 psi.
8. Check valve shall be 10 inch Val-Matic Series 500A; Cla-Val Series 584, or equal.

J. Well Service Air Valve

1. Valves shall be of the type that automatically exhausts large quantities of air during the filling of a pump column and allows air to re-enter at shut off.
2. The inlet and outlet of the valve shall have the same cross-section area. The floats shall be guided by a stainless steel guide shaft and seat against a synthetic seat.
3. Valves shall have N.P.T. inlets and outlets.
4. Valves shall be constructed of cast iron with stainless steel trim and Buna-N seating
5. Provide a riser pipe and isolation valve on the inlet side,
6. Provide piping including a 180 degrees return bend with screened outlet on the discharge side. The outlet shall be directed to drain into the local floor or hub drain, maintain 24 inch minimum height of discharge above floor plus an air-gap of two pipe diameters where required.
7. Sizing shall be as shown on the plans and as noted below:
   a. 1-inch downstream of high lift pumps (2 total)
   b. 2-inch downstream of well pump (1 total)
8. Valves shall be Model 100ST, Well Service Air Valve, as manufactured by Val-Matic Valve and Manufacturing Corporation, Model 33AWSTD Well Service Valve as manufactured by Cla-Val, or equal.

K. Air Release Valve

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1. Air Release Valves shall be of the simple lever type and shall be capable of automatically releasing accumulated air from a fluid system while that system is in operation and under pressure.
2. To assure drop tight shut-off, a viton orifice button shall be used to seal the valve discharge orifice when the valve is in a closed position. The orifice diameter shall be sized for use within a given operating pressure range to ensure maximum discharge capacity.
3. The materials of construction are as follows:
   a. The body and cover shall be of cast iron. With the exception of the viton orifice button, the leverage mechanism, float and all other internal trim shall be of stainless steel.
   b. The stainless steel float shall be designed to and capable of withstanding a pressure in excess of 1,000 psi.
4. The inlet size shall be 1 inch NPT. Provide a 1 inch stainless steel ball valve on the inlet side, and a 180 degrees return bend with screened outlet.
5. The valve shall be Model No. 22, as manufactured by Val-Matic Valve and Manufacturing Corporation, or equal.

L. Solenoid Valve
1. Furnish and install a 1/2-inch, two-way pilot operated solenoid valve on the pump prelube line. Valve shall be designed for normally closed operation, and rated to 150 psi pressure. Valve shall have brass body, bonnet and seat; stainless steel enclosing tube, plunger, and plunger spring; and Buna-N diaphragm. Electric operator shall be compatible with prelube solenoid timer and relay to be furnished by Electrical Contractor. Solenoid valve shall be Model GP400, as manufactured by Parker-Hannifin Corporation, or equal.

2.05 WATER METER

A. Equipment provided by Div 26. Provide appurtenances as necessary for installation.

2.06 FLOW SWITCH

A. Equipment provided by Div 26. Provide appurtenances as necessary for installation.

2.07 PRESSURE SENSOR/TRANSMITTER

A. Equipment provided by Div 26. Provide appurtenances as necessary for installation.

2.08 PRELUBE LINE WATER METER

A. Owner shall furnish one (1) prelube meter for installation. The Contractor shall install the prelube meter in accordance with the manufacturer's instructions and project requirements.

2.09 RESTRAINED FLANGE ADAPTER

A. Flange adapters shall be used for adapting and restraining a plain end of ductile iron pipe to a flange, conforming to ANSI/AWWA C110/A21.10.

B. All flange adapters shall have a minimum working pressure equal to two times the pipe on which they are installed.

C. Flange adapters shall be Series 2100 Mega-Flange, manufactured by the EBBA Iron, Inc. or equal.

D. Flange adapters shall only be installed as shown on the contract drawings or where approved by the Engineer.

2.10 RESTRAINED MECHANICAL JOINTS – BELOW GRADE

A. Mechanical joints on pressurized pipe below the floor slab shall be installed with double wedge action restraining glands, 1100TDM Mega-Lug by EBAA Iron Sales, Inc. PRESSURE GAUGES

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2.11 FLUSHING CONNECTION

A. Provide Carbon Steel 6" Flange x 4 ½" Male NH with lockable cap at flushing discharge point on exterior building to allow for connection of hydrant diffuser.

2.12 PRESSURE GAUGES

A. Pressure gauges shall be a minimum of 3-1/2 inches in diameter, read from 0 to 150 psi and be calibrated in both psi and feet. Install pressure gauges per the contract drawings.

2.13 SAMPLING TAP

A. Smooth end sampling taps shall be located as shown on the contract drawings. Shall be T&S Brass B-0703, Kohler K-7870-C or Engineer-approved equal.

2.14 PIPE HANGERS

A. Pipe hangers shall consist of ceiling flange threaded rod, and adjustable clevis type hanger constructed of carbon steel.

2.15 PIPE SUPPORTS

A. Pipe supports shall consist of a base flange, support rod with threaded ends for height adjustment, and a saddle type or stanchion type support as required.

2.16 LABELING AND TAGGING

A. Provide "Non-Potable Water" sign at every non-potable water outlet.

B. Furnish and install adequate marking of exposed accessible process equipment, piping and control devices, per ANSI A13.1.

C. Piping. Painted stencil, or self-adhesive vinyl markers over finished insulation covering. Colors to match system specified in High Performance Coatings - Division 09 of these specifications.

D. Valves. Minimum diameter plastic engraved tags, 1-1/2 inches. Colors to match system specified in High Performance Coatings - Division 09 of these specifications.

E. Submit schedule of identification labels/tags for Engineer approval.

2.17 PAINTING

A. Painting of process piping, valves and specialties shall be done in Phase 2.

PART 3 EXECUTION

3.01 GENERAL

A. The Mechanical Contractor is responsible for process piping within the limits shown on the contract drawings.

B. All pipe shall be carefully unloaded so it will not be chipped, cracked or have the surface coating damaged. It shall be carefully stored so it is in no way damaged or made unsuitable for its purpose. Pipe shall not be skidded upon the ground. Damaged pipe shall be immediately removed from the work site.

3.02 EQUIPMENT START-UP

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A. The pump control valve shall be started by a factory-trained representative who shall certify to the Engineer that all equipment is properly installed and the plant operator has been instructed concerning proper operation and maintenance. All other equipment shall be started up when installation has been approved as ready for operation. A trained technician shall supervise the startup, make all necessary adjustments and run field tests in the presence of the Engineer.

3.03 PIPE INSTALLATION

A. Primary line and elevation will be provided by the Engineer. Line and elevation will be established in the field, which, in conjunction with information on the contract drawings, will be sufficient control for the work. The Contractor shall be responsible for preserving the control stakes, marks or nails and if disturbed, shall pay the actual cost of replacement. Notice shall be given one week in advance to give the Engineer enough time to set the control. The Contractor shall transfer line and elevation from the primary control by approved methods. Such methods may vary at different locations to achieve the desired degree of accuracy.

B. Pipes shall be laid with ends abutting and true to line and elevation. Joints shall be full depth or rigidly fixed and located for proper alignment of piping. Pipe suspended or exposed shall be placed at the elevations indicated and supported as shown on the contract drawings. Any work which has been disturbed or which does not conform to line and elevation before final acceptance shall be removed and reconstructed by the Contractor at their expense.

C. Pipes shall be installed with the minimum depth of cover as called for on the contract drawings or as defined in Special Procedures - Division 01 of these specifications.

D. Manufacturer's recommended installation procedures shall be followed.

3.04 VALVE INSTALLATION

A. Valves shall be installed per the manufacturer's recommendations. Valves shall be operated prior to system start-up to ensure proper installation and full range of operation.

3.05 GAUGE INSTALLATION

A. Gauges shall be installed per the manufacturer's recommendations. Gauges shall be tested prior to system start-up to ensure proper operation, which shall include range of motion, lack of oscillations caused by vibration and correct calibration for the installation.

3.06 PERMISSIBLE LEAKAGE

A. Leakage is not permissible on any exposed line or any line that will be placed under pressure or suction. The Contractor shall at their own expense locate and repair the defective joints until the leakage is within the limits described above.

3.07 TESTING

A. General. The following tests shall be performed by the Contractor in the presence of the Engineer. The Contractor shall be responsible for providing all labor, materials and equipment for the testing.

B. Pressure Test. All pressure lines shall be tested until successfully meeting the requirements of ANSI A26.00 (AWWA C600), latest edition, for pressure and leakage testing excepting exposed lines which are allowed no leakage. Temporary capping and thrust restraint of open lines will be required for testing.

C. Bacteriological Test. The Contractor shall be responsible for sampling water from process piping after installation. All process piping in contact with potable water shall be tested. All costs for bacteriological testing shall be included in the lump sum bid for the Work. Two "safe" water tests with respect to coliform bacteria shall be obtained at an interval of 24-hours apart and the laboratory reports shall be submitted to the Engineer.

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D. Detention Tank Process Piping Test. The Contractor shall test that the downward bend and vertical discharge process piping in the detention tank can be removed and rotated to connect to the process pipe through the detention tank divider wall. The Contractor shall confirm that this will allow water from one-half of the detention tank to be discharged into the other half of the detention tank without leakage. This shall be tested for both halves of the detention tank.

E. Acceptance. If any of the tests are not met, the Contractor shall, at their own expense, determine the source of the problem and repair or replace all defective materials.

3.08 PIPE HANGERS AND SUPPORTS

A. Piping hangers and their supports shall be sized per the pipe manufacturer's requirements for the process fluid carried, but in no case shall this be less than 3/4 inch wide, 18 gauge steel strap or ring type hangers secured by screw fasteners. Hangers in contact with un-insulated copper tubing or brass piping shall be electrolytically coated and shall be sized accordingly for the outside diameter of the pipe.

B. The location of the hangers and supports shall be coordinated with the structural work to assure that the structural members will support the intended load. In lieu of separate hangers or supports, the Contractor shall submit for approval a detailed drawing of the type of hanger or support he proposes to furnish for handling and supporting multiple pipes.

3.09 VERTICAL PIPING

A. Iron vertical piping shall be supported at each floor and at intervals determined by the vertical load involved. Riser clamps shall be supported on spring hangers. Short risers shall include a saddle at the bottom and may require an additional hanger at the top. Longer risers may require over-sized U-bolts or similar devices to prevent lateral motion.

B. Copper vertical tubing shall be bonded at intervals determined by the vertical load involved. Riser clamps shall be supported on spring hangers. Short risers shall include a saddle at the bottom and may require an additional hanger at the top. Longer risers may require over-sized U-bolts or similar devices to prevent lateral motion.

3.10 FIXTURE SUPPORTS

A. Wall hung fixtures, hanger plates, support arms or mounting lugs shall be fastened to the wall by through bolts where appearance of the bolts is not objectionable. Exposed bolt heads in finished areas shall be hexagonal and painted. Exposed nuts shall be chromium plated hexagonal cap nuts. Washers shall be painted or chromium plated to match bolt heads or nuts.

3.11 THRUST RESTRAINTS

A. Provide all pressure pipelines with concrete thrust blocking at all bends, tees, caps, plugs and changes in direction.

B. All bends, tees, caps, plugs and changes in direction under structures shall have both restrained joints and thrust blocks.

C. Concrete thrust blocks shall be poured against firm, undisturbed ground, with a minimum size as shown on the contract drawings. Where it is not possible to pour thrust blocks against undisturbed ground, thrust blocks shall be poured against backfill compacted to 95 percent modified proctor density. All fittings shall be wrapped in polyethylene prior to placement of concrete thrust blocks. Thrust blocks shall be formed in such a way that joints will be kept free of concrete.

PART 4 MEASUREMENT AND PAYMENT

4.01 PROCESS PIPING, VALVES AND SPECIALTIES

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A. General. Process piping, valves and specialties shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Process Piping, Valves and Specialties, Inclusive. When no quantity is provided, process piping, valves and specialties shall be considered inclusive to payment for work scheduled under this contract.

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SECTION 44 42 56.10
VERTICAL TURBINE PUMP

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM A48 - Specification for Gray Iron Fittings, Current Edition.
      b. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped Zinc Coated Welded and Seamless, Current Edition.
      c. ASTM A108 - Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality, Current Edition.
      d. ASTM A193 - Specification for Alloy-Steel and Stainless Steel Bolting Materials for High Temperature Service, Current Edition.
      e. ASTM A276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes, Current Edition.
      f. ASTM A582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished, Current Edition.
      g. ASTM A743 - Specifications for Castings, Iron-Chromium, Iron-Chromium-Nickel and Nickel-Base Corrosion-Resistant for General Application, Current Edition.
      h. ASTM B505 - Specification for Copper-Base Alloy Continuous Castings, Current Edition.
      i. ASTM B584 - Specification for Copper Alloy Sand Castings for General Applications, Current Edition.
   2. American Water Works Association (AWWA), Specifications and Standards:
      a. AWWA E101 - Vertical Turbine Pumps - Line Shaft and Submersible Types, Current Edition.
      b. AWWA C654 – Disinfection of Wells, Current Edition.
   3. National Electrical Manufacturer's Association (NEMA), Specifications and Standards:
      a. Procedure IEEE 112, Current Edition.

1.03 DESCRIPTION OF WORK

A. The Contractor shall, unless specified otherwise, furnish all material, equipment, tools and labor necessary to furnish and install a vertical turbine pump as indicated in other applicable sections and as specified herein.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Non-Shrink Grouting - Division 03

C. Electrical - Division 26 (All Sections)

D. Process Piping, Valves and Specialties-Division 40

1.05 SUBMITTALS

A. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications.

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B. The Contractor shall provide a list, catalog cuts and descriptive information of all instrumentation and control equipment components to be provided.

C. Submittals shall indicate the intended equipment arrangement, major support requirements, plot area, and process flow.

D. Submittals shall be submitted which indicate the internal control schematics and remote equipment, such as flowmeter, chart recorders, etc. Submittals shall be submitted which indicate equipment and terminal block layout for interconnections to remote equipment.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

1.07 VERIFICATION OF DIMENSIONS

A. The Contractor shall coordinate and properly relate the work to the site and to the work of all trades. The Contractor shall visit the premises and familiarize himself with all details of the work and working conditions, shall verify all dimensions in the field, and shall advise the Engineer of any discrepancy before performing any work.

1.08 DEVIATIONS

A. It is the intent of these specifications and drawings to secure a complete and operating system functioning with the limits indicated. It is realized that several manufacturers can supply a system with equal performances and reliability in differing manners.

B. Should the Contractor wish to bid upon a system which differs from the specifications and which he feels will result in equal performance and reliability, he may do so by submitting completed detailed pre-submittal drawings stating all deviations and supplying sufficient information to evaluate the system. Any changes to equipment layout, electrical requirements, etc., shall be made at no additional cost to the Owner.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. For the purpose of standardization, the equipment shall be furnished by a single supplier to the greatest degree possible. All equipment shall be of the latest and best design and shall have an overall performance as guaranteed by the manufacturer.
   1. It shall be the responsibility of the Contractor to supply a complete and working system in conformance with all applicable codes and regulations. The drawings and specifications are intended to include sufficient details for a complete equipment installation for the purposes specified. The Contractor shall be responsible for all details which may be necessary to properly install, adjust and place in operation the complete installation. The Contractor shall assume full responsibility for additional costs which may result from unauthorized deviations from the specifications.
   2. Each major component of equipment shall have, as a minimum, the manufacturer's name, address, and catalog or style number on a nameplate securely attached to the item of equipment.

B. Materials and equipment submitted for approval shall be products of a manufacturer regularly engaged in the manufacture of the products. Such manufacturer shall have been engaged in the manufacturing of similar equipment at least one year prior to bid opening. All materials shall meet AWWA standards.

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2.02 GENERAL REQUIREMENTS

A. The vertical turbine pumps shall be suitably sized for the design conditions and shall be of the water-lubricated type.

B. Pumps shall meet AWWA standards.

C. The following design parameters shall be utilized for preliminary Well #9 vertical turbine pump selection:

1. Pump Setting (ft.)
   (to top of bowls) 145
2. Pump Capacity (gpm)
   (minimum @ bowl efficiency) 900
3. Pump Head (ft.)
   (total dynamic head) 125
4. Bowl Efficiency (%)
   (minimum @ capacity) 83
5. Static Water Level (ft.)
   (below ground surface, estimate) 28
6. Pumping Water Level (ft.)
   (below ground surface, estimate) 115 @ 900 gpm (S.C. = 10.6 gpm/ft)
7. Motor Synchronous Speed (rpm)
   (maximum operating) 1770
8. Motor Size (hp)
   (minimum @ capacity, estimate) 50
9. The pump shall be Goulds Model 12CHC, or approved equal.

D. The following design parameters shall be utilized for the preliminary two (2) high lift pump selection:

1. Pump Setting (ft.)
   (to top of bowls from FF elev.) 8
2. Pump Capacity (gpm)
   (minimum @ bowl efficiency) 1200
3. Pump Head (ft.)
   (total dynamic head) 260
4. Bowl Efficiency (%)
   (minimum @ capacity) 83
5. Static & Pumping Water Level (ft.)
   (below FF elev) 1 @ 900 gpm
   (match well pump and high lift pump capacity, operate simultaneously)
6. Motor Synchronous Speed (rpm)
   (maximum operating) 1770
7. Motor Size (hp)
   (minimum @ capacity, estimate) 125
8. The pump shall be Goulds Model 12CHC, or approved equal.

2.03 MOTOR

A. The motor shall be drip proof, Starter Code G, and have Class F insulation, vertical hollow shaft, ball-bearing fitted heavy thrust motor designed for 460 volt, three phase, 60 cycle current meeting the requirements for NEMA WP-1 motors.

1. The motor shall have a minimum service factor of 1.15 and a minimum full load efficiency of 94 percent as determined by NEMA Procedure IEEE 112 Test Method B. A premium efficient type motor with cast iron construction and all copper windings is required.
2. A thrust bearing of ample capacity to carry the weight of all rotating parts plus the hydraulic thrust shall be incorporated as an integral part. The bearing shall be of such capacity that the AFBMA calculated rating life shall be no less than 8800 hr. All bearings shall be sealed and may be either oil

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or grease lubricated. The motor shall be equipped with a vis-o-lube window for quick check of oil level when oil lubricated.

B. Motor shall have a ball-style non-reverse ratchet for backspin prevention. Contractor shall provide a self-release coupling if the design or operating conditions indicate upthrust will occur.

C. The motor shall be inverter duty rated for use with a variable frequency drive.

D. The motor shall be manufactured in its entirety by the motor manufacturer whose name shall appear on the nameplate. The motor shall be suited to operate with the starting equipment furnished under this contract. Motor manufacturer shall be G.E., U.S. or equal.

2.04 DISCHARGE HEAD

A. A suitable pump head of high grade, close-grained, cast iron of rugged design, ASTM A48, Class 30 shall be provided for mounting the motor and supporting the pump column, bowls and suction pipe. The above ground outlet shall be 10 inches diameter, flanged, and drilled to match 150 pound ANSI connections. Also, the discharge flange shall have a 1/4 inch NPT connection for a pressure gauge in the discharge flange, a 1/2 inch NPT connection for a an airline, and a 1 1/4 inch NPT connection for level transducer.

B. The design shall permit the drive shaft to be coupled above the stuffing box to facilitate easy removal and replacement of the driver. The cast iron stuffing box shall be of the deep bore type with a minimum of six rings of packing and a seal cage. Connections for grease inlet and pressure relief shall be provided. The packing gland shall be the bronze split type and secured in place with ASTM A193, Grade B8 stainless steel studs and silicon bronze nuts. The stuffing box bearing shall be ASTM B505, Alloy 836 bronze and shall be renewable. A water slinger shall be provided to protect the motor.

C. The pump head shall be equipped with a separate 150 pound ANSI base flange designed to be welded to the 16 inch diameter well head casing and prevent leaking of the flowing well. The base plate shall be grouted permanently into the concrete foundation.

2.05 DISCHARGE COLUMN ASSEMBLY

A. The column pipe and shaft assembly shall be provided to the top of the bowls. The pump column shall be 10 inches in diameter and shall be Schedule 40. Column pipe shall be of ASTM A53, Grade A steel pipe. Ends shall be machined with 8 threads per inch with a 1/8 inch taper and faced parallel to butt against machined shoulders in the column couplings. Column piping and coupling shall be epoxy coated. Epoxy coating shall meet AWWA C210 Standards. Column pipe and shaft lengths shall not exceed 10 feet and shall be interchangeable. Top and bottom sections of column pipe shall not exceed 5 feet.

B. The upper end of bottom and intermediate column pipes shall be fitted with couplings of ASTM A108, Grade 1020 steel. Provide lineshaft bearings at each column coupling. The bearing shall be spaced at intervals of not more than 10 feet. The bearing shall be centered accurately in the discharge column by retaining it in a drop-in style bronze spider. The shaft bearing shall be designed for vertical turbine pump service, to be lubricated by the liquid pumped. The line shaft bearing shall be of synthetic rubber and be held in bearing holder without the use of auxiliary collars or rings. The internal shape of the bearing shall be a polygon to provide minimum friction contact to the shaft sleeves. Replacement bearings shall be capable of being installed by hand without special tools.

C. Line shafts shall be of ASTM A108, Grade 1045, stainless steel ground and polished with a surface finish not to exceed 40 rms. Shaft diameter selection shall be based on a combined shear stress of not more than 18 percent of the ultimate strength or not in excess of 30 percent of the elastic limit in tension. Intermediate shaft sections shall be interchangeable and shall not exceed 10 feet in length. The butting ends shall be machined square to the axis of the shaft and faces shall be recessed to threaded from solid steel bars, and designed with a safety factor 1-1/2 times the shaft safety factor. Threads shall be left hand to tighten during pump operation. The couplings shall be without vent holes. The shaft shall be provided with an ASTM A743 Type 304 stainless steel sleeve to act as a journal for each rubber line shaft bearing. The sleeve shall be

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placed on a full size shaft without undercutting and secured in position by a suitable adhesive. Replacement sleeves shall permit field installation without special tools. The size of the shaft and the spacing of bearings shall be such as to prevent any whipping of the shaft. The line shaft couplings shall be ASTM A276 Type 316 or 416 stainless steel.

2.06 BOWLS AND IMPELLERS

A. The pump bowl assembly shall be of a size that will readily pass into a 17 inch diameter well. Pump bowls, suction and discharge cases shall be of close grained cast iron equivalent to ASTM A48, Class 30, without imperfections. For pump sizes 8 inches through 15 inches, the bowl water passages shall be porcelain enamel coated to provide optimum performance and consistency of output. For pumps 8 inches and larger, the suction case and intermediate bowls shall be fitted with replaceable wear rings of bronze, ASTM B584, alloy 876.

1. Wear rings shall have the minimum practical clearance to the mating cylindrical surface of the impeller to provide adequate sealing independent of vertical positioning of the impellers.
2. Bowls and cases shall have bronze sleeve type bushings to support and guide the shaft. Bushing material shall be bronze, ASTM B584, alloy 876. The suction case bearing shall be grease packed with provision for grease circulation from a reservoir in the suction case hub. A sand collar of rubber or bronze, ASTM B584, alloy 876 shall be provided to protect the suction case bearing from abrasive in the liquid pumped. The discharge case shall have vanes to deliver the flow of water with minimum turbulence. The intermediate stages shall be selected to provide the maximum efficiency with least number of stages. Impeller shall be of the enclosed type, stainless steel, Type 316, machined, mechanically balanced, hydraulically balanced, and filed for optimum performance and minimum vibration. The design shall be non-overloading for the capacity of the motor selected. The impeller shall be securely fastened to the bowl shaft with taper collets of ASTM A582, Type 416 stainless steel.
3. Bowl shaft shall be of sufficient diameter to transmit the pump horsepower with a liberal safety factor and rigidly support the impellers between the bowl or case bearings. The bowl shaft material shall be high chrome stainless steel of ASTM A276, Type 410.

B. Impellers shall be trimmed to meet the pumping characteristics specified. All surfaces for contact shall be in full bearing, metal spacers; washers will not be allowed.

2.07 STRAINER

A. Contractor shall provide a strainer which shall thread onto the bottom of the bowl assembly. Strainer shall be corrosion resistant material and shall have a net inlet area of at least three times the suction pipe area.

B. Maximum openings in the strainer shall not be more than 75 percent of the minimum opening of the water passage through the bowl or impeller.

2.08 AIR LINE AND ALTITUDE GAUGE – WELL #9

A. A 1/2 inch O.D. airline constructed of double braded neoprene or HPDE rated for 400 psi working pressure with necessary fittings, an altitude gauge and a hand air pump shall be provided. The air line shall be securely fastened to column pipe with nylon ties, or waterproof plastic tape, at five foot intervals. One spare air line shall be installed. Air line shall extend to the top of the pump bowls.

B. The altitude gauge shall be not less than 4 inches in diameter and shall have a sufficient range to show the water level anywhere between standing water level and the bottom of the airline. The gauge is to read in feet and have an extra red hand adjustable to indicate static water level.

2.09 LEVEL TRANSDUCER AND MESSENGER CONDUIT – WELL #9

A. Level transducer and cable shall be supplied by Division 26. Verify diameter of conduit with Division 26 contractor.

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B. Install a 1-1/4-inch Schedule 40 PVC level transducer conduit. Conduit shall be banded to the column pipe every 10 vertical feet with ½" stainless steel bands.

C. The upper end of the conduit shall terminate in a way that allows for removal of pump and motor either by:
   1. Terminating the conduit 12-inches below the discharge head, and securing cable with a hanger and/or locking grip. A connector and slack shall be provided for times of removing the motor.
   2. Connecting the top of the conduit to a nipple in the discharge plate.

D. The lower end of the conduit shall terminate at the top of bowls. Bottom of conduit shall have a bolt or pin such that the weight of the transducer rests on the bolt or pin.

2.10 PRESSURE GAUGE

A. Contractor shall provide a pressure gauge specifically manufactured for this type of use. Gauge shall read in feet of water and psi, and its range shall be twice the anticipated pumping head. The gauge shall be a minimum of 4 inches diameter with increments of 1 psi.

B. The gauge accuracy shall be a ±1 percent of pressure for full scale.

2.11 WELL VENT

A. A mushroom cap-style screened well vent shall be provided. the vent shall terminate at least 24 inches above the floor. Minimum diameter of the vent piping shall be 2 inch, and shall protrude through the concrete pump base as shown on the Contract Drawings. Screen shall be 24-mesh corrosion resistant.

2.12 TOOLS AND LUBRICATING EQUIPMENT

A. The Contractor shall furnish all tools, one container of each type of lubricant used, and lubricating equipment required for regular maintenance of the pump and motor.

2.13 FINISH

A. All exposed surfaces of pumping machinery shall be painted with one (1) coat of metal filler and two (2) coats of the best grade of machine enamel.

B. All other surfaces shall have a corrosion resisting finish approved by the Engineer.

PART 3 CONSTRUCTION METHODS

3.01 PUMP BASE

A. The Contractor shall submit to the Engineer, detailed information or a template for anchor bolt locations and sizing.

B. It shall be the Contractor's responsibility after leveling the turbine pump to grout in the pump with non-shrink grouting proportioned for a minimum compressive strength of 4000 psi.

3.02 VERTICAL TURBINE PUMP

A. The well will be reasonably vertical, but the Contractor may check the alignment of the well and submit a report to the Engineer in case he finds it out of plumb or alignment so as to affect the performance or wear of the pump. If no such report, in writing, stating the extent to which the well is out of plumb or alignment is received by the Engineer within seven (7) days from the date of installation of the pump, the Contractor alone will be responsible for the pump in accordance with the specifications.

3.03 TESTING

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A. The pump shall be tested after installation to check the guaranteed performance. The Contractor shall furnish and install all gauges and accessories required for this test and shall run the pump as directed by the Engineer.

1. A wire to water efficiency shall be calculated by the Contractor and submitted to the Engineer for acceptance review.
2. A field performance test data shall be conducted by the Contractor with data obtained from at least three different operating points for comparison with pump curves.
3. A vibration test shall be performed on the equipment when set in final position. Vibrations at any point on the equipment greater than 0.2 inches per second (peak) shall be cause for rejection. The Contractor shall be responsible for all adjustments or replacements necessary.

B. Any defects in the equipment or failure to meet the guarantees or requirements of the specifications shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled their obligations under the contract shall be final. If the Contractor fails or refuses to make these corrections or if the improved equipment, when tested shall again fail to meet the guarantees of the Contractor, the Owner, notwithstanding its Ownership of work and materials which have entered into the manufacture of said equipment, shall have the option of rejecting said equipment or of accepting the same at such reduced price as may be agreed upon by the parties hereto.

C. In case the Owner exercises its option and rejects said equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him for said rejected equipment, on progress certificates or otherwise, on account of the lump sum prices herein specified, and upon the receipt of said sum of money, the Owner will execute and deliver to the Contractor a bill of all its right, title and interest in and to said rejected equipment: PROVIDED, however, that said equipment shall not be removed from the premises of the Owner until the Owner obtains from other sources other equipment to take the place of that rejected. The Owner hereby agrees to obtain said other equipment within a reasonable time, and the Contractor agrees that the Owner may use the equipment furnished by him without rental or other charge until said other new equipment is obtained.

D. Bacteriological Test - Well #9. The Contractor shall be responsible for sampling the raw water from the well after pump installation. All costs for bacteriological testing shall be included in the lump sum bid for the Work. Two “safe” water tests with respect to coliform bacteria shall be obtained at an interval of 24-hours apart and the laboratory reports shall be submitted to the Engineer.

E. Bacteriological Test – High Lift Pumps. The Contractor shall be responsible for sampling the water pumped through the high lift pumps. All costs for bacteriological testing shall be included in the lump sum bid for the Work. Two “safe” water tests with respect to coliform bacteria shall be obtained at an interval of 24-hours apart and the laboratory reports shall be submitted to the Engineer.

3.04 EQUIPMENT START-UP

A. Equipment shall be started by a factory-trained representative who shall certify to the Engineer that all equipment is properly installed and the plant operator has been instructed concerning proper operation and maintenance.

3.05 WIRING AND ELECTRICAL

A. The entire electrical installation when completed by the Contractor shall comply with the requirements of the National Electrical Code, and all utility, state and municipal regulations applicable. All necessary permits and inspections required shall be obtained and paid for by the Contractor.

B. The installation and all material used therein shall be in accordance with the current standards of the American Institute of Electrical Engineers and the National Electrical Manufacturer's Association, insofar as they are now applicable and not in conflict with these specifications.

PART 4 MEASUREMENT AND PAYMENT

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4.01 VERTICAL TURBINE PUMP

A. General. Vertical turbine pump shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

1. Vertical Turbine Pump, Inclusive. When no quantity is provided, the vertical turbine pump shall be considered inclusive to payment for work associated with well construction.

B. Full and final payment for the vertical turbine pump and related equipment shall not be made for less than a complete and operating system working at the guaranteed performance.

END OF SECTION

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SECTION 44 42 76.30
MECHANICAL LIFT SLIDE GATE

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Iron and Steel Institute (AISI), Specifications and Standards, Current Edition.
   2. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards:
      a. ASTM A36 - Specification for Structural Steel, Current Edition.
      b. ASTM A48 - Specification for Gray Iron Castings, Current Edition.
      c. ASTM A126 - Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings, Current Edition.
      d. ASTM A276 - Specification for Stainless and Heat-Resisting Steel Bars and Shapes, Current Edition.
      e. ASTM A582 - Specification for Free-Machining Stainless and Heat-Resisting Steel Bars, Hot-Rolled or Cold-Finished.
      f. ASTM B21 - Specification for Naval Brass Rod, Bar and Shapes, Current Edition.
      g. ASTM B98 - Specification for Copper Silicon Alloy Rod, Bar and Shapes, Current Edition.
      h. ASTM B138 - Specification for Manganese Bronze Rod, Bar and Shapes, Current Edition.
      i. ASTM 139 - Specification for Phosphorus Bronze Rod, Bar and Shapes, Current Edition.
      j. ASTM B148 - Specification for Aluminum Bronze Castings, Current Edition.
      k. ASTM B150 - Specification for Aluminum Bronze Rod, Bar and Shapes, Current Edition.
      l. ASTM B584 - Specification for Copper Alloy Sand Castings for General Applications, Current Edition.
      m. ASTM D471 - Test Method for Rubber Property - Effect of Liquids, Current Edition.
      n. ASTM D1149 - Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber, Current Edition.
      o. ASTM D2000 - Classification System for Rubber Products in Automobile Applications, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing slide gates with non-rising stems, frames and accessories as shown on the contract drawings.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Submittals - Division 01

C. Metal Fabrications - Division 05

1.05 SUBMITTALS

A. Preparation of Submittals shall be in conformance with requirements in Submittals - Division 01 of these specifications.

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B. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the equipment. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications.

C. Submittals shall indicate the intended equipment arrangement, major support requirements, plot area, and process flow.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submittal literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance, and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review, an outline of any variations of information for the operation and maintenance manuals and other documentation they propose to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 MANUFACTURERS

A. Acceptable manufacturers shall be Waterman (McWane Plant & Industrial), or equal.
1. Mechanical slide gate shall be Waterman SS-253-1-NT-16x16-10, or Engineer approved equal.

2.02 DESIGN CRITERIA

A. Design and test data to verify the above shall be furnished with the equipment drawing submittal. Manufacturer shall have proof of design test records in accordance with AWWA C513 on file available for submittal.

B. Gates shall have upward opening as shown on the Drawings.

2.03 FRAME

A. The mounted to wall F type thimble style frame as shown on the Drawings shall consist of 1/4 inch minimum thickness type 304L stainless steel incorporating ultra high molecular weight polymer seats/seals and guides on both faces of the slide. Each seal will be shaped to provide two sealing edges which maintain contact with the slide during gate travel.

B. The frame style shall be non-self-contained with separate stem guides and operator.

C. The frame shall positively retain the polymer guide/seal strip and the neoprene loading pad on studs welded to it. Non-loosening (prevailing torque) fasteners shall be used on the gate guide assembly. The guide seal assembly shall be field adjustable and replaceable. The length (vertical height) of the guide shall retain at least 2/3 of the slide height in the full open position.

D. Guide seal shall be UHMW polymer to positively retain the slide and form a tight seal on faceplate edge. Sealing shall be accomplished by the pinching action of the polymer guide/seal on the elastomer loading pad and the fastener cover bar system. Engagement of slide into guide groove shall be minimum of 7/8 inch.

E. The top and bottom seal shall be neoprene rubber molded shape securely attached to the frame. It shall have an elastomer loading pad to ensure contact with the slide plate. Corners or intersections of seals and loading pads shall be interlocked and sealed for leak-proof joint.

F. The frame shall fit a 16” X 16” gate.

2.04 SLIDE

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A. The slide shall be a minimum thickness 1/4 inch type 304L stainless steel plate reinforced with stiffeners as required so that the design head will not deflect more than 1/720 of its width and stress is limited to 12,000 PSI.

2.05 YOKE

A. The yoke shall consist of as a minimum two structural angles welded or bolted to the top of the guides or anchor bolted to the floor. The yoke shall be designed so that its deflection, including the stem offset, under the full operating load will not exceed 1/360th of the span.

2.06 STEM

A. The operating stem shall be of type 304 stainless steel. The stem shall be sized to safely withstand, without buckling or permanent distortion, the stresses induced by normal operating forces. The stem shall have a minimum diameter of 1-1/2 inch with rolled ACME thread, and shall be designed to transmit in compression at least 2.5 times the output of the manual operator with an 80# effort on the handwheel.

B. The stem shall be non-rising

2.07 MANUAL OPERATORS

A. The operator shall be as selected by the gate manufacturer so that the maximum effort to operate the gate does not exceed a 40 pound pull when the gate is subjected to its maximum operating head. The operator will be enclosed in a high-strength cast aluminum housing with tapered roller-type bearings above and below the flange of the bronze operating nut.

1. Non-geared Handwheel Operators: Where required, the handwheel will have a maximum diameter of 15 inch. The operator shall be arranged so that the centerline of the handwheel shall be 24 inch minimum and 36 inch maximum from the operating floor.
2. Geared Crank Operators: Where required, the crank will have a maximum radius of 15 inch. The operator shall be arranged so that the centerline of the crank shall be 36 inch minimum and 48 inch maximum from the operating floor. The geared operator shall have a stainless steel pinion shaft and tapered roller-type pinion bearings. The remote operator drive supplied to meet the previously described height requirements shall be of the chain and sprocket type. The remote operator shall have a aluminum safety guard for any exposed chain, coupling or shafts.

2.08 STEM GUIDES

A. The guide shall be the non-rising stem type and the non-rising stem unit shall be provided with a stem cover. Clear butyrate plastic shall have mylar markings graduated to the 1/2-inch for position indication.

B. All necessary attachment bolts and anchor bolts shall be stainless steel and shall be furnished by the slide gate manufacturer.

C. The stem guide shall be equipped with an alternate hand wheel actuator.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions and approved Submittals.

PART 4 MEASUREMENT AND PAYMENT

4.01 MECHANICAL LIFT SLIDE GATE

A. General. Mechanical lift slide gate shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.

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1. Mechanical Lift Slide Gate, Lump Sum. When so provided, payment for mechanical lift slide gate shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.

END OF SECTION

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SECTION 44 44 16.10
CHLORINATION SYSTEM

PART 1 GENERAL

1.01 APPLICABLE PROVISIONS

A. Applicable provisions of Division 01 shall govern the work of this section.

1.02 APPLICABLE PUBLICATIONS

A. The following publications of the issues listed below, but referred to thereafter by basic designation only, form a part of this specification to the extent indicated by the reference thereto.
   1. American Institute of Electrical Engineers (AIEE), Standards and Specifications, Current Edition.
   2. National Electrical Manufacturer's Associations (NEMA), Standards and Specifications, Current Edition.
   3. National Institute for Occupational Safety and Health (NIOSH) Standards and Specifications, Current Edition.

1.03 DESCRIPTION OF WORK

A. The work under this section shall cover furnishing and installing a chlorination system, complete as indicated on the contract drawings and specified herein.

B. Pre-Chlorine
   1. Solution feed water from the building water service as shown on the contract drawings mixes with gaseous chlorine fed from a vacuum type chlorinator and is injected into the well discharge pipe as shown on the contract drawings. Chlorine shall be stored in two 150 pound cylinders.

C. Post-Chlorine
   1. An emergency addition of chlorine that gets supplied through high pressure water from a booster pump. The high pressure water from the booster pump shall be mixed with gaseous chlorine and injected as shown on the contract drawings. Chlorine shall be stored in a 150 pound cylinder.

D. Storage
   1. Two stand-by 150-lb gas chlorine cylinders shall be provided to site and stored out of the operating area restrained in position to prevent movement.

1.04 RELATED WORK ELSEWHERE

A. Procurement and Contracting Requirements - Division 00 (All Sections)

B. Plumbing - Division 022

C. Electrical - Division 26

1.05 SUBMITTALS

A. The Contractor shall submit such Submittals and/or catalog cuts required for the construction and installation of the equipment and all components. These drawings shall be accurate in every detail and shall contain all information necessary to relate the equipment to the specifications.

B. The Contractor shall provide a list of all instrumentation and control equipment components to be provided, (only those components required not included in the facility motor control and process control center, MCC/PCC) catalog cuts, and descriptive information for each component.

C. Submittals shall indicate the intended equipment arrangement, equipment dimensions, major support requirements, plot area, and process flow.

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D. Submittals submitted to include materials list, shop printed information, motor data, and wiring diagrams.

1.06 OPERATION/MAINTENANCE MANUALS AND INSTRUCTIONS

A. The manuals shall include operating and maintenance literature for all components provided. The submitted literature shall be in sufficient detail to allow for the installation, operation, adjustment, calibration, maintenance and removal of each component provided.

B. Preparation of this document shall be in conformance with the requirements stated in Submittals - Division 01 of these specifications. The Contractor shall submit to the Engineer for review an outline of any variations of information for the operation and maintenance manuals and other documentation he proposes to prepare.

PART 2 PRODUCTS AND MATERIALS

2.01 ACCEPTABLE MANUFACTURERS

A. Manufacturer of the chlorination system shall have a minimum of five years experience in the construction of municipal and industrial chemical feed systems and shall have successfully completed a minimum of 50 projects involving the manufacturer and installation of chemical feed systems for water and municipal and industrial wastewater.

B. Chlorinator shall be Hydro Series 300, or engineer approved equal.

C. The following primary Hydro Series equipment is anticipated:
1. Three (3) Hydro Instruments 300 Series Cylinder Mounted Vacuum Regulators (2 Pre-chlorine, 1 Post-chlorine).
2. Two (2) Hydro Instruments 300 Series Vacuum Ejectors (1 Pre-chlorine, 1 Post-chlorine).

2.02 OPERATING CRITERIA

A. Chlorination system for pre and post chlorine shall be designed to meet the following conditions:

1.	Chlorination Rate (maximum):	2.31 ppm CL2
2.	Flow Rate:	900 gpm
3.	Chlorinator Capacity:	21.62 lbs per day
4.	Rotameter Capacity:	50 lbs per day

2.03 CHLORINATOR

A. A wall-mounted or scale-mounted vacuum-operated, solution feed unit, and a pressure regulating relief valve shall be provided to maintain normal operating pressures. The chlorinator shall be supplied complete with a rotameter with a scale indicating rate of flow and be capable of controlling the chlorinator over a 20:1 feed range while maintaining a 4 percent accuracy. The gas regulating valve shall be a V-notch variable orifice.

B. Chlorinator shall be vented with polyethylene tubing terminating outdoors, complete with fine mesh insect screen. The chlorinator shall have all valves and controlling apparatus on a factory preassembled and pretested panel.

2.04 AUTOMATIC SWITCHOVER VACUUM REGULATOR (PRE-CHLORINE ONLY)

A. The automatic switchover system shall be all vacuum operated and shall automatically switch chlorine gas feed from an empty container to a full container. The system shall have an automatic reset and shall not permit a return to the initial source until the second source is exhausted. The system shall consist of one switchover module and two vacuum regulators with flow metering tubes for local indication of chlorine gas feed.

B. Vacuum regulators shall have internal switchover built into them. External switchover will not be acceptable.

2.05 CHLORINE LEAK DETECTOR

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A. The chlorine leak detector shall be mounted in the chlorine room with sample unit located 12 inches off the floor and shall be responsive to less than one part per million chlorine by volume in air. In the presence of chlorine, a current shall actuate an alarm light located immediately outside the door to the chlorine room. The alarm contacts shall actuate the chlorine room exhaust fan.

B. The leak detector shall be either solid-state or have a measuring electrode continuously cleaned by gravity flow of an electrolyte. The later type shall be furnished with one gallon of electrolyte, four feet of drain tubing, two packages of activated carbon, and one spare wicking.

2.06 CHLORINE GAS MASK

A. The chlorine gas mask shall be a 30-minute self-contained, full-face, pressure demand type breathing apparatus which meets current NIOSH and State DNR standards. Device to be delivered to the Owner complete with custom molded high density polyethylene case. Acceptable manufacturers are Scott Davis “Air Pac”; Mine Safety Appliances, “Air Mask with Ultravue Facepiece”; or equal.

B. Provide two extra 30-minute steel air tanks compatible for use with masks. Provide wall-mounted FRP storage cabinet for mask as shown on the contract drawings.

2.07 TWO-CYLINDER SCALE (PRE-CHLORINE ONLY)

A. Two-cylinder scale having an accuracy of 1 percent of full scale designed for 150 pound cylinders. Tare weight of cylinders shall be canceled out with adjusting knob so scale reads net weight only.

B. Scale platform shall not be higher than 1-1/2 inches off floor.

C. Scale shall have adjustable cross bar with chains to restrain the cylinders.

2.08 ONE-CYLINDER SCALE (POST-CHLORINE ONLY)

A. One-cylinder scale having an accuracy of 1 percent of full scale designed for 150 pound cylinder. Tare weight of cylinder shall be canceled out with adjusting knob so scale reads net weight only.

B. Scale platform shall not be higher than 1-1/2 inches off floor.

C. Scale shall have adjustable cross bar with chains to restrain the cylinder.

2.09 BOOSTER PUMP

A. One (1) booster pump shall be provided for Post-chlorine.

B. Booster pump shall be Grundfos CR3 Series, or engineer approved equal.

2.10 EMERGENCY SHUTOFF SYSTEM

A. Emergency shutoff system shall be provided for Pre-chlorine and Post-chlorine system.

B. Emergency shutoff system for Pre-chlorine shall be Halogen Valve Gemini Emergency Cylinder Shutoff System with one (1) display and two (2) terminator gravity mount shutoffs, or engineer approved equal.

C. Emergency shutoff system for Post-chlorine shall be Halogen Valve Gemini Emergency Cylinder Shutoff System with one (1) display and one (1) terminator gravity mount shutoffs, or engineer approved equal.

2.11 ACCESSORIES

A. Accessories shall include auxiliary cylinder valves, chlorine connection adaptors, polyethylene tubing, gaskets, vent hose and screen, safety chains, and special wrenches.

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B. Provide a leak repair kit suitable for use on 150 pound cylinders.

2.12 PIPING

A. Piping shall be as shown on the contract drawings and as recommended by the manufacturer. The ejector water supply line shall contain a check valve, Y-strainer, pressure gauge (0-200 psi), manual shut-off valves on each side of the booster pump if applicable, and solenoid operated ball valve. Also provide fixed-thread injector, diffuser, and fittings (including corporation stop) for point of application.

2.13 CHLORINE TESTING EQUIPMENT

A. Provide one portable test kit for measuring the chlorine residual in the water supply. Test kit shall include SL250 Single-Port Portable Parallel Analyzer (PPA) Model 9430250 by Hach Company, Loveland, Colorado, or approved equal. Test kit shall include carrying case.

B. Provide Chemkey Reagents compatible with Hach SL250
   1. Free Chlorine Chemkey Reagents Product Number 9429000
   2. Total Chlorine Chemkey Reagents Product Number 9429100

PART 3 EXECUTION

3.01 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions and approved Submittals. All equipment shall be by the same manufacturer and the manufacturer shall be responsible for an operable system.

B. All readouts shall be at eye level without the use of a pedestal.

3.02 EQUIPMENT START-UP

A. The equipment shall be started by a factory-trained representative who shall certify to the Engineer that all equipment is properly installed and the operator has been instructed concerning proper operation and maintenance.

B. A written covering the representative's activities and installation approval shall be submitted to the Engineer. This report shall cover all inspections and outline in detail any deficiencies in the installation.

3.03 ELECTRICAL

A. The entire electrical installation when complete by the Contractor shall comply with the requirements of the National Electrical Code and all utility, municipal and state regulations applicable. All necessary permits and inspections required shall be obtained and paid for by the Contractor. The installation and all material used therein shall also be in accordance with the current standards of the American Institute of Electrical Engineers and the National Electrical Manufacturer's Association, insofar as they are now applicable and not in conflict with these specifications.

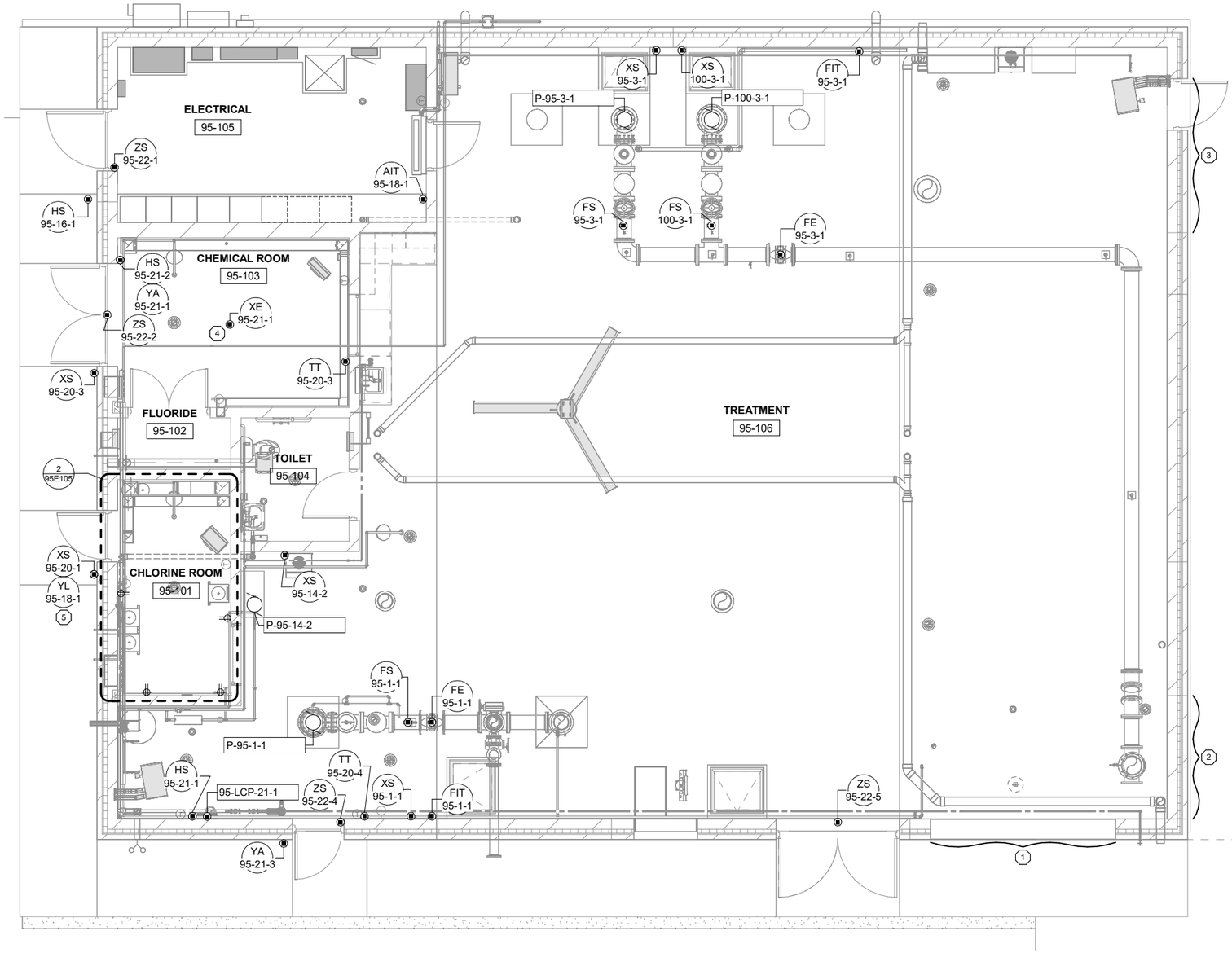
PART 4 MEASUREMENT AND PAYMENT

4.01 CHLORINATION SYSTEM

A. General. Chlorination system shall be paid for at the bid price in accordance with one of the following methods, unless indicated otherwise in the Bid Schedule or Special Procedures - Division 01.
   1. Chlorination System, Lump Sum. When so provided, payment for chlorination system shall be made at the contract lump sum price bid or as specified in Special Procedures - Division 01.
   2. Chlorination System, Inclusive. When no quantity is provided, chlorination system shall be considered inclusive to payment for work associated with plumbing.

END OF SECTION

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95 - GROUND LEVEL - PROCESS ELECTRICAL PLAN

1/4" = 1'-0" (22" x 34") 0 2 4 8
1/8" = 1'-0" (11" x 17")

GENERAL NOTES:

A. IF DIMENSIONS ARE IN QUESTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CLARIFICATIONS FROM THE ENGINEER BEFORE CONTINUING WITH CONSTRUCTION.

B. 120V HOMERUN WIRING SHALL BE MINIMUM OF (2) #12 & #12G IN 3/4"C UNLESS OTHERWISE NOTED. SIZE FOR VOLTAGE DROP.

C. SEE ONE-LINE DIAGRAMS, PANEL SCHEDULES, AND FIELD DEVICES WIRING SCHEDULES FOR WIRING OF ALL PROCESS AND INSTRUMENTATION EQUIPMENT.

D. INSTALL FIELD INSTRUMENTS PER DETAIL REFERENCED IN FIELD DEVICE WIRING SCHEDULE.

E. REFER TO SECTION 26 05 00 FOR CONDUIT, BOX AND HARDWARE USAGE REQUIREMENTS FOR THE ENVIRONMENT CLASSIFICATION SCHEDULED FOR EACH SPACE. "EXISTING CONSTRUCTION - WET" CLASSIFICATION SHALL APPLY TO ANY UNLISTED SPACE AND TO ALL SPACES DEPICTED WHERE NO ENVIRONMENT CLASSIFICATION SCHEDULE IS PRESENT ON THIS PLAN.

ENVIRONMENT CLASSIFICATIONS

SPACE NUMBER	SPACE NAME / DESCRIPTION	ENVIRONMENT CLASSIFICATIONS
95-101	CHLORINE ROOM	NEW CONSTRUCTION - CORROSIVE
95-102	FLUORIDE	NEW CONSTRUCTION - CORROSIVE
95-103	CHEMICAL ROOM	NEW CONSTRUCTION - CORROSIVE
95-104	TOILET	NEW CONSTRUCTION - DAMP
95-105	ELECTRICAL	NEW CONSTRUCTION - DRY
95-106	TREATMENT	NEW CONSTRUCTION - DAMP

KEY NOTES (X)

1 **12'-0" AREA OF BREAKOUT WALL, REFER TO ARCHITECTURAL DRAWINGS. NO CONDUIT MAY BE INSTALLED WITHIN THE BREAKOUT AREA OR WITHIN 6-INCHES OF EDGE.**

2 **8'-0" AREA OF FUTURE OPENING, REFER TO ARCHITECTURAL DRAWINGS. NO CONDUIT MAY BE INSTALLED WITHIN THE BREAKOUT AREA OR WITHIN 6-INCHES OF EDGE.**

3 **10'-0" AREA OF FUTURE OPENING, REFER TO ARCHITECTURAL DRAWINGS. ROUTE CONDUIT TO MINIMIZE THE AMOUNT WITHIN THE BREAKOUT AREA AND EXTENDING 6-INCHES FROM ALL EDGES.**

4 **COORDINATE SMOKE DETECTOR MOUNTING LOCATION WITH LIGHTING PLAN. MOUNT PER MANUFACTURER'S REQUIREMENTS. REFER TO SHEET 95E101.**

5 **MOUNT SO THAT ALARM STROBE IS 9'-0" ABOVE GRADE. CONFIRM MOUNTING HEIGHT WITH OWNER.**

PLOT DATE: 12/19/2025 14:19:43 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007_07_ELECTRICAL_OVERALL_MODEL_R24.rvt

PROJECT DATE:	DEC 23, 2025	DRAWN BY:	CJC
		DESIGNED BY:	CJC
		CHECKED BY:	LET

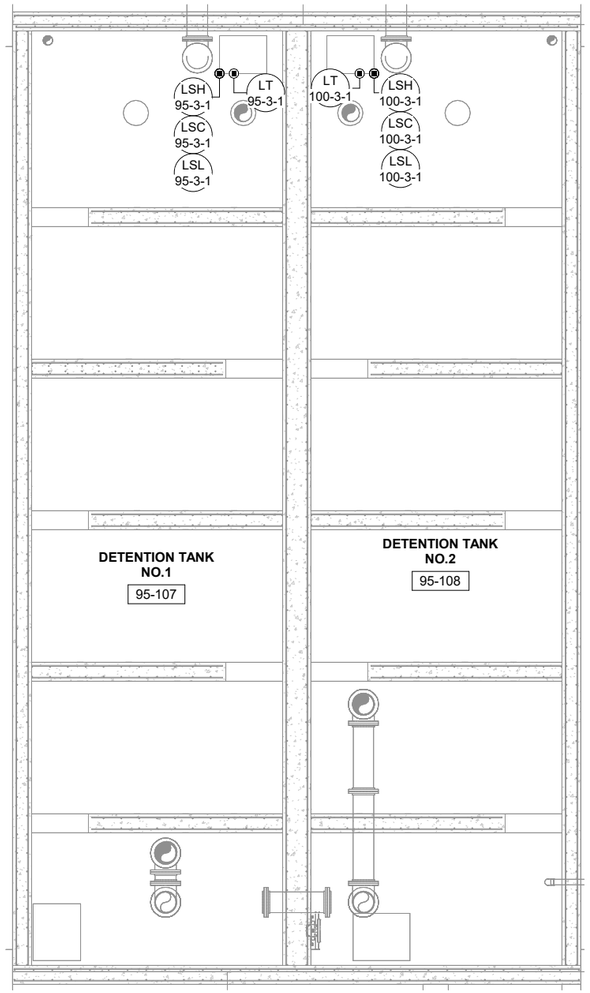
No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

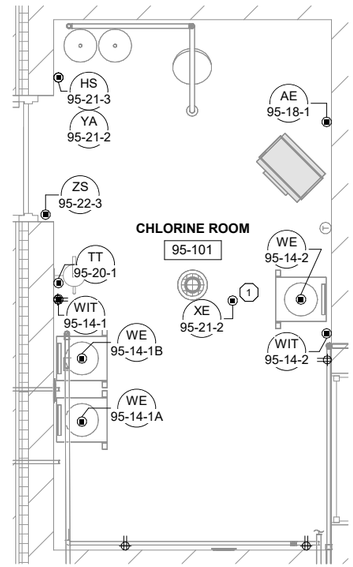
WELL AND BUILDING PROCESS ELECTRICAL PLAN

PROJECT NO. 05323007.1
SHEET 95E104



95 - BELOW GRADE - PROCESS ELECTRICAL PLAN

1/4" = 1'-0" (22" x 34") 0 2 4 8
1/8" = 1'-0" (11" x 17")



95 - CHLORINE ROOM - ENLARGED PROCESS ELECTRICAL PLAN

1/2" = 1'-0"

GENERAL NOTES:

A. IF DIMENSIONS ARE IN QUESTION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING CLARIFICATIONS FROM THE ENGINEER BEFORE CONTINUING WITH CONSTRUCTION.

B. 120V HOMERUN WIRING SHALL BE MINIMUM OF (2) #12 & #12G IN 3/4"C UNLESS OTHERWISE NOTED. SIZE FOR VOLTAGE DROP.

C. SEE ONE-LINE DIAGRAMS, PANEL SCHEDULES, AND FIELD DEVICES WIRING SCHEDULES FOR WIRING OF ALL PROCESS AND INSTRUMENTATION EQUIPMENT.

D. INSTALL FIELD INSTRUMENTS PER DETAIL REFERENCED IN FIELD DEVICE WIRING SCHEDULE.

E. REFER TO SECTION 26 05 00 FOR CONDUIT, BOX AND HARDWARE USAGE REQUIREMENTS FOR THE ENVIRONMENT CLASSIFICATION SCHEDULED FOR EACH SPACE. "EXISTING CONSTRUCTION - WET" CLASSIFICATION SHALL APPLY TO ANY UNLISTED SPACE AND TO ALL SPACES DEPICTED WHERE NO ENVIRONMENT CLASSIFICATION SCHEDULE IS PRESENT ON THIS PLAN.

ENVIRONMENT CLASSIFICATIONS

SPACE NUMBER	SPACE NAME / DESCRIPTION	ENVIRONMENT CLASSIFICATIONS
95-101	CHLORINE ROOM	NEW CONSTRUCTION - CORROSIVE
95-107	DETENTION TANK NO.1	NEW CONSTRUCTION - WET
95-108	DETENTION TANK NO.2	NEW CONSTRUCTION - WET

KEY NOTES ⓧ

1 COORDINATE SMOKE DETECTOR MOUNTING LOCATION WITH LIGHTING PLAN. MOUNT PER MANUFACTURER'S REQUIREMENTS. REFER TO SHEET 95E101.

PLOT DATE: 12/10/2025 14:10:46 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007_07_ELECTRICAL_OVERALL_MODEL_834.rvt

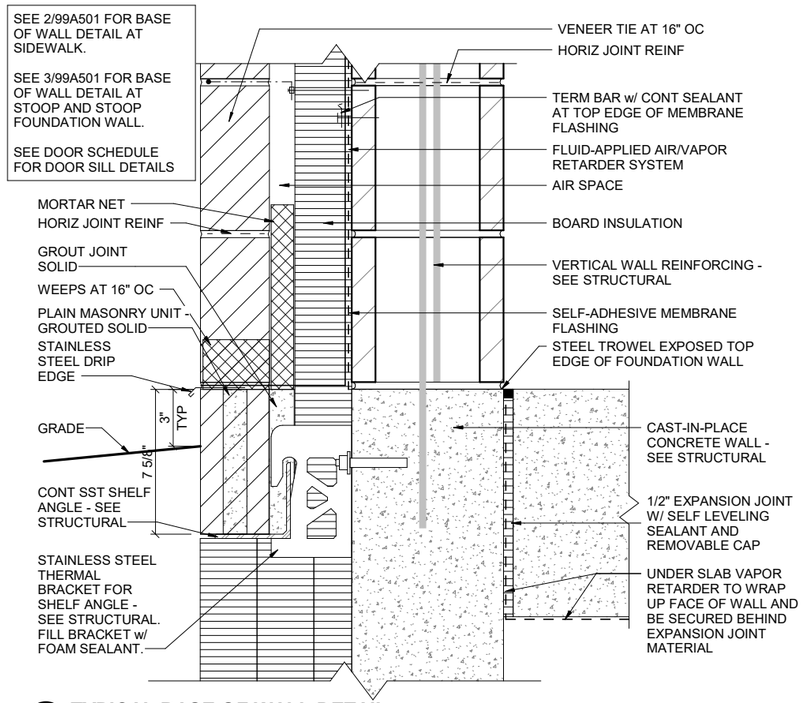
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PROJECT DATE:	DEC 23, 2025	DRAWN BY: CJC				
		DESIGNED BY: CJC				
		CHECKED BY: LET				

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
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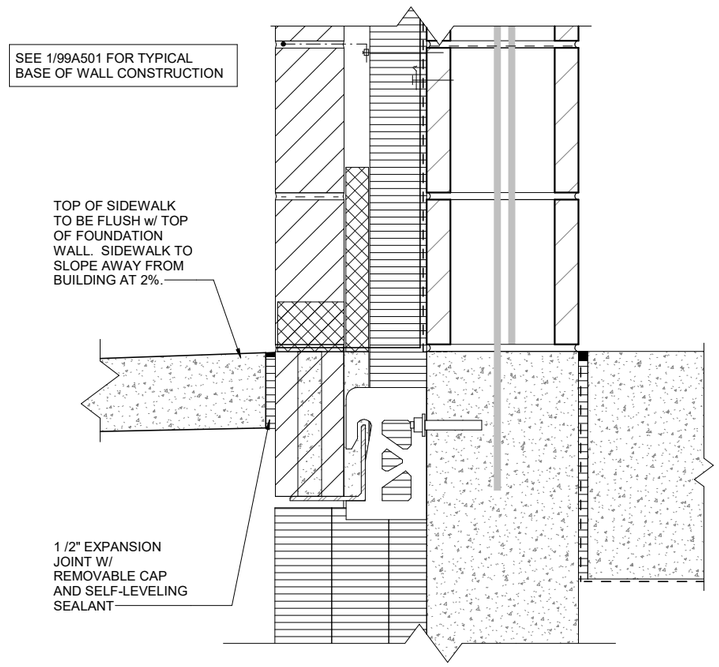
WELL AND BUILDING PROCESS ELECTRICAL PLAN

PROJECT NO. 05323007.1
SHEET 95E105



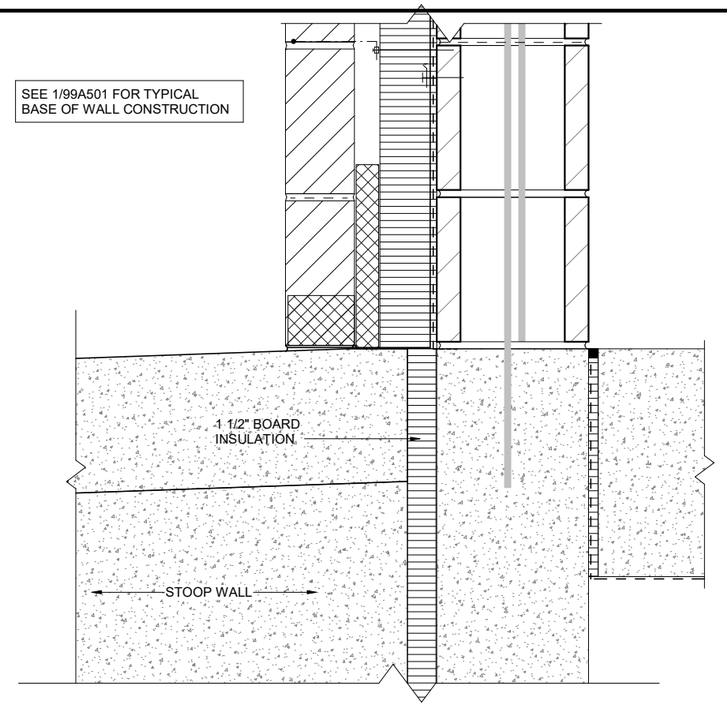
1 TYPICAL BASE OF WALL DETAIL

99A501 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



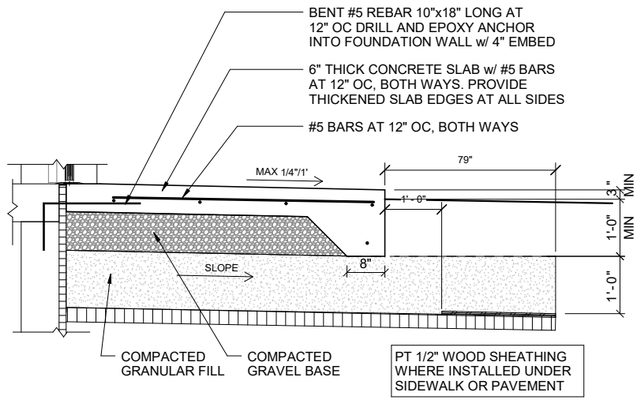
2 BASE OF WALL DETAIL - AT SIDEWALK

99A501 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



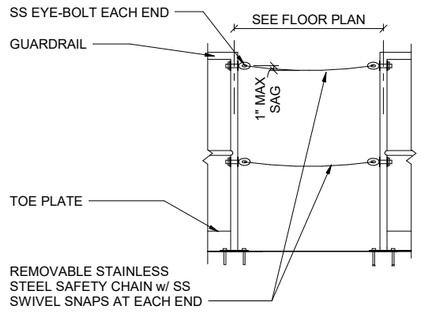
3 BASE OF WALL DETAIL - AT STOOP AND STOOP FOUNDATION WALL

99A501 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



4 FLOATING STOOP SLAB DETAIL

99A501 NONE



5 REMOVABLE SAFETY CHAIN

99A501 NONE

PROJECT DATE:	DEC 23, 2025	DRAWN BY:	CKW
		DESIGNED BY:	XL
		CHECKED BY:	CJW

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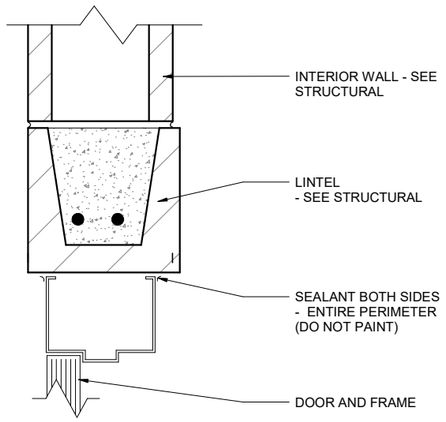
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WELL #9 WATER TREATMENT FACILITY - PHASE 1
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STANDARD DETAILS AND SCHEDULES
ARCHITECTURAL DETAILS

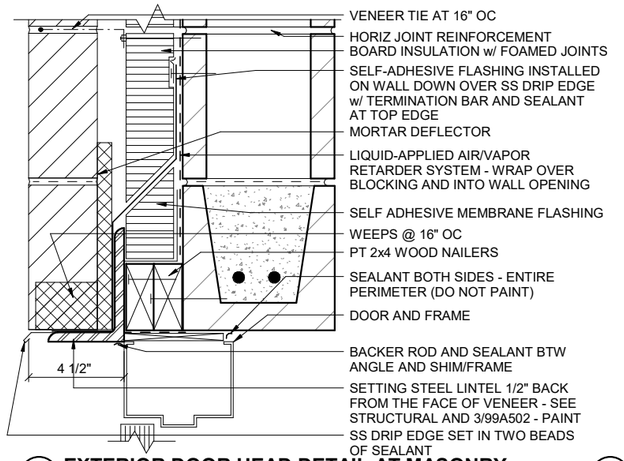
PROJECT NO. 05323007.1
SHEET 99A501

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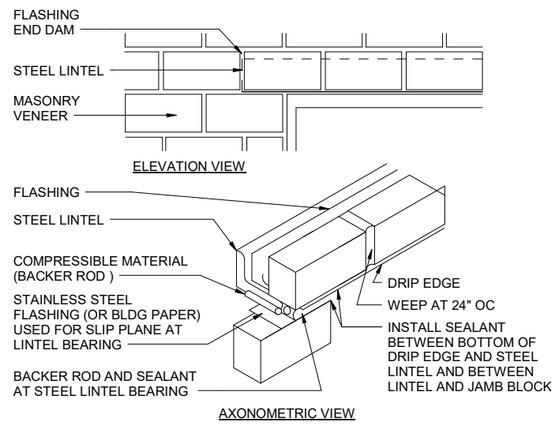
1 INTERIOR DOOR HEAD DETAIL - CMU

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



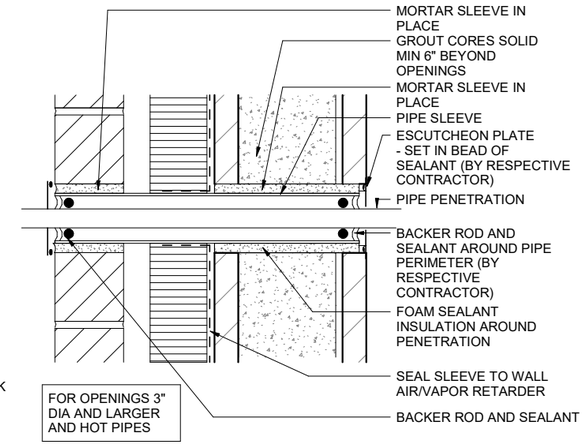
2 EXTERIOR DOOR HEAD DETAIL AT MASONRY

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



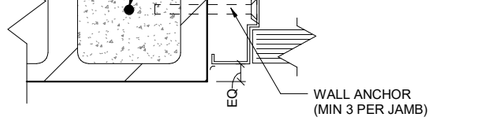
3 TYP EXTERIOR MASONRY CAVITY WALL OPENING HEAD AT JAMB DETAIL

99A502 3/4" = 1'-0" (22"x34") 3/8" = 1'-0" (11"x17") 0 6" 1' 2' 3'



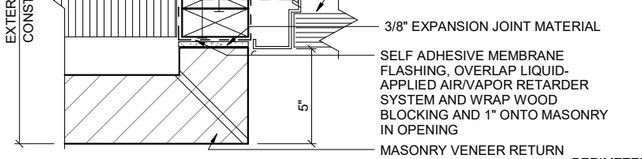
4 EXTERIOR WALL PENETRATION SLEEVE DETAIL

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



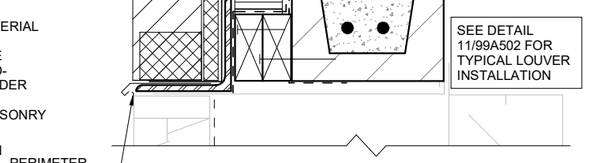
5 INTERIOR DOOR JAMB DETAIL - CMU

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



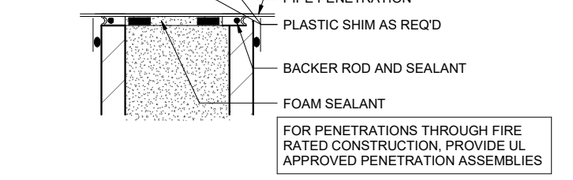
6 EXTERIOR DOOR JAMB DETAIL AT MASONRY VENEER

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



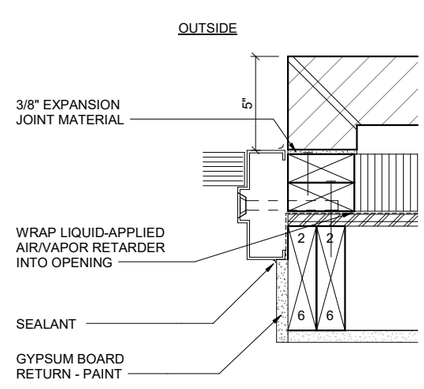
7 EXTERIOR LOUVER HEAD DETAIL

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



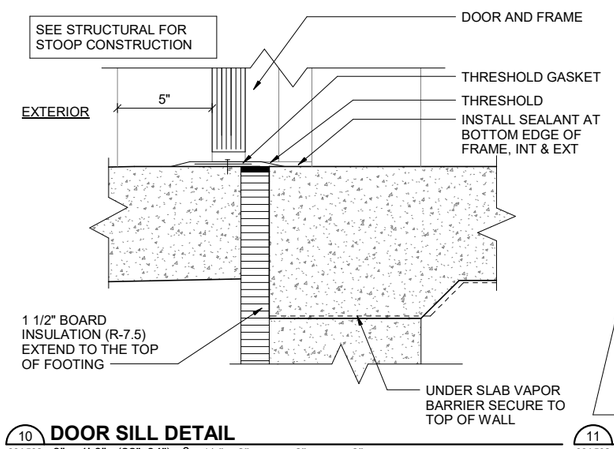
8 INTERIOR WALL PENETRATION DETAIL

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



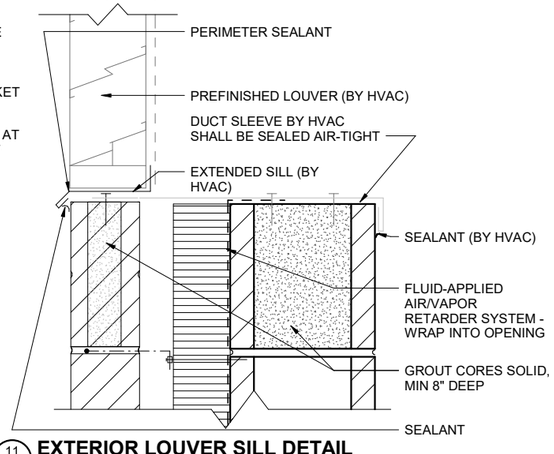
9 DOOR JAMB DETAIL AT FUTURE OPENING

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



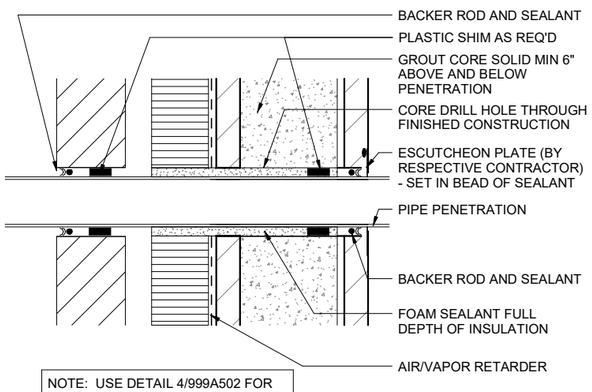
10 DOOR SILL DETAIL

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



11 EXTERIOR LOUVER SILL DETAIL

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



12 EXTERIOR WALL PENETRATION DETAIL

99A502 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"

PLOT DATE: 12/20/2025 8:35:54 AM - Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007 Menomonie Well #9_ARCH_R24.rvt

PROJECT DATE:	DEC 23, 2025
DRAWN BY:	CKW
DESIGNED BY:	XL
CHECKED BY:	CJW

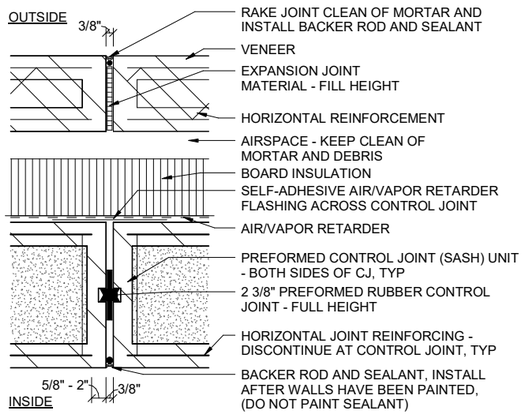
No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
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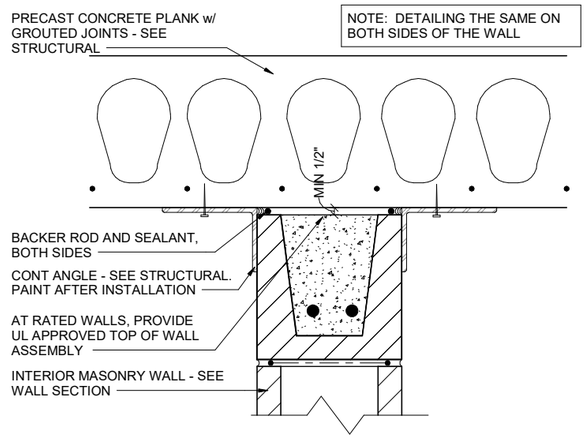
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ARCHITECTURAL DETAILS

PROJECT NO. 05323007.1
SHEET 99A502



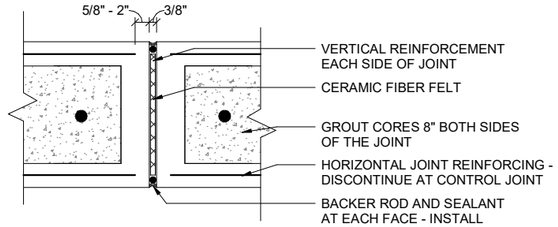
1 EXT WALL CONTROL JOINT (CJ) DETAIL

99A503 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



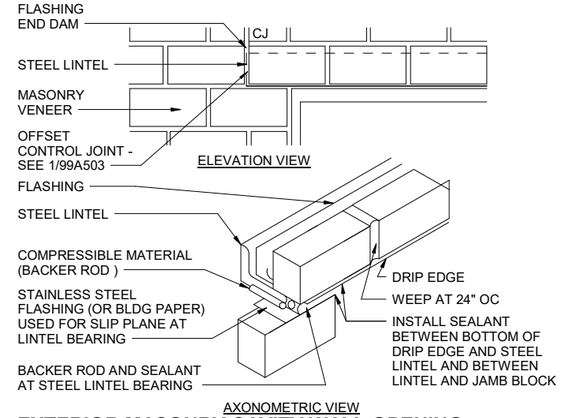
2 TOP OF INTERIOR CMU WALL DETAIL (PRECAST)

99A503 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



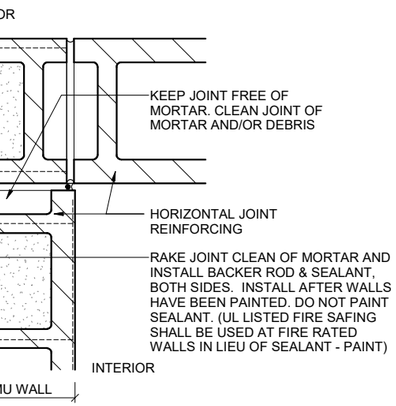
3 INTERIOR FIRE-RATED WALL CONTROL JOINT (CJ) DETAIL (ASTM E 119 4-HOUR)

99A503 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



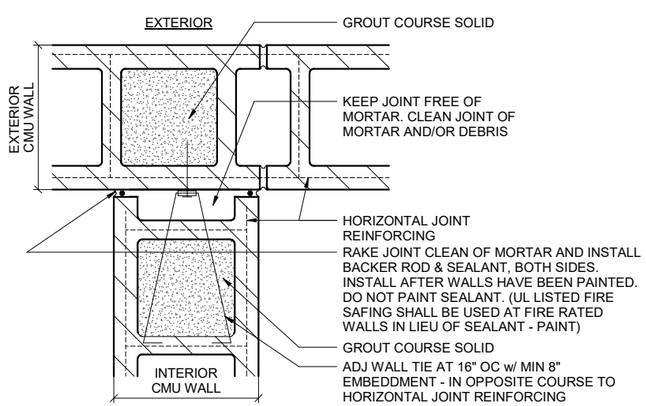
4 EXTERIOR MASONRY CAVITY WALL OPENING HEAD AT JAMB DETAIL

99A503 3/4" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



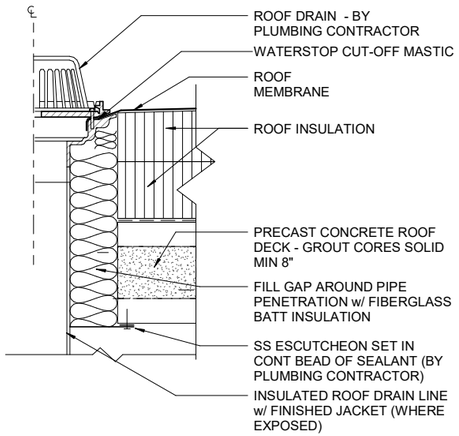
5 INTERIOR/INTERIOR CMU INTERSECTION CONTROL JOINT (CJ) DETAIL

99A503 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



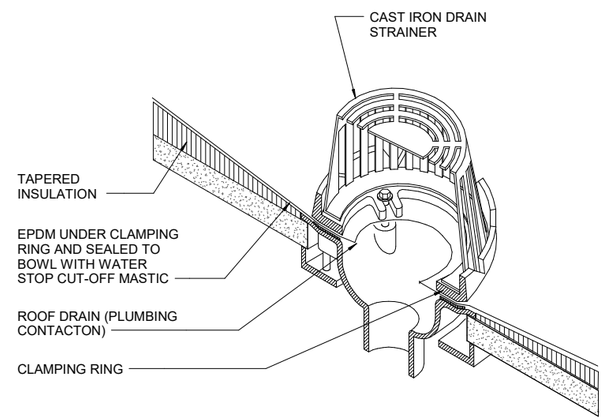
6 EXTERIOR/INTERIOR CMU INTERSECTION CONTROL JOINT (CJ) DETAIL

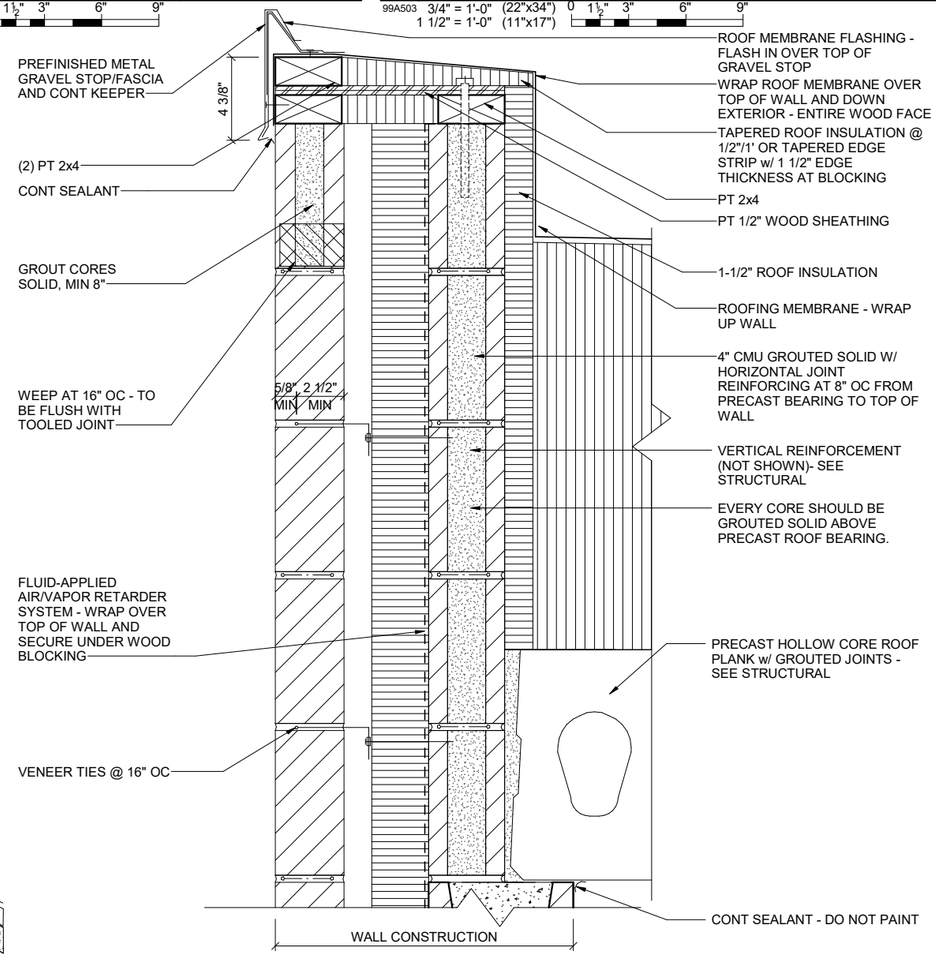
99A503 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



7 TYPICAL ROOF DRAIN DETAIL

99A503 NONE





8 TYPICAL ROOF EDGE DETAIL

99A503 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"

PLOT DATE: 12/2/2025 8:35:55 AM , J:\Autodesk Docs\105323007 City of Menomonie WI Well #9\05323007 Menomonie Well #9_ARCH_R24.rvt

PROJECT DATE: DEC 23, 2025	DRAWN BY: CKW	No	DATE	REVISIONS	BY
	DESIGNED BY: XL				
	CHECKED BY: CJW				

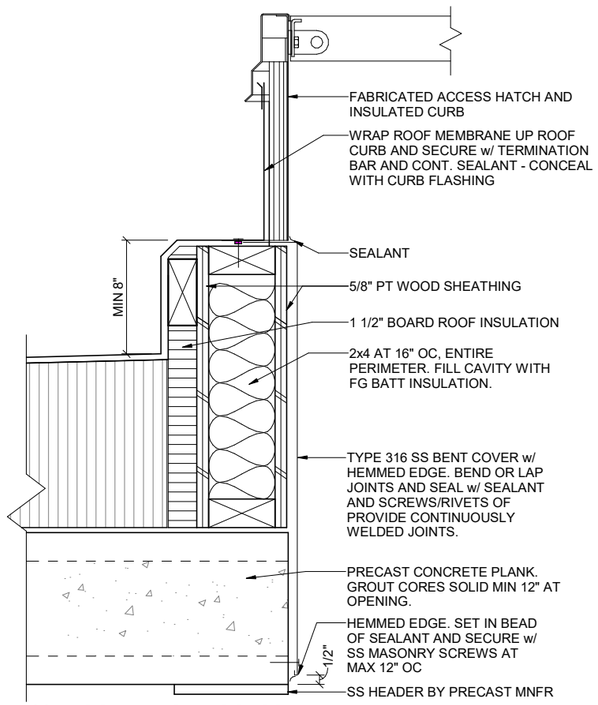
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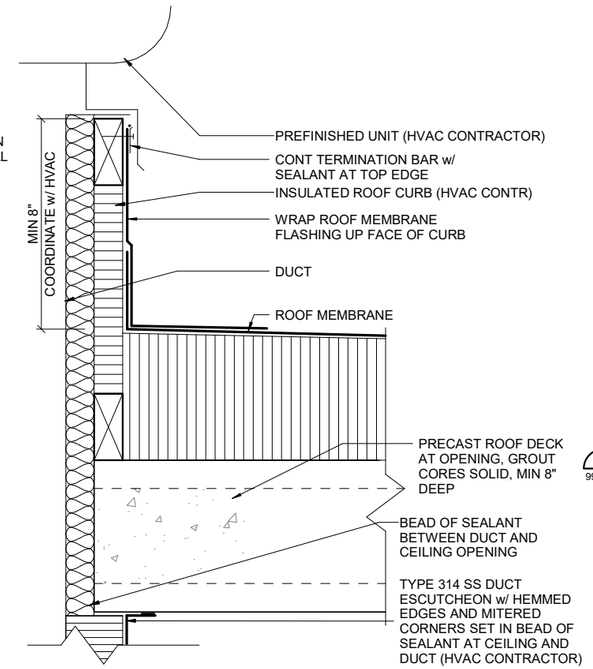
WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WI

STANDARD DETAILS AND SCHEDULES
ARCHITECTURAL DETAILS

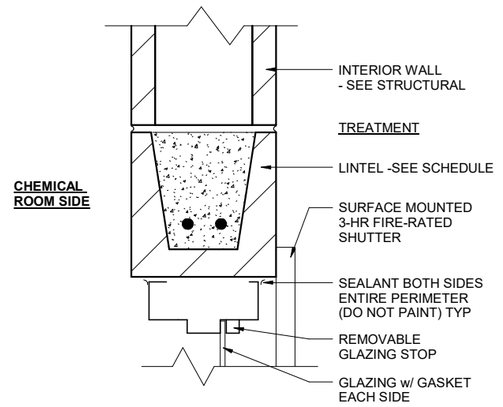
PROJECT NO. 05323007.1
SHEET 99A503



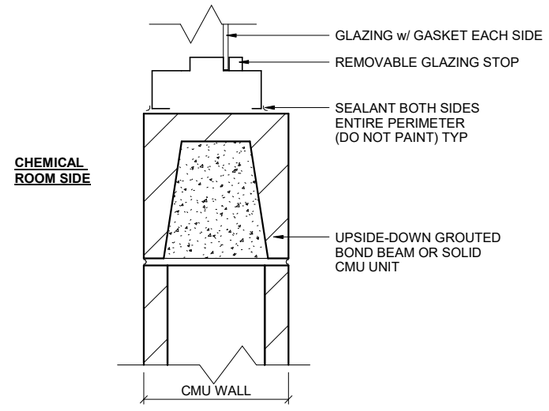
1 **ROOF HATCH ACCESS DETAIL**
99A504 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



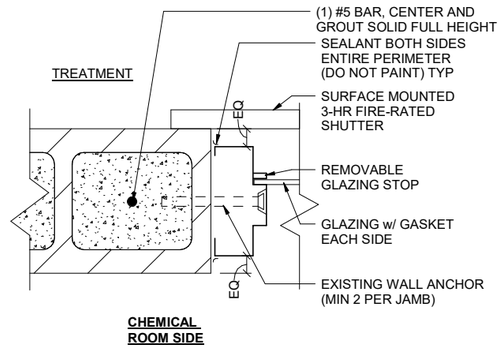
2 **TYPICAL HVAC UNIT ROOF CURB DETAIL**
99A504 NONE



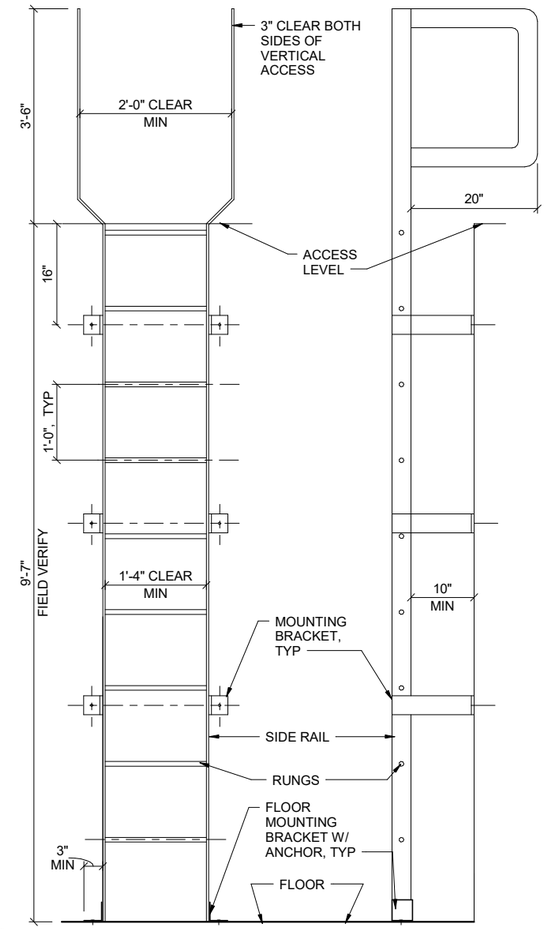
3 **INTERIOR WINDOW HEAD DETAIL**
99A504 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



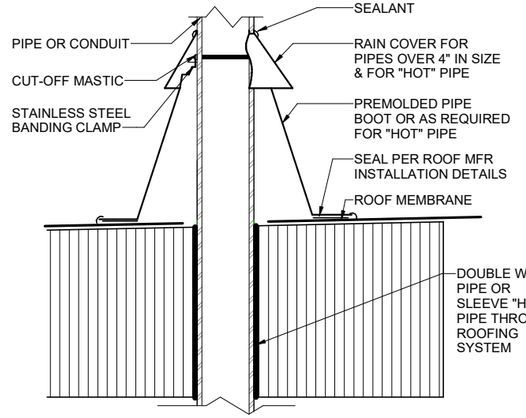
9 **INTERIOR WINDOW SILL DETAIL**
99A504 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



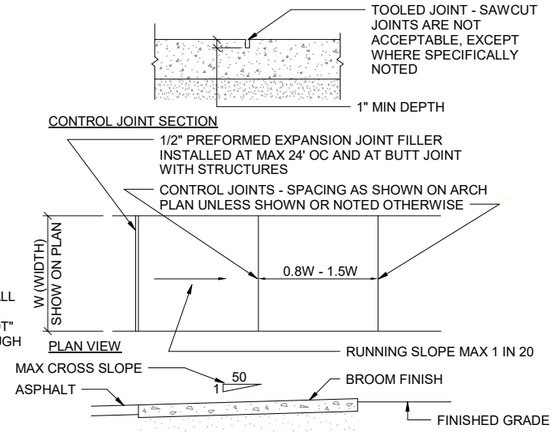
4 **INTERIOR WINDOW JAMB DETAIL**
99A504 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



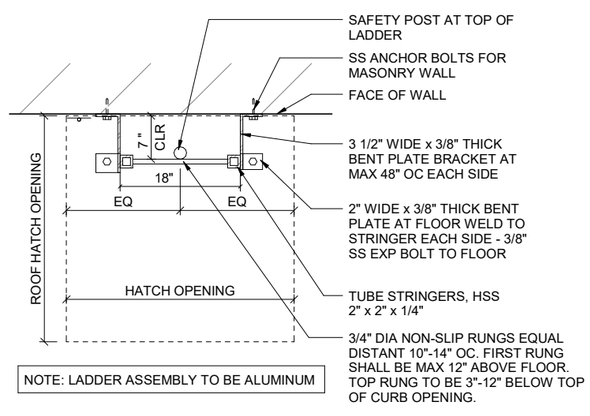
8 **ALUMINUM ACCESS LADDER DETAIL**
99A504 NONE



5 **VENT PIPE FLASHING DETAIL**
99A504 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



6 **CONCRETE SIDEWALK DETAIL**
99A504 NONE



NOTE: LADDER ASSEMBLY TO BE ALUMINUM

7 **ROOF ACCESS LADDER DETAIL**
99A504 1" = 1'-0" (22"x34") 1/2" = 1'-0" (11"x17") 0 6" 1' 2'

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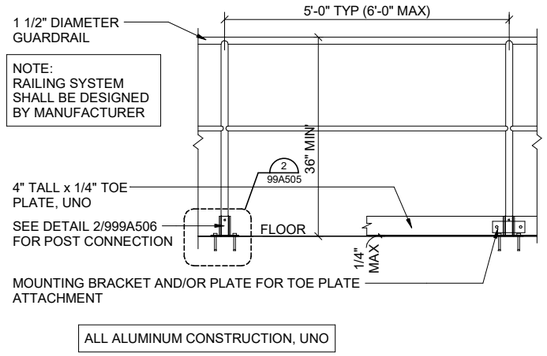
PROJECT DATE: DEC 23, 2025	DRAWN BY: CKW	No	DATE	REVISIONS	BY
	DESIGNED BY: XL				
	CHECKED BY: CJW				

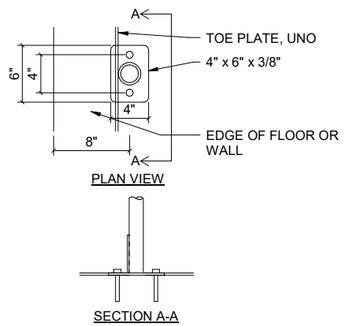
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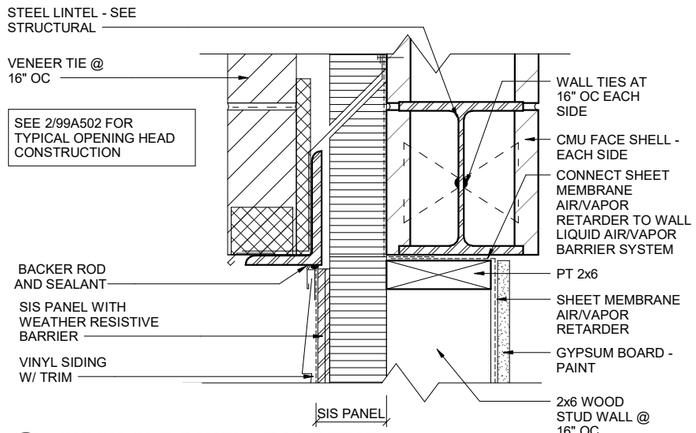
WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WI

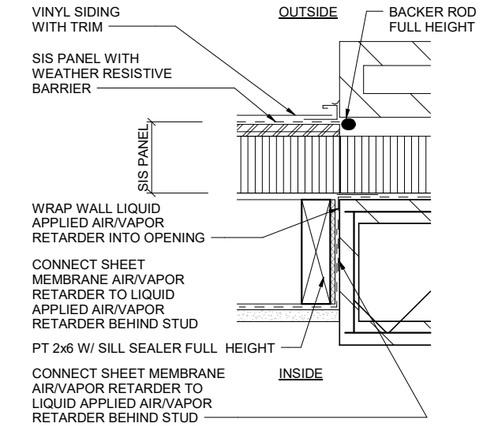
STANDARD DETAILS AND SCHEDULES
ARCHITECTURAL DETAILS

PROJECT NO. 05323007.1
SHEET 99A504



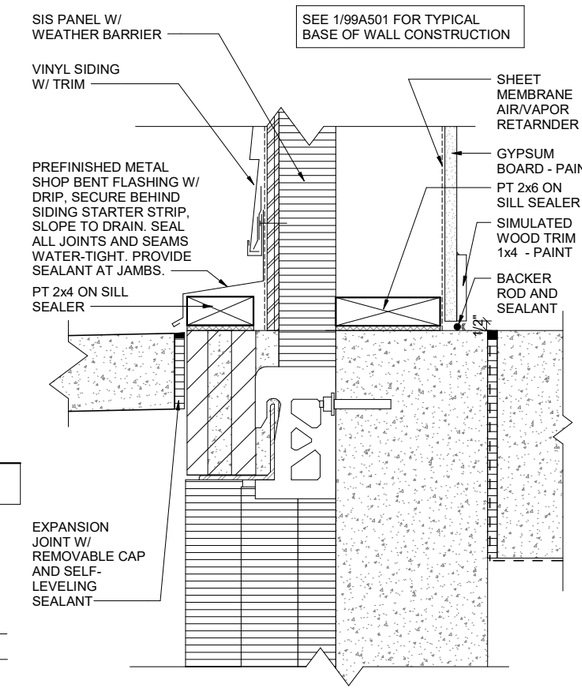




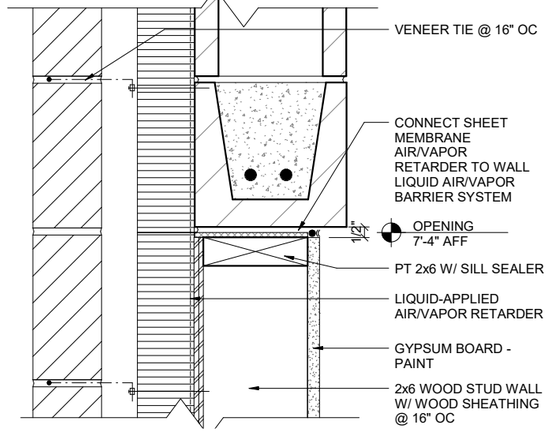


1 SURFACE (TOP) MOUNTED GUARDRAIL DETAIL
99A505 NONE

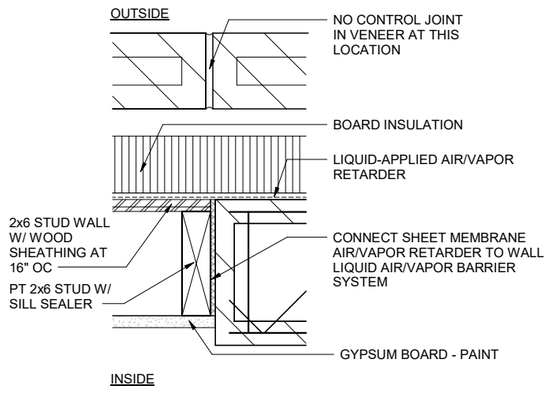
2 SURFACE MOUNTED POST CONNECTION DETAIL
99A505 NONE

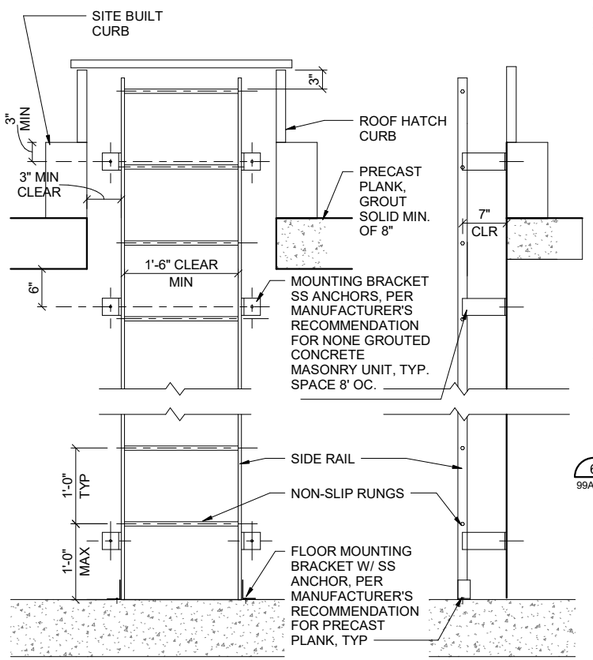


3 KNOCK-OUT PANEL HEAD DETAIL
99A505 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



4 KNOCK-OUT PANEL JAMB DETAIL
99A505 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"

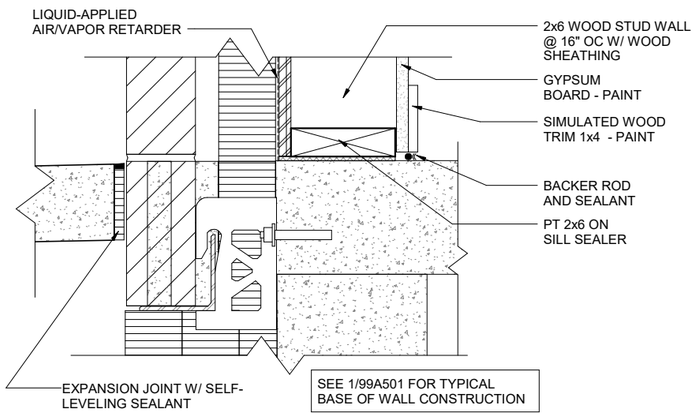




5 ROOF ACCESS LADDER DETAIL
99A505 NONE

6 KNOCK-OUT PANEL SILL DETAIL
99A505 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"

7 FUTURE WALL OPENING HEAD DETAIL
99A505 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"



8 FUTURE OPENING JAMB DETAIL
99A505 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"

9 FUTURE OPENING SILL DETAIL
99A505 3" = 1'-0" (22"x34") 1 1/2" = 1'-0" (11"x17") 0 1½" 3" 6" 9"

PLOT DATE: 12/23/2025 8:35:57 AM , Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007 Menomonie Well #9_ARCH_R24.rvt

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	DESIGNED BY: XL				
	CHECKED BY: CJW				

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WI

STANDARD DETAILS AND SCHEDULES
ARCHITECTURAL DETAILS

PROJECT NO. 05323007.1
SHEET 99A505

ROOM FINISH SCHEDULE

GENERAL NOTES

A. PAINT EXPOSED SURFACES OF HOT-DIP GALVANIZED STEEL LINTELS

REMARKS

1. PROVIDE (1) COAT OF BLOCK FILLER ON PRECAST CONCRETE PLANK IN LIEU OF PRIMER. BEFORE INSTALLATION OF SPECIFIED PAINTING SYSTEM

LEGEND

FLOOR: HDF HEAVY-DUTY CONCRETE FLOOR FINISH - NONE	WALLS: PT PAINT - NONE
BASE: - NONE	CEILING: PT PAINT - NONE

SCHEDULE

ROOM No	ROOM NAME	FLOOR	BASE	WALLS				CEILING		REMARKS
				NORTH	EAST	SOUTH	WEST	MAT'L	HEIGHT	
95-101	CHLORINE	HDF	-	PT	PT	PT	PT	PT	8'-8"	
95-102	FLUORIDE	HDF	-	PT	PT	PT	PT	PT	8'-8"	
95-103	CHEMICAL	HDF	-	PT	PT	PT	PT	PT	8'-8"	
95-104	TOILET	HDF	-	PT	PT	PT	PT	PT	8'-8"	
95-105	ELECTRICAL	HDF	-	PT	PT	PT	PT	PT	8'-8"	
95-106	TREATMENT	HDF	-	PT	PT	PT	PT	PT	16'-0"	
95-201	EQUIPMENT PLATFORM		-	PT	PT	PT	PT	PT	6'-5"	

DOOR SCHEDULE

GENERAL NOTES

A. JAMB SEAL (WEATHERSTRIPPING AT JAMBS AND HEAD) SHALL BE CONTINUOUS, INSTALL CLOSER AND LATCH FOR PAINC DEVICE (WHERE PROVIDED) OVER TOP OF WEATHERSTRIPPING.

B. WHERE THRESHOLD SEAL (WEATHERSTRIPPING) IS REQUIRED, IT SHALL BE INSTALLED ON TOP OF THE THRESHOLD. THE THRESHOLD SHALL BE INSTALLED OVER THRESHOLD GASKET WHERE SPECIFIED.

C. SET THRESHOLD IN A BEAD OF SEALANT.

D. DOOR AND DRAME SHALL BE FIELD PAINTED

REMARKS

1. PAIR OF DOORS, EQUAL SIZED LEAVES.103A: EAST DOOR SHALL BE THE ACTIVE DOOR. 103B: NORTH DOOR SHALL BE THE ACTIVE DOOR. 106B: NORTH DOOR SHALL BE THE ACTIVE DOOR

2. INSTALL WARNING SIGN TO EXTERIOR OF DOOR AFTER PAINTING IS COMPLETE

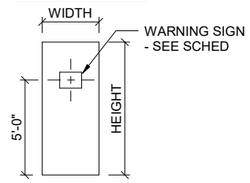
3. INSTALL FRAME AFTER THE WALL CONSTRUCTION IS COMPLETED - USE EXPOSED FASTENERS

4. RFP PANEL INFILL AT TRANSOM

SCHEDULE

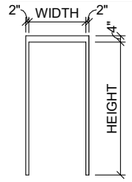
OPENING No	DOOR					FRAME					HW SET	GLASS TYPE	FIRE RATING	REMARKS
			NOMINAL SIZE					DETAILS						
	TYPE	MAT'L	WIDTH	HEIGHT	THICKNESS	TYPE	MAT'L	HEAD	JAMB	SILL				
101	D1	FRP	3' - 0"	7' - 0"	1 3/4"	F1	FRP	2/99A502	6/99A502	10/99A502	1	-	-	2.
103A	D1	FRP	6' - 4"	7' - 0"	1 3/4"	F1	FRP	2/99A502	6/99A502	10/99A502	2	-	-	1. 2.
103B	D1	FRP	5' - 0"	7' - 0"	1 3/4"	F1	FRP	1/99A502	5/99A502		3	-	-	1.
104	D1	FRP	3' - 0"	7' - 0"	1 3/4"	F1	FRP	2/99A502	6/99A502	10/99A502	4	-	-	
105A	D1	FRP	3' - 8"	7' - 0"	1 3/4"	F1	FRP	2/99A502	6/99A502	10/99A502	5	-	-	
105B	D1	FRP	3' - 0"	7' - 0"	1 3/4"	F1	FRP	1/99A502	5/99A502		6	-	-	
106A	D1	FRP	3' - 0"	7' - 0"	1 3/4"	F1	FRP	2/99A502	6/99A502	10/99A502	7	-	-	
106B	D1	FRP	7' - 8"	8' - 8"	1' - 0 3/4"	F2	FRP	2/99A502	6/99A502	10/99A502	8	-		1.3.4.
106C	D1	FRP	3' - 0"	7' - 0"	1 3/4"	F1	FRP	2/99A502	6&9/99A502	4/99A501	7	-	-	3.

DOOR TYPES

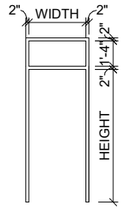


D1
FLUSH

FRAME TYPES

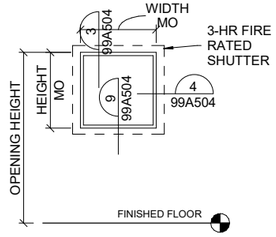


F1
2"x5 3/4"
DOUBLE RABBET
(PAINT)



F2
2"x5 3/4"
DOUBLE RABBET
(PAINT)

WINDOW TYPES



A
FIXED WINDOW
FRP 2x5 3/4" DOUBLE RABBET
w/ TYPE A GLAZING
- PAINT

ACCESS HATCH SCHEDULE

GENERAL NOTES

NONE

REMARKS

1. CONFIRM OPENING SIZE WITH ROOF HATCH REVIEWED SHOP DRAWINGS.

2. INSTALL WATERSTOP MASTIC.
...

SCHEDULE

OPENING NO	TYPE	MAT'L	CATEGORY	NOMINAL OPENING SIZE		DETAILS			SAFETY GRATING	FIRE RATING	REMARKS
				WIDTH	LENGTH	HINGE	JAMB	OTHER			
RH101A	H1	AL		3' - 0"	3' - 0"	1/99A504	1/99A504		NO	N/A	1
RH101B	H1	AL		4' - 0"	4' - 0"	1/99A504	1/99A504		NO	N/A	1
VD101A	H2	AL		2' - 6"	3' - 0"				NO	N/A	2
VD101B	H2	AL		2' - 6"	3' - 0"				NO	N/A	2
VD101C	H2	AL		2' - 0"	2' - 6"				NO	N/A	2
VD101D	H2	AL		2' - 0"	2' - 6"				NO	N/A	2

ASSEMBLY CONSTRUCTION SCHEDULE

TAG	ASSEMBLY	DESCRIPTION
FLOORS		
F1		• CAST-IN-PLACE CONCRETE FLOOR SLAB-ON-GRADE - SEE STRUCTURAL • UNDER SLAB VAPOR BARRIER • (REFER TO BUILDING CROSS SECTIONS FOR WATER PROOFING MEMBRANES AROUND TANK AND CONNECTION TO SLAB VAPOR BARRIER)
F2		• (3-HR FIRE RATED HORIZONTAL ASSEMBLY) • 3" CONCRETE TOPPING - SEE STRUCTURAL • HOLLOW CORE PRECAST CONCRETE PLANK w/ GROUTED JOINTS- SEE STRUCTURAL
WALLS		
W1		• DECORATIVE CMU w/ VENEER TIES AT 16" OC • AIR SPACE • 3" BOARD INSULATION • FLUID APPLIED AIR/VAPOR RETARDER SYSTEM • 8" CONCRETE MASONRY UNIT w/ HORIZONTAL JOINT REINFORCING AT 16" OC,WHERE NOTED ON STRUCTURAL AND AS INDICATED ON EXTERIOR ELEVATIONS w/ VERTICAL REINFORCING GROUTED SOLID - SEE STRUCTURAL.
W2		• 8" CONCRETE MASONRY UNITS w/ HORIZONTAL JOINT REINFORCING AT 16" OC
W3		• 3-HOUR FIRE RATED 12" CONCRETE MASONRY UNITS w/ HORIZONTAL JOINT REINFORCING AT 16" OC
W4		• 3-HOUR FIRE RATED 8" CONCRETE MASONRY UNITS w/ HORIZONTAL JOINT REINFORCING AT 16" OC
ROOF		
R1		• FULLY ADHERED MEMBRANE ROOFING SYSTEM - SEE ROOFING DESCRIPTION ON SHEET 95A103 • HOLLOW CORE PRECAST CONCRETE PLANK w/ GROUTED JOINTS - SEE STRUCTURAL

GENERAL NOTES

A. FLOOR TYPES ARE LISTED TOP TO BOTTOM
B. WALL TYPES ARE LISTED EXTERIOR TO INTERIOR
C. ROOF TYPES ARE LISTED EXTERIOR TO INTERIOR

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WI

STANDARD DETAILS AND SCHEDULES
SCHEDULES

PROJECT NO. 05323007.1
SHEET 99A601

PIPE FITTING SCHEDULE - PROPOSED

NOTE: FITTING SCHEDULE IS PROVIDED AS A GENERAL REFERENCE. ADDITIONAL FITTINGS (NOT SHOWN) MAY BE REQUIRED TO COMPLETE THE PROJECT. CONTRACTOR IS REQUIRED TO PROVIDE A COMPLETE AND OPERABLE SYSTEM. CONTRACTOR SHALL VERIFY ANY INFORMATION LISTED AND NOTIFY ENGINEER OF ANY CONFLICTS, DISCREPANCIES, OR MISSING INFORMATION.

TAG ID	ABBREVIATION	TYPE	SIZE	COMMENTS
	CAP	CAP - MJ	10"ø	
	CAP	CAP - MJ	12"ø	
FL-FL	E	ELBOW - FLANGED	6"ø-6"ø	
	E	ELBOW - FLANGED	10"ø-10"ø	
FL-FL	E	ELBOW - FLANGED	10"ø-10"ø	TEMPORARY PIPING
FL-FL	E	ELBOW - FLANGED	10"ø-10"ø	TEMPORARY PIPING
FL-FL	E	ELBOW - FLANGED	10"ø-10"ø	TEMPORARY PIPING
FL-FL	E	ELBOW - FLANGED	10"ø-10"ø	TEMPORARY PIPING
FL-FL	E	ELBOW - FLANGED	10"ø-10"ø	
	E	ELBOW - FLANGED	10"ø-10"ø	
	E	ELBOW - FLANGED	10"ø-10"ø	
FL-FL	E	ELBOW - FLANGED	12"ø-12"ø	
FL-FL	E	ELBOW - FLANGED	12"ø-12"ø	
	E	ELBOW - FLANGED	12"ø-12"ø	
FL-FL	E	ELBOW - FLANGED	12"ø-12"ø	
FL-FL	E	ELBOW - FLANGED	12"ø-12"ø	
	E	ELBOW - FLANGED	12"ø-12"ø	
MJ-MJ	E	ELBOW - MJ	14"ø-14"ø	
MJ-MJ	E	ELBOW - MJ	14"ø-14"ø	
MJ-MJ	E	ELBOW - MJ	14"ø-14"ø	
	E	ELBOW - MJ	14"ø-14"ø	
	E	ELBOW, INSULATED - MJ	6"ø-6"ø	
	E	ELBOW, INSULATED - MJ	6"ø-6"ø	
	E	ELBOW, INSULATED - MJ	6"ø-6"ø	
	E	ELBOW, INSULATED - MJ	6"ø-6"ø	
FL-FL	E	ELBOW, REDUCING - FLANGED	6"ø-6"ø	
FL-FL	E-B	ELBOW, ROUND BASE - FLANGED	10"ø-10"ø	
FL-FL	R	REDUCER - FLANGED	12"ø-10"ø	TEMPORARY PIPING
	R	REDUCER - PVC - SCH 40 - DWV	4"ø-2"ø	
	R	REDUCER - PVC - SCH 40 - DWV	4"ø-2"ø	
FL-FL-FL	T	TEE - FLANGED	10"ø-10"ø-10"ø	
FL-FL-FL	T	TEE - FLANGED	10"ø-10"ø-10"ø	
FL-FL-FL	T	TEE - FLANGED	10"ø-10"ø-10"ø	
FL-FL-FL	T	TEE - FLANGED	10"ø-10"ø-10"ø	
FL-FL-FL	T	TEE - FLANGED	10"ø-10"ø-10"ø	
FL-FL-FL	T-R	TEE, REDUCING - FLANGED	10"ø-10"ø-6"ø	
FL-FL-FL	T-R	TEE, REDUCING - FLANGED	14"ø-10"ø-10"ø	

APPURTENANCES SCHEDULE - PROPOSED

NOTE: APPURTENANCE SCHEDULE IS PROVIDED AS A GENERAL REFERENCE. APPURTENANCES (NOT SHOWN) MAY BE REQUIRED TO COMPLETE THE PROJECT. CONTRACTOR IS REQUIRED TO PROVIDE A COMPLETE AND OPERABLE SYSTEM. CONTRACTOR SHALL VERIFY ANY INFORMATION LISTED AND NOTIFY ENGINEER OF ANY CONFLICTS, DISCREPANCIES, OR MISSING INFORMATION.

TAG ID	ABBREVIATION	SIZE	COMMENTS
	BFV	6"ø-6"ø	
95-1-1-1	WCV	10"ø-10"ø	
95-1-1-2	BFV	10"ø-10"ø	
95-1-1-3	BFV	6"ø-6"ø	
95-3-1-1	WCV	10"ø-10"ø	
95-3-1-2	GV	10"ø-10"ø	
100-3-1-1	WCV	10"ø-10"ø	
100-3-1-2	GV	10"ø-10"ø	

PLOT DATE: 12/19/2025 11:40:32 Autodesk Docs://05323007 City of Menomonie W Well #9/05323007 Menomonie Well #9_MECH.rvt

PROJECT DATE: DEC 23, 2025
DRAWN BY: JMS
DESIGNED BY: BJS
CHECKED BY: EOE

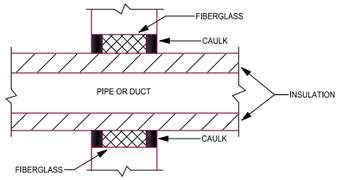
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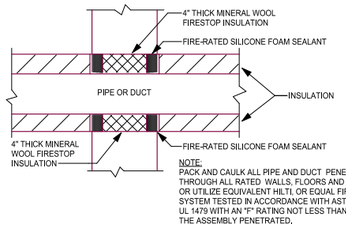
WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
PROCESS SCHEDULES

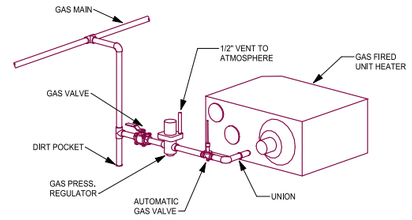
PROJECT NO. 05323007.1
SHEET 99M601



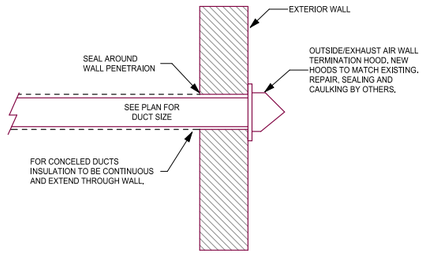
1 PACK AND CAULK (NON-RATED WALLS)
99H501 NOT TO SCALE



2 PACK AND CAULK (RATED WALLS)
99H501 NOT TO SCALE

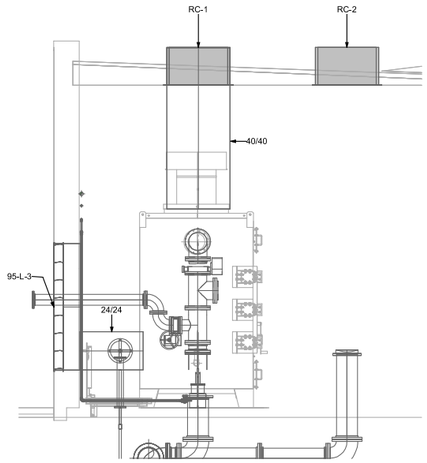


3 GAS FIRED UNIT HEATERS
99H501 NOT TO SCALE

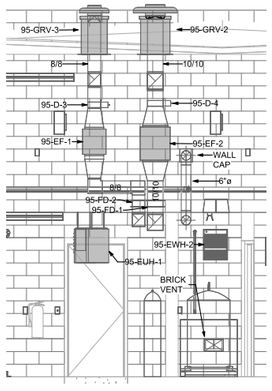


CONCEALED DUCT

4 WALL CAP DETAIL
99H501 NOT TO SCALE



5 AERATOR CONNECTION SECTION
99H501 1/4" = 1'-0"



6 EXHAUST FAN SECTION
99H501 1/4" = 1'-0"

GENERAL HVAC NOTES

A. SEE GENERAL NOTES ON SHEET 00G003.

B. SEE GENERAL NOTES ON THE ARCHITECTURAL PLANS AS THEY APPLY TO THIS WORK.

C. CONTRACTOR TO COORDINATE INSTALLATION OF ALL EQUIPMENT WITH OTHER CONTRACTORS TO AVOID CONFLICTS. INSTALL ALL WORK TO PROVIDE MAXIMUM CLEARANCES.

D. DO NOT RUN DUCTWORK, CONDUIT OR PIPING ABOVE ELECTRICAL PANELS.

E. PAINTING WORK TO BE PERFORMED UNDER DIVISION 09.

F. MOUNT THERMOSTATS, CONTROLS, ETC, NO MORE THAN 4' ABOVE THE FINISHED FLOOR.

G. ALL DUCTWORK SHALL BE RUN TIGHT TO CEILING OR WALL UNLESS OTHERWISE NOTED, TYP.

H. PENETRATIONS AND SEALING:
1. INTO CHEMICAL RESISTANCE AREAS SHALL BE AIR AND VAPOR TIGHT.
2. ALL PENETRATIONS THROUGH EXTERIOR WALLS SHALL SEALED WEATHER, AIR AND VAPOR TIGHT. ALL PENETRATIONS THROUGH INTERIOR WALLS SHALL BE SEALED AIR AND VAPOR TIGHT.
3. ALL PENETRATIONS THROUGH CEILINGS SHALL BE SEALED TO AIR/VAPOR RETARDER.
4. HVAC CONTRACTOR SHALL INSTALL SEALANT FOR ALL PENETRATIONS WHERE WORK WILL BE CONCEALED WITH FINAL CONSTRUCTION. WHERE SEALANT WILL BE EXPOSED, PENETRATIONS SHALL BE SEALED BY SEALANT CONTRACTOR (DIVISION 07).
5. ALL PENETRATIONS THROUGH ROOF SHALL BE FLASHED BY ROOFING CONTRACTOR.
6. SEE ARCHITECTURAL FOR PENETRATION DETAILS.

I. APPLIANCE CONNNECTIONS:
1. ELECTRICAL: FINAL ELECTRICAL CONNECTION BY ELECTRICAL CONTRACTOR.
2. GAS: FINAL GAS CONNECTION BY PLUMBING CONTRACTOR.

J. ALL DUCTWORK BETWEEN DAMPER AND EXTERIOR WALL, CEILING, OR ROOF SHALL BE INSULATED. INSTALL FINISHED JACKET ON ALL INSULATION EXPOSED INSIDE BUILDING.

K. FURNISH MANUAL BALANCING DAMPERS IN EACH DUCT BRANCH (WHETHER SHOWN OR NOT), DO NOT FURNISH AS PART OF GRILLE ASSEMBLY.

L. CHEMICAL RESISTANCE AREAS:
1. DUCTWORK SHALL BE PVS OR PVD COATED HOT-DIP GALVANIZED STEEL. TOUCH UP CUT ENDS AND THREADS.
2. CONDUIT SHALL BE PER DIVISION 26.
3. ALL MATERIALS AND EQUIPMENT SHALL BE CHEMICAL RESISTANT OR PROVIDED WITH CHEMICAL RESISTANT CONTRUCTION OR COATINGS, UNLESS OTHERWISE NOTED.

M. CORROSION RESISTANCE AREAS:
1. DUCTWORK SHALL BE ALUMINUM. TOUCH UP CUT ENDS AND THREADS.
2. CONDUIT SHALL BE PER DIVISION 26.
3. ALL MATERIALS AND EQUIPMENT SHALL BE CHEMICAL RESISTANT OR PROVIDED WITH CHEMICAL RESISTANT CONTRUCTION OR COATINGS, UNLESS OTHERWISE NOTED.

PLOT DATE: 12/22/2025 9:49:51 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007 Menomonie Well #9 HVAC_R24.rvt

			No	DATE	REVISIONS	BY
PROJECT DATE:	DEC 23, 2025	DRAWN BY: ATW				
		DESIGNED BY: AVE				
		CHECKED BY: AVE				

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
HVAC GENERAL NOTES AND DETAILS

PROJECT NO. 05323007.1
SHEET 99H501

GAS FIRED UNIT HEATERS (GUH)

UNIT NO.	SERVICE	GAS INPUT MBH	GAS OUTPUT MBH	CFM OF STD. AIR	GAS TYPE	GAS PRESS. IN PSIG	MOTOR HP	FAN TYPE	COMB. AIR VENT DIA.	FUEL VENT DIA.	DIFFUSER	ELEV. ABOVE FIN. FL.	MANUF. MODEL	Comments
95-GUH-1	TREATMENT 95-106	60	49.2	990	NAT. GAS	0	0.083	PROP.	4"	4"	HORIZ.	14' - 0"	MODINE HDS30AS01	
95-GUH-2	TREATMENT 95-106	60	49.2	990	NAT. GAS	0	0.083	PROP.	4"	4"	HORIZ.	14' - 0"	MODINE HDS30AS01	

ELECTRIC UNIT HEATERS (EUH)

UNIT NO.	SERVICE	TYPE	CAP. KW	CAP. MBH	CFM OF STD. AIR	MOTOR HP	MOTOR RPM	SPEED	DIFFUSER	ELEV. ABOVE FIN. FL.	MANUF. MODEL	Comments
95-EUH-1	CHLORINE 95-101	HORIZ.	20.00 W	68.2	1,320	0.1	1500	2	HORIZ.	6' - 0"	QMARK MUH	1, 2, 9
95-EUH-2	CHEMICAL 95-103	HORIZ.	7.50 W	25.6	650	0.03	1600	1	HORIZ.	6' - 0"	QMARK MUH	1, 2, 9

ELECTRIC WALL HEATERS (EWH)

UNIT NO.	SERVICE	CABINET W	CABINET H	CABINET D	CAP. WATTS	CAP. BTU	RECESS	INTEGRAL STAT	MANUF. MODEL	Comments
95-EWH-1	TOILET 95-104	16"	20"	4"	1,500	5,120	4"		QMARK AWH	
95-EWH-2	FL 95-102	16"	20"	4"	1,500	5,120	4"		QMARK AWH	

IN-LINE EXHAUST FANS (EF)

UNIT NO.	SERVICE	CFM OF STD. AIR	EXT. S.P. IN IN. WATER	MAX. O.V.	MOTOR HP	DRIVE	FAN DIA.	MOTOR TYPE	VOLUME CONTROL	SUPPORT	VIBRATION ISOLATORS TYPE	VIBRATION ISOLATORS MIN. STATIC DEFLECT.	MANUF. MODEL	Comments
95-EF-1	CHLORINE 95-101	200	0.37	0	0.04	DIRECT	0' - 10 7/8"	ODP	SP.SW.	SUSPENDED	D	1"	GREENHECK SQ-90	1, 2, 4, 10
95-EF-2	CHLORINE 95-101	900	0.25	0	0.5	DIRECT	0' - 10 7/8"	ODP	SP.SW.	SUSPENDED	D	1"	GREENHECK SQ-120	1, 2, 4, 10
95-EF-3	CHEMICAL 95-103	200	0.37	0	0.04	DIRECT	0' - 10 7/8"	ODP	SP.SW.	SUSPENDED	D	1"	GREENHECK SQ-90	1, 2, 4, 10

DESTRATIFICATION FANS - HVLS (DF)

UNIT NO.	SERVICE	FAN DIA	MOTOR HP	CONTROL PANEL	BLADE HEIGHT A.F.F.	MANUF. MODEL
95-DF-1	TREATMENT 95-106	12' - 0"	0.75	YES	0' - 0"	GREENHECK DS-3

CEILING EXHAUST FANS (EF)

UNIT NO.	SERVICE	CFM OF STD. AIR	TYPE	MAX. SONES	EXT. S.P. IN IN. WATER	MOTOR WATTS	MOTOR RPM	MOTOR TYPE	VOLUME CONTROL	MANUF. MODEL	Comments
95-EF-4	TOILET 95-104	75	CLG.		0.28	16 W	950	PSC	SP.SW.	GREENHECK SP-A110	1, 2, 4

DAMPER SCHEDULE (D)

TAG	SERVICE	HEIGHT	WIDTH	MFR. MODEL	ACTUATOR ELECTRIC	ACTUATOR POWER	RUN TIME	BLADE TYPE	FAIL POSITION	END SWITCH	COMMENTS
95-D-1	95-L-1	24	24	GREENHECK ICD-45	BELIMO NFBUP	120	NORMAL	PARALLEL	OPEN	NO	3, 10
95-D-2	95-L-2	16	16	GREENHECK ICD-45	BELIMO NFBUP	120	NORMAL	PARALLEL	OPEN	NO	3, 10
95-D-3	95-EF-1	8	8	GREENHECK ICD-45	BELIMO NFBUP	120	NORMAL	PARALLEL	OPEN	NO	3, 10
95-D-4	95-EF-2	10	10	GREENHECK ICD-45	BELIMO NFBUP	120	NORMAL	PARALLEL	OPEN	NO	3, 10
95-D-5	95-EF-3	8	8	GREENHECK ICD-45	BELIMO NFBUP	120	NORMAL	PARALLEL	OPEN	NO	3, 10

ROOM AIR CONDITIONING UNITS (SS)

INDOOR UNITS UNIT NO.	INDOOR UNITS SERVICE	INDOOR UNITS TYPE	INDOOR UNITS CFM OF STD. AIR	INDOOR UNITS COOLING CAP. (BTU)	OUTDOOR UNITS UNIT NO.	OUTDOOR UNITS SERVICE	OUTDOOR UNITS NOM. CAP. TONS	OUTDOOR UNITS MIN. SEER	MANUF. MODEL	Comments
95-SS-1	ELECTRICAL 95-105	HORIZ.	0	36,000	95-SS-1	ELECTICAL 95-105	3	16.2	MITSUBISHI MSZ-GS36NA	1, 2, 4, 5

WEATHERPROOF LOUVERS (L)

UNIT NO.	SERVICE	NOM. WIDTH (IN.)	NOM. HEIGHT (IN.)	CFM	MAX FREE AREA VELOCITY (FPM)	MANUF. MODEL
95-L-1	CHLORINE 95-101	24	24	900	517	GREENHECK ESJ-401
95-L-2	CHEMICAL 95-103	16	16	200	465	GREENHECK ESJ-401
95-L-3	TREATMENT 95-106	48	80	0	-	GREENHECK ESJ-401

GRILLES AND DIFFUSERS (EG)

Mark	SERVICE	NECK SIZE	DUCT CONN. SIZE	VOLUME DAMPER LOCATION	AIR PATTERN	MANUF. MODEL
95-EG-1	SIDEWALL EXHAUST GRILLE	6x6	-	DUCT TAKEOFF	45°	PRICE 530

GRAVITY ROOF VENTILATOR SCHEDULE (GRV)

TAG	SERVICE	VOLUME (CFM)	MFR. MODEL	STATIC PRESSURE	UNIT SIZE	MOUNTING	COMMENTS
95-GRV-1	95-EF-3	200	GREENHECK GRSR	0.08	8	ROOF CURB	8
95-GRV-2	95-EF-2	900	Loren Cook Company	0.08	12	ROOF CURB	8
95-GRV-3	95-EF-1	200	GREENHECK GRSR	0.08	8	ROOF CURB	8

EQUIPMENT ELECTRICAL INFORMATION

DESCRIPTION	MCA	MOTOR HP	VOLTAGE	PHASE	FLA	KW	REMARKS
95-DF-1		0.75	480	3	2.5		
95-EF-1	-	0.04	120	1	-		
95-EF-2	8.2	0.50	120	1	6.6		
95-EF-3	-	0.04	120	1	-		
95-EF-4	0.2		120	1	0.19	0.02	
95-EUH-1	-	0.10	480	3	24	20	
95-EUH-2	-	0.03	480	3	9	7.5	
95-EWH-1	-		120	1	12.5	1.5	
95-EWH-2	-		120	1	12.5	1.5	
95-GUH-1	3.75	0.08	120	1	2.4		
95-GUH-2	3.75	0.08	120	1	2.4		
95-SS-1	19		208	1			

SCHEDULE REMARKS

1. SEE PROJECT MANUAL (HVAC SPECIFICATION) FOR SEQUENCE OF OPERATION.
2. MOUNTING BRACKET BY UNIT MANUFACTURER.
3. DAMPER TO BE FLANGED TO DUCT, SIZE LISTED IS OUTSIDE OF DAMPER SIZE.
4. FURNISH DISCONNECT. INSTALLATION BY ELECTRICAL.
5. MOUNT EXTERIOR UNIT TO MAINTAIN CLEARANCES REQUIRED BY MANUFACTURER.
6. KYNAR COATING. COLOR TO BE SELECTED BY ARCHITECT.
7. PROVIDE MANUFACTURER'S OPTIONAL (SS) CORROSION RESISTANT CONSTRUCTION.
8. PERMATECTOR COATING. COLOR TO BE SELECTED BY ARCHITECT.
9. REMOTE WIRED THERMOSTAT BY UNIT MFR.
10. EQUIPMENT, WORK AND ACCESSORIES SHALL BE SUITABLE FOR CORROSIVE (NEMA 4X) ENVIRONMENTS. SEE SPECIFICATION FOR ADDITIONAL DETAIL.

PROJECT DATE: DEC 23, 2025 | DRAWN BY: ATW | DESIGNED BY: AVE | CHECKED BY: AVE

No	DATE	REVISIONS	BY

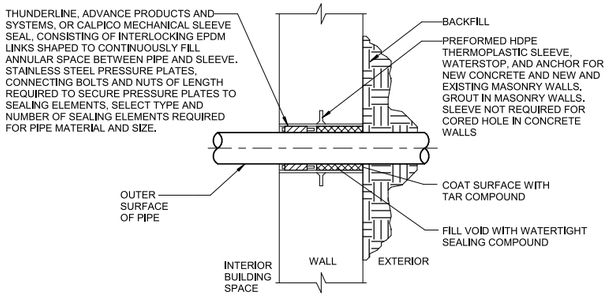
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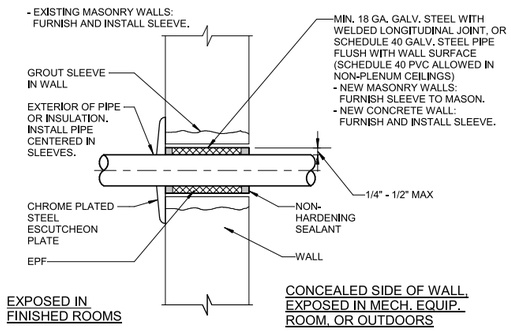
STANDARD DETAILS AND SCHEDULES
HVAC - SCHEDULES

PROJECT NO. 05323007.1
SHEET 99H601

PLOT DATE: 12/22/2025 9:49:59 AM
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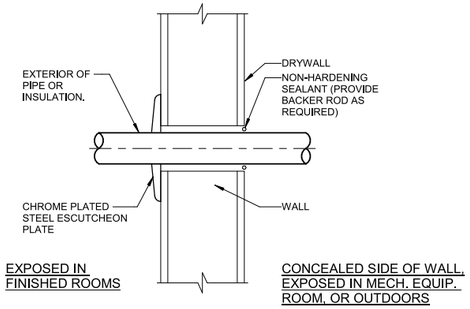
APPLICATIONS
- PIPE PENETRATION THRU BELOW GRADE EXTERIOR WALL



EXPOSED IN FINISHED ROOMS

CONCEALED SIDE OF WALL, EXPOSED IN MECH. EQUIP. ROOM, OR OUTDOORS

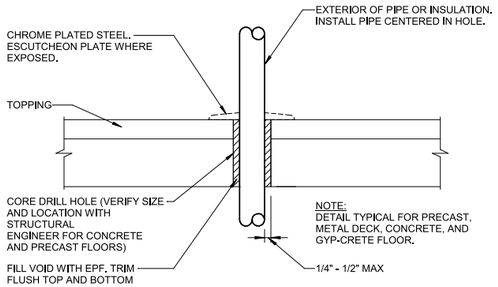
APPLICATIONS
- PIPE PENETRATION THRU MASONRY OR CONCRETE WALL



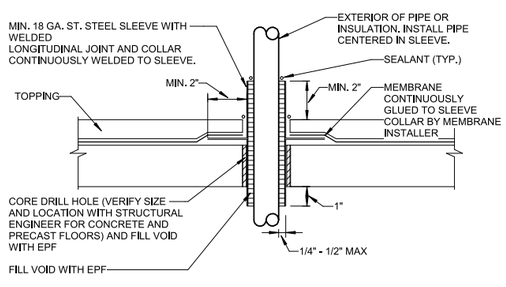
EXPOSED IN FINISHED ROOMS

CONCEALED SIDE OF WALL, EXPOSED IN MECH. EQUIP. ROOM, OR OUTDOORS

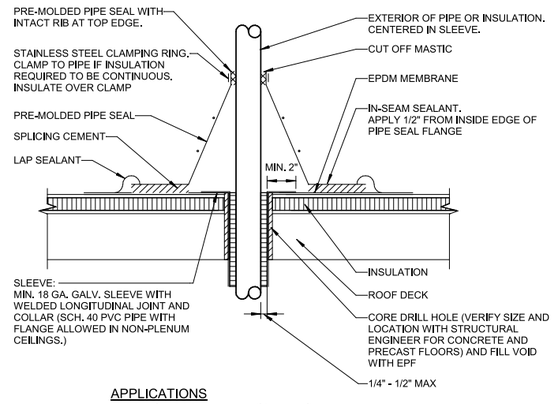
APPLICATIONS
- PIPE PENETRATION THRU STUD WALL



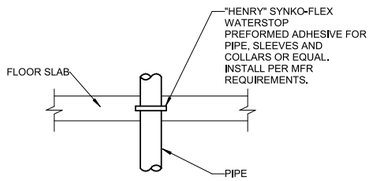
APPLICATIONS
- PIPE PENETRATION THRU ABOVE GRADE FLOOR



APPLICATIONS
- PIPE PENETRATION THRU ABOVE GRADE FLOOR WITH MEMBRANE

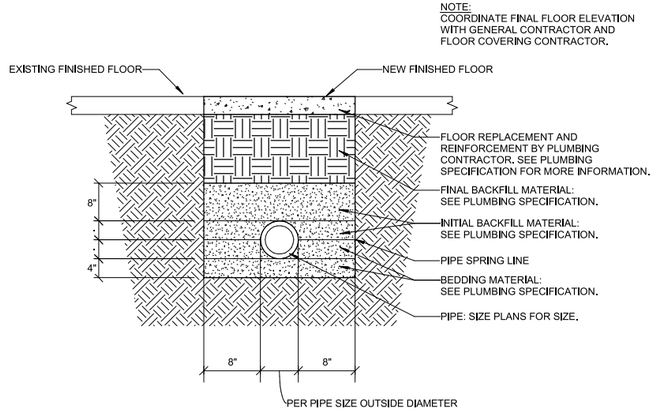


APPLICATIONS
- ROOF PIPE BOOT PENETRATION DETAIL



APPLICATIONS
- SLAB ON GRADE PIPE PENETRATION DETAIL

1 PIPE PENETRATION DETAILS
99P501 NOT TO SCALE



2 PIPE TRENCH DETAIL
99P501 NOT TO SCALE

PLOT DATE: 12/19/2025 12:00:34 J:\Autodesk Docs\05323007 City of Menomonie WI Well #9\05323007 Menomonie Well #9_PLMB_R24.rvt

PROJECT DATE:	DEC 23, 2025	DRAWN BY:	BL
		DESIGNED BY:	AE
		CHECKED BY:	AE

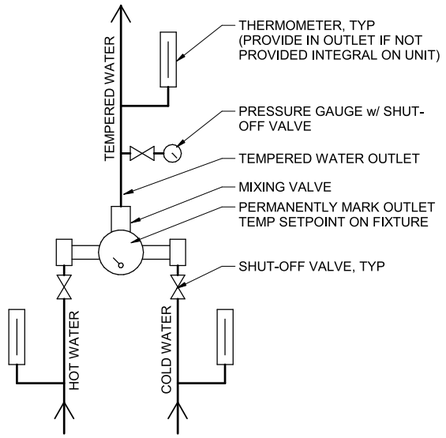
No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

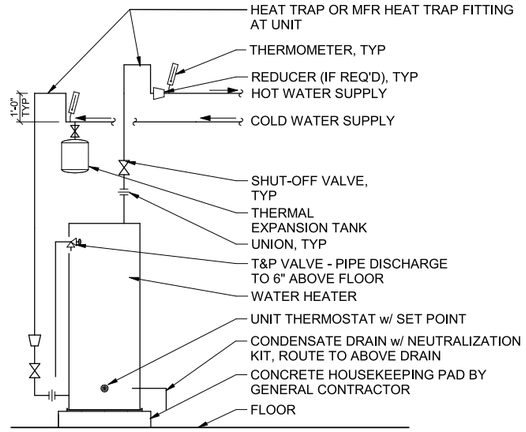
STANDARD DETAILS AND SCHEDULES
PLUMBING DETAILS

PROJECT NO. 05323007.1
SHEET 99P501



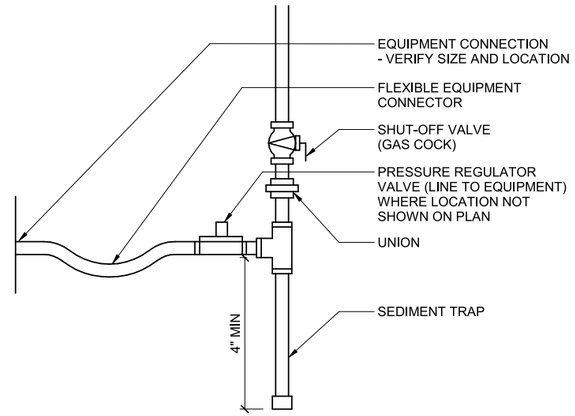
1 MIXING VALVE (EMERGENCY STATION) DETAIL

99P502



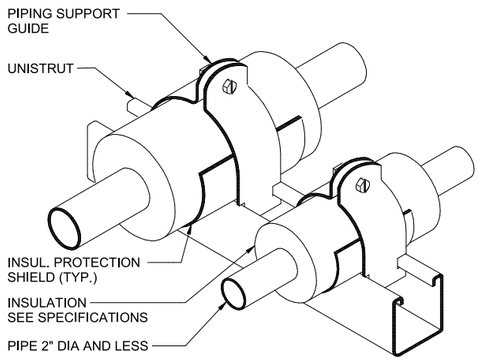
2 GAS WATER HEATER DETAIL

99P502



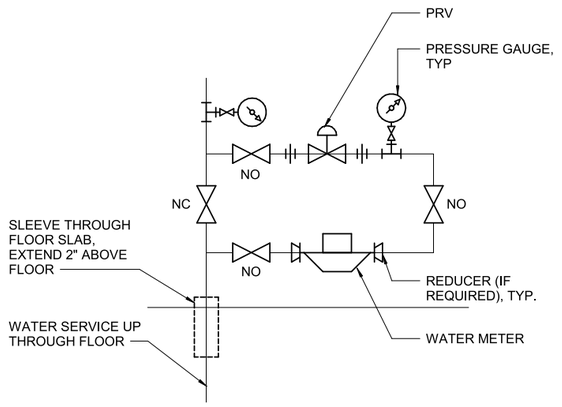
3 TYP EQUIPMENT GAS CONNECTION DETAIL

99P502



4 UNISTRUT PIPING SUPPORT DETAIL HORIZONTAL

99P502

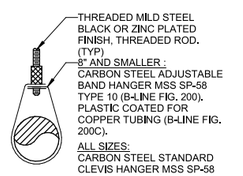


5 WATER SERVICE DETAIL

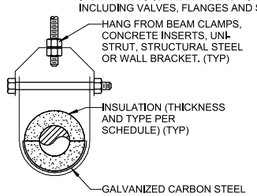
99P502

MAX. SPACING BETWEEN PIPE SUPPORTS AND MIN. HANGER ROD SIZES											
PIPE SIZE	STEEL			COPPER			PVC	CPVC	PEX	CAST IRON	MIN. ROD
	WATER	GAS	MIN. ROD	WATER	GAS	MIN. ROD					
1/4"-1/2"	7'	8'	3/8"	5'	6'	3/8"	4'	3'	32"	5'	3/8"
3/4"	7'	9'	3/8"	5'	7'	3/8"	4'	3'	32"	5'	3/8"
1"	7'	9'	3/8"	6'	8'	3/8"	4'	3'	32"	5'	3/8"
1 1/4"	7'	9'	3/8"	7'	9'	3/8"	4'	4'	32"	5'	3/8"
1 1/2"	9'	12'	3/8"	8'	10'	3/8"	4'	4'	32"	5'	3/8"
2"	10'	12'	3/8"	8'	11'	3/8"	4'	4'	-	5'	3/8"
2 1/2"	11'	12'	3/8"	9'	12'	3/8"	4'	4'	-	5'	3/8"
3"	12'	12'	3/8"	10'	12'	3/8"	4'	4'	-	5'	3/8"
4"	12'	12'	3/8"	12'	12'	3/8"	4'	4'	-	5'	3/8"
6"	12'	12'	3/8"	12'	12'	3/8"	4'	4'	-	5'	3/8"
8"	12'	12'	1/2"	-	-	-	4'	4'	-	5'	3/8"
10"	12'	12'	1/2"	-	-	-	4'	4'	-	-	3/8"
12"	12'	12'	5/8"	-	-	-	4'	4'	-	-	3/8"
14"	12'	12'	5/8"	-	-	-	4'	4'	-	-	3/8"
16"	12'	12'	3/4"	-	-	-	4'	4'	-	-	3/8"
MAX VERT. (1)	15'	15'	-	10'	10'	-	10'	10'	10'		-

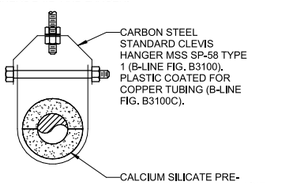
(1) SUPPORT AT MINIMUM EVERY FLOOR LEVEL OR SPACING LISTED.
(2) SPACING MAY BE INCREASED TO 10' FOR 10' PIPE LENGTHS.
MSS = MANUFACTURER'S STANDARDIZATION SOCIETY
- INSTALL ADDITIONAL HANGERS WITHIN 12" OF ELBOWS AND TEES AND AT CONCENTRATED LOADS, INCLUDING VALVES, FLANGES AND STRAINERS 2 1/2" AND LARGER.



APPLICATIONS
- UNINSULATED PIPING



APPLICATIONS
- HOT AND COLD WATER PIPING



APPLICATIONS
- HOT AND COLD WATER PIPING

6 PIPE HANGER AND INSULATION DETAILS

99P502 NOT TO SCALE

PLOT DATE: 12/19/2025 12:00:35 Ayotte\ek Docs\05323007 City of Menomonie WI Well #9\05323007 Menomonie Well #9_PLUMB_B24.rvt

PROJECT DATE:	DEC 23, 2025	DRAWN BY:	BL
		DESIGNED BY:	AE
		CHECKED BY:	AE

No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
PLUMBING DETAILS

PROJECT NO. 05323007.1
SHEET 99P502

BACKFLOW PREVENTER SCHEDULE (BFP)

TAG	MANUFACTURER	MODEL	LOCATION	MAX. PD. (PSI)	SIZE	VALVE TYPE	BFP/VB	APPLICATION	ASSE STD.	NOTES
BFP-1	WATTS	LF009	TREATMENT 95-106	15.0	1 1/4"	REDUCED PRESSURE	CONTINOUS	CHLORINE TREATMENT	1013	(1)(2)

(1) PROVIDE WITH MFR STRAINER.
(2) PROVIDE AIR GAP FITTING.

CLEANOUT SCHEDULE (CO)

TAG	MANUFACTURER	MODEL	TYPE	APPLICATION	BODY MATERIAL	ACCESS COVER MATERIAL	NOTES
WCO	ZURN	Z1469	WALL	WALL	PVC	STAINLESS STEEL	
CO	ZURN	Z1400-KC	FLOOR	GENERAL AREAS	CAST IRON	NICKEL BRONZE	

DRAIN SCHEDULE (FD, HD)

TAG	MANUFACTURER	MODEL	TYPE	DFU	OUTLET SIZES	BODY MATERIAL	STRAINER TOP MATERIAL	NOTES
FD-1	ZURN	Z415N	FLOOR	3	4-INCH	CAST IRON	NICKEL BRONZE	(1)
FD-2	SIOUX CHIEF	842-NR	FLOOR	3	4-INCH	ABS	NICKEL BRONZE	
HD-1	ZURN	Z1870	HUB DRAIN	4	4-INCH	304 STAINLESS STEEL	-	
DSN-1	ZURN	Z199	EXTERIOR	-	6-INCH	NICKEL BRONZE	-	

(1) PROVIDE TRAP SEAL - RECTORSEAL SURE SEAL

EMERGENCY FIXTURE SCHEDULE (ESH)

TAG	MANUFACTURER	MODEL	MOUNTING	OPERATION	BOWL COVER	EYE WASH	FACE WASH	SHOWER	PSIG / GPM	NOTES
ESH-1	BRADLEY	S19314-A-C-2-E-H-H-B-O-P	FLOOR	HAND	YES	YES	YES	YES	30 / 20.0	

WATER CLOSET SCHEDULE

TAG	ADA (1)	BOWL				TANK			SEAT		NOTES
		MANUFACTURER	MODEL	MOUNTING	RIM HT. A.F.F.	TYPE	GAL. PER FLUSH	OPERATION TYPE	MANUFACTURER	MODEL	
WC-6	YES	KOHLER	K-25077-0	FLOOR	16-1/2"	GRAVITY	-	-	BEMIS	1655SSCT	

GAS WATER HEATER SCHEDULE (WH)

TAG	MANUFACTURER	MODEL	LOCATION	APPLICATION	TYPE	GAS BTU/hr	THERMAL EFF.	RECOVERY GPH	TANK SIZE GAL.	OUTLET TEMP. DEG. F	POWER VOLTAGE	NOTES
WH-1	STATE	GP6-50-YTVIT	EQUIPMENT PLATFORM 95-201	DOMESTIC HOT WATER	TANK	76,000	94	95	50	130	120/60/1	(1)(2)(3)(4)

(1) 1ST HOUR RECOVERY BASED ON 90 DEGREE F TEMPERATURE RISE.
(2) PROVIDE WITH CONCENTRIC VENT KIT WITH EXTERIOR HOOD.
(3) PROVIDE AMTROL ST-5 PRESSURE TANK.
(4) SEE DETAIL 2/95P502
(5) PROVIDE 3-INCH HIGH FABRICATED EQUIPMENT PAD. PAD TO EXTEND MIN 2-INCH BEYOND UNIT.

LAVATORY SCHEDULE

TAG	ADA (1)	BASIN							FAUCET				NOTES
		MANUFACTURER	MODEL	MOUNTING	DRAIN TYPE	FAUCET HOLES	CENTER OF HOLES	CARRIER	MANUFACTURER	MODEL	FLOW RATE (GPM)	OPERATION TYPE	
L-1	YES	KOHLER	K-2005	WALL	GRID	3	4"	YES	CHICAGO	895317GN2AE65VPAB	1	MANUAL WRIST BLADE	-

SINK SCHEDULE

TAG	ADA (1)	BASIN						FAUCET								NOTES
		MANUFACTURER	MODEL	NO. OF COMP	MOUNTING	SIZE L" x W" x D"	DRAIN TYPE	MANUFACTURER	MODEL	FAUCET QTY.	SPOUT REACH	SPOUT HEIGHT	FLOW RATE (GPM)	SPRAY TYPE	HANDLE	
S-1	YES	JUST	SLADA1921A554-J	1	TOP-MOUNT	22" x 19-1/2" x 5-1/2"	BASKET	CHICAGO	1100-GN8AE35-317AB	1	8"	8"	1.5	AERATED	WRIST BLADE	(1)

(1) PROVIDE AIR ADMITTANCE VALVE AT POINT OF SANITARY CONNECTION

HOSE BIBB SCHEDULE (HB)

TAG	MANUFACTURER	MODEL	LOCATION	FREEZE PROOF	CONTROL	WATER SUPPLY	NOTES
HB-1	WOODFORD	V26	INTERIOR	NO	LOOSE KEY OR HANDLE	COLD	
HB-2	WOODFORD	B67	EXTERIOR	YES	BOX w/ LOOSE KEY	COLD	

MIXING VALVE (MV)

TAG	MANUFACTURER	MODEL	MAX P.D.	OUTLET TEMP SETPOINT	MOUNTING BOX	NOTES
TMV-1	GUARDIAN	G6040	7 PSI @ 20 GPM	65F	NO	(1)(2)

(1) MOUNT TO WALL IN AN ACCESSIBLE LOCATION.
(2) SEE DETAIL 1/95P901.

WATER METER SCHEDULE (WM)

TAG	MANUFACTURER	MODEL	APPLICATION	SIZE	FLOW (GPM)	PRESSURE LOSS (PSIG)	NOTES
WM-1	BADGER	RECORDALL	BUILDING	2"	60	1.0	

SAMPLE TAP (ST)

TAG	MANUFACTURER	MODEL	LOCATION	FREEZE PROOF	BACKFLOW PREVENTER	CONTROL	WATER SUPPLY	NOTES
ST-1	CHICAGO	350-E35ABCP	INTERIOR	NO	VACUUM BREAKER ASSE 1052	HANDLE	COLD	(1)

(1) FAUCET SHALL HAVE A SMOOTH OUTLET FOR FINISHED WATER TESTING

PLOT DATE: 12/19/2025 12:05:34 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007 Menomonie Well #9_PLUMB_R24.rvt

PROJECT DATE:	DEC 23, 2025	DRAWN BY:	BL
		DESIGNED BY:	AE
		CHECKED BY:	AE

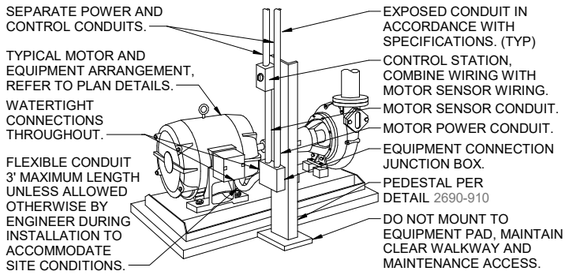
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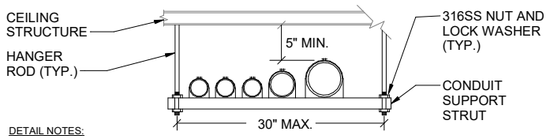
STANDARD DETAILS AND SCHEDULES
PLUMBING SCHEDULES

PROJECT NO. 05323007.1
SHEET 99P601



2605-002 PROCESS EQUIPMENT CONNECTION EXPOSED CONDUIT

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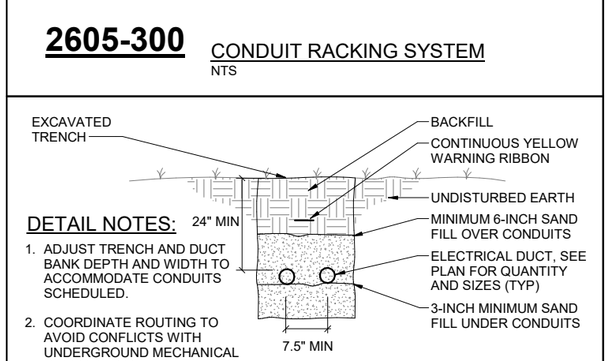


DETAIL NOTES:

1. LENGTH OF CONDUIT SUPPORT STRUT VARIES WITH NUMBER OF CONDUITS TO BE SUPPORTED AND SPACING BETWEEN CONDUITS.
2. SIZE CONDUIT SUPPORT STRUT TO SUPPORT LOAD WITHOUT DEFLECTION. MINIMUM SIZE OF CONDUIT SUPPORT STRUT SHALL BE 1-1/2"x1-1/2".
3. HANGAR ROD SHALL BE CONSTRUCTED OF HOT-DIPPED GALVANIZED STEEL, SIZE ROD TO SUPPORT LOAD, MINIMUM SIZE SHALL BE 3/8".
4. MANUFACTURERS WRITTEN RECOMMENDATIONS SHALL DICTATE ALLOWABLE SPAN, NUMBER/SIZE OF HANGER RODS, AND ALLOWABLE LOADING.
5. USE CONCRETE INSERTS FOR SUPPORT OF HANGAR RODS FROM CONCRETE CEILING, USE SWIVEL BEAM CLAMPS FOR STEEL BEAM APPLICATIONS.

2605-300 CONDUIT RACKING SYSTEM

NTS

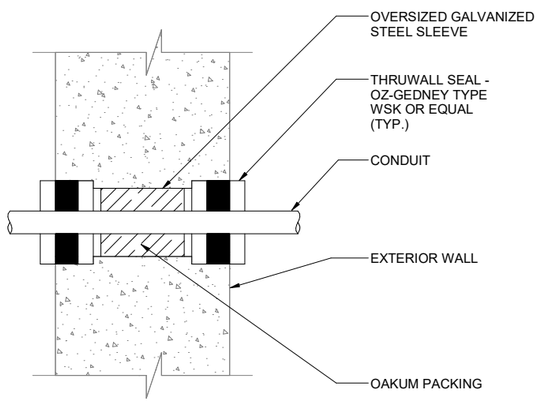


DETAIL NOTES:

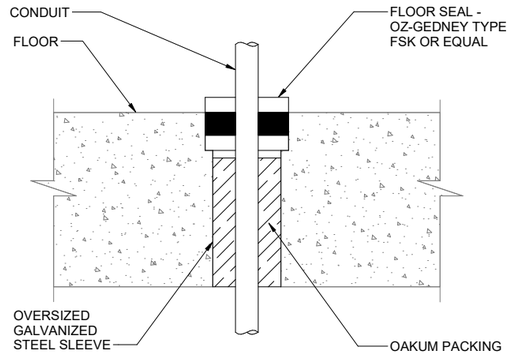
1. ADJUST TRENCH AND DUCT BANK DEPTH AND WIDTH TO ACCOMMODATE CONDUITS SCHEDULED.
2. COORDINATE ROUTING TO AVOID CONFLICTS WITH UNDERGROUND MECHANICAL PIPING AND OTHER UTILITIES.

2605-310 RACEWAY INSTALLATION DIRECT BURIED UNDERGROUND

NTS



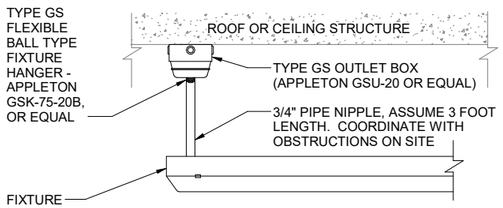
WALL PENETRATION



FLOOR PENETRATION

2605-305 CONDUIT WALL AND FLOOR PENETRATIONS

NTS

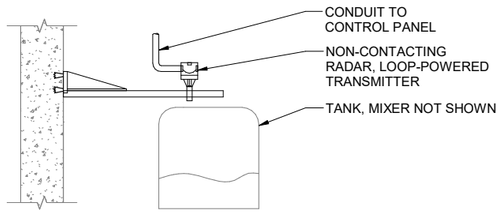


DETAIL NOTES:

1. PROVIDE RATED EQUIPMENT FOR HAZARDOUS LOCATIONS.

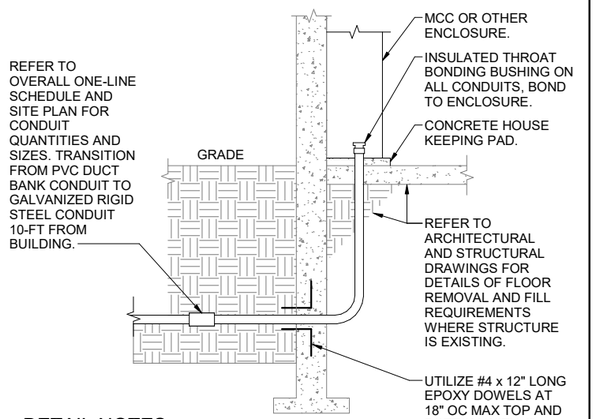
2650-100 PENDANT FIXTURE MOUNTING

NTS



2690-033 INSTRUMENT INSTALLATION, WALL-MOUNTED RADAR LEVEL TRANSMITTER

NTS

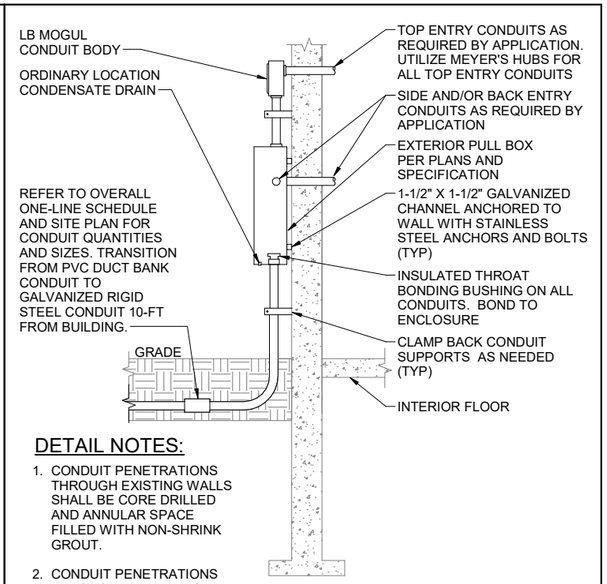


DETAIL NOTES:

1. CONDUIT PENETRATIONS THROUGH EXISTING WALLS SHALL BE CORE DRILLED AND ANNULAR SPACE FILLED WITH NON-SHRINK GROUT.
2. CONDUIT PENETRATIONS THROUGH NEW WALLS SHALL BE SLEEVED AND ANNULAR SPACE FILLED WITH NON-SHRINK GROUT.

2605-501 DUCT BANK INTERFACE INTERIOR, SLAB-ON-GRADE

NTS

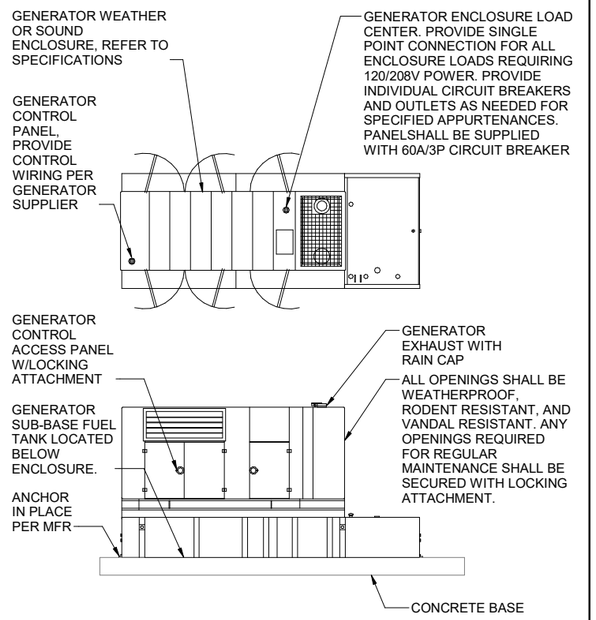


DETAIL NOTES:

1. CONDUIT PENETRATIONS THROUGH EXISTING WALLS SHALL BE CORE DRILLED AND ANNULAR SPACE FILLED WITH NON-SHRINK GROUT.
2. CONDUIT PENETRATIONS THROUGH NEW WALLS SHALL BE SLEEVED AND ANNULAR SPACE FILLED WITH NON-SHRINK GROUT.

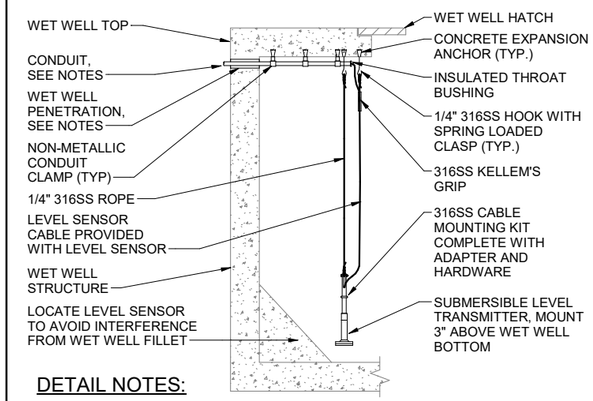
2605-504 DUCT BANK INTERFACE EXTERIOR ABOVE GRADE

NTS



2632-400 PERMANENT GENERATOR EXTERIOR INSTALLATION

NTS



DETAIL NOTES:

1. INSTALL LEVEL SENSOR IN LOCATION WHERE SUSPENSION HOOKS, CABLES, AND CONDUIT(S) ARE ALL ACCESSIBLE FROM THE WET WELL HATCH WITHOUT ENTERING THE WET WELL.
2. INSTALL AND CONNECT LEVEL SENSOR BREATHER TUBE (IF PROVIDED) PER MANUFACTURER'S INSTRUCTIONS.
3. PROVIDE SUFFICIENT SLACK CABLE, COILED AND SUSPENDED FROM HOOK, TO ALLOW ADJUSTMENT +/- 3 FT. FROM SPECIFIED ELEVATION.
4. WET WELL PENETRATION SHALL CONSIST OF NON-METALLIC SLEEVE FOR CAST IN-PLACE STRUCTURE OR CORED HOLE FOR PRE-CAST OR EXISTING STRUCTURE, GROUT FOR WATERTIGHT CONDUIT PENETRATION.
5. CONDUIT SHALL BE SIZED TO ACCOMMODATE LEVEL SENSOR CABLE. MATERIALS SHALL BE AS SPECIFIED.

2690-000 LEVEL INSTRUMENT INSTALLATION SUBMERSIBLE LEVEL TRANSMITTER

NTS

PLOT DATE: 12/10/2025 14:10:47 Autodesk Docs://05323007.07_ELECTRICAL_OVERALL_MODEL_R24.rvt

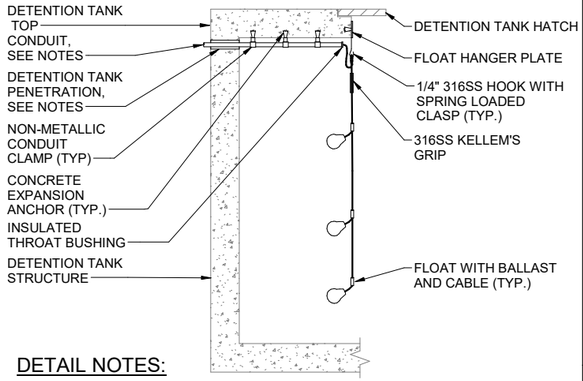
PROJECT DATE: DEC 23, 2025	DRAWN BY: CJC	No	DATE	REVISIONS	BY
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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
ELECTRICAL DETAILS

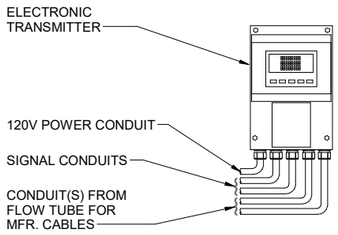
PROJECT NO. 05323007.1
SHEET 99E501



DETAIL NOTES:

1. INSTALL FLOAT SWITCHES IN LOCATION WHERE SUSPENSION HOOKS, CABLES, AND CONDUIT(S) ARE ALL ACCESSIBLE FROM THE DETENTION TANK HATCH WITHOUT ENTERING THE DETENTION TANK. ADJUST FLOAT SWITCH MOUNTING TO ACHIEVE ACTIVATION ELEVATIONS AS SPECIFIED, SHOWN ON PLANS, OR DIRECTED IN THE FIELD BY THE ENGINEER.
2. INSTALL NO MORE THAN THREE FLOAT SWITCH CABLES IN EACH CONDUIT. PROVIDE MULTIPLE CONDUITS IF MORE THAN THREE FLOATS ARE SPECIFIED. CONDUIT SHALL BE 2-1/2". MATERIALS SHALL BE AS SPECIFIED.
3. FLOAT SWITCH GROUND CONDUCTOR SHALL BE SOLIDLY GROUNDED
4. PROVIDE SUFFICIENT SLACK CABLE, COILED AND SUSPENDED FROM HOOK, TO ALLOW ADJUSTMENT +/- 3 FT. FROM SPECIFIED ELEVATION.
5. DETENTION TANK PENETRATION SHALL CONSIST OF NON-METALLIC SLEEVE FOR CAST IN-PLACE STRUCTURE OR CORED HOLE FOR PRE-CAST OR EXISTING STRUCTURE, GROUT FOR WATERTIGHT CONDUIT PENETRATION.

2690-053 LEVEL INSTRUMENT INSTALLATION
FLOAT SWITCH
NTS



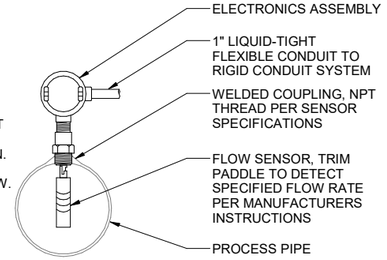
DETAIL NOTES:

1. ALL CABLES SHALL BE INSTALLED IN CONDUIT.
2. INSTALL CONDUIT(S) BETWEEN FLOW TUBE AND TRANSMITTER PER MFR INSTRUCTIONS.
3. PROVIDE SEPARATE SIGNAL AND POWER CONDUIT SYSTEMS PER SPECIFICATIONS.
4. INSTALL TRANSMITTER PER 2690-900

2690-101 FLOW INSTRUMENT INSTALLATION
REMOTE FLOW TRANSMITTER
NTS

DETAIL NOTES:

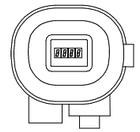
1. SWITCH IS ONLY SUITABLE FOR POTABLE WATER SERVICE, MAXIMUM FLOW RATE OF 200GPM.
2. FIELD VERIFY EXACT FLOW RATE FOR SWITCH ACTIVATION. PROVIDE POSITIVE INDICATION OF FLOW.



2690-152 INSTRUMENT INSTALLATION,
PADDLE TYPE FLOW SWITCH
NTS

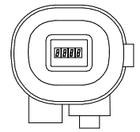
GAS SENSORS MOUNTED IN THIS ZONE:

HYDROGEN (H2)
METHANE (CH4)



ON OR NEAR CEILING

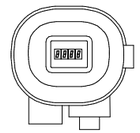
GAS SENSORS MOUNTED IN THIS ZONE:



ACETYLENE (C2H2)	HYDROGEN FLUORIDE (HF)
AMMONIA (NH3)	HYROGEN SULFIDE (H2S)
CARBON DIOXIDE (CO2) PPM	METHANOL (CH4O)
CARBON MONOXIDE (CO)	OXYGEN (O2)
CHLORINE (CL2)	OZONE (O3)
ETHYLENE (C2H4)	NITRIC OXIDE (NO)
FORMALDEHYDE (CH2O)	NITROGEN DIOXIDE (NO2)
FLUORINE (F2)	PHOSPHINE (PH3)
HYDROGEN CHLORIDE (HCL)	SILANE (SIH4)
HYDROGEN CYANIDE (HCN)	SULPHUR DIOXIDE (SO2)

4-6 FT ABOVE FLOOR

GAS SENSORS MOUNTED IN THIS ZONE:



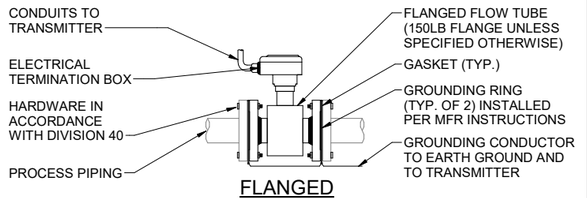
ALCOHOL	ISOBUTYLENE (C4H8)
BENZENE (C6H6)	JET FUEL
CARBON DIOXIDE (CO2) %VOL.	PROPANE (C3H8)
DIESEL FUEL	PENTANE (C5H12)
ETHANOL (C2H6O)	PROPYLENE (C3H6)
GASOLINE	REFRIGERANTS
HEXANE (C6H14)	TOLUENE (C7H8)
ISOBUTANE (I-C4H10)	XYLENE (C8H10)

6-IN ABOVE FLOOR

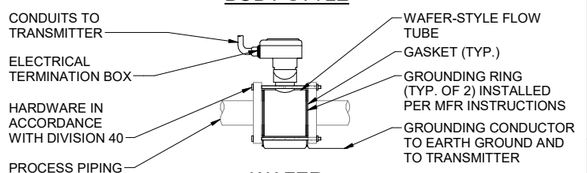
DETAIL NOTES:

1. WHERE EQUIPMENT IS INSTALLED IN SPACE THAT INCLUDES MORE THAN ONE FLOOR OR CEILING, "FLOOR" SHALL BE INTERPRETED AS THE LOWEST FLOOR AND "CEILING" SHALL BE INTERPRETED AS THE HIGHEST CEILING.

2690-650 GAS DETECTOR INSTALLATION
SENSOR MOUNTING HEIGHTS
NTS



FLANGED
BODY STYLE

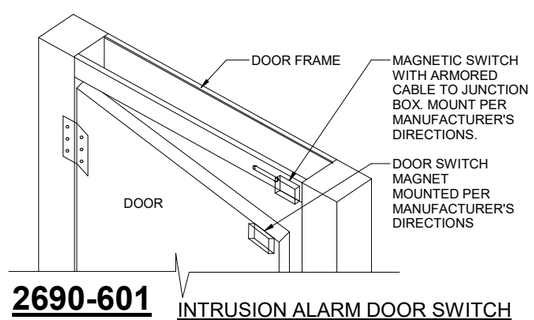


WAFER
BODY STYLE

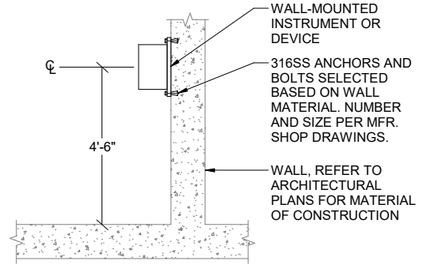
DETAIL NOTES:

1. INSTALL FLOW METER TO MAINTAIN STRAIGHT RUN OF 5 UPSTREAM PIPE DIAMETERS AND 2 DOWNSTREAM PIPE DIAMETERS, MINIMUM.
2. INSTALL CONDUIT(S) BETWEEN FLOW TUBE AND TRANSMITTER IN ACCORDANCE WITH MANUFACTURER'S WRITTEN INSTRUCTIONS.
3. ALL CABLES SHALL BE INSTALLED IN CONDUIT.
4. INSULATED GROUND CONDUCTOR NEED NOT BE INSTALLED IN CONDUIT.
5. GROUNDING SYSTEM SHALL PROVIDE LESS THAN 0.5 OHM, 100MV WHEN TESTED WITH STANDARD METHODS.

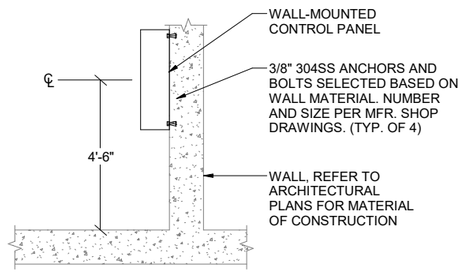
2690-100 FLOW INSTRUMENT INSTALLATION
ELECTROMAGNETIC FLOW TUBE
NTS



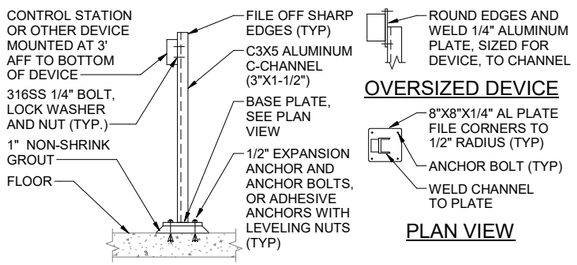
2690-601 INTRUSION ALARM DOOR SWITCH
NTS



2690-900 INSTRUMENT/DEVICE INSTALLATION
INTERIOR/EXTERIOR WALL-MOUNT
NTS



2690-800 CONTROL PANEL INSTALLATION
INTERIOR WALL-MOUNT
NTS



OVERSIZED DEVICE

PLAN VIEW

2690-910 INSTRUMENT/DEVICE INSTALLATION
INTERIOR PEDESTAL
NTS

PROJECT DATE:	DEC 23, 2025	DRAWN BY:	CJC
		DESIGNED BY:	CJC
		CHECKED BY:	LET

No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
ELECTRICAL DETAILS

PROJECT NO. 05323007.1
SHEET 99E502

PLOT DATE: 12/19/2025 14:10:48 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007_07_ELECTRICAL_OVERALL_MODEL_R24.rvt

PANEL SCHEDULE - 95-PDP-001

TYPE: SQUARE D - I-LINE
MOUNT: SURFACE
ISOLATED GROUND BUS: No
GROUND BUS: Yes
LOCATION: ELECTRICAL 95-105
VOLTAGE: 277/480V 3P, 4W
BUS AMPACITY: 800 A
MAIN CIRCUIT BKR: 800 A
SUB FEED LUGS: No
AMPS AIC: 33 KAIC

CKT. NO.	TRIP/P	DESCRIPTION	A		B		C		DESCRIPTION	TRIP/P	CKT. NO.
1			613.3 A	2.5 A							2
3	600 A/3	95-MCC-1			613.3 A	2.5 A			95-DF-1	20 A/3	4
5							613.3 A	2.5 A			6
7			24.0 A	9.0 A							8
9	30 A/3	95-EUH-1			24.0 A	9.0 A			95-EUH-2	20 A/3	10
11							24.0 A	9.0 A			12
13			52.5 A	0.0 A							14
15	125 A/3	95-T-001			33.9 A	0.0 A			95-SPD-001	30 A/3	16
17							25.3 A	0.0 A			18
19			0.0 A	0.3 A							20
21	20 A/3	SPARE			0.0 A	0.3 A			JIT-95-16-1	30 A/3	22
23							0.0 A	0.3 A			24
25											26
27											28
29											30
31											32
33											34
35											36
37											38
39											40
41											42
			194016 VA		188869 VA		186801 VA				
			701.6 A		683 A		674.4 A				

NOTES:

Load Classification	Connected Load	Demand Factor	Estimated...	Panel Totals	
Lighting	1576 VA	125.00%	1970 VA		
Receptacles	7020 VA	100.00%	7020 VA	**Total Conn. Load:**	569687 VA
HVAC(EQ)	2516 VA	100.00%	2516 VA	**Total Est. Demand:**	363918 VA
HVAC(EQ)(HEAT)	30723 VA	100.00%	30723 VA	**Total Conn. Current:**	685.2 A
HVAC(MTR)	2078 VA	100.00%	2078 VA	**Total Est. Demand...**	437.7 A
HVAC(MTR)(AC/HEAT)	193 VA	100.00%	193 VA		
Spare	2748 VA	100.00%	2748 VA		
HVAC	288 VA	100.00%	288 VA		
Process Equipment	314361 VA	100.00%	314361 VA		
Process Equipment Standby	206183 VA	0.01%	21 VA		
MISC	2000 VA	100.00%	2000 VA		

PANEL SCHEDULE - 95-LDP-001

TYPE: SQUARE D - NQ
MOUNT: SURFACE
ISOLATED GROUND BUS: No
GROUND BUS: Yes
LOCATION: ELECTRICAL 95-105
VOLTAGE: 120/208V 3P, 4W
BUS AMPACITY: 400 A
MAIN CIRCUIT BKR: 300 A
SUB FEED LUGS: No
AMPS AIC: 10 KAIC

CKT. NO.	TRIP/P	DESCRIPTION	A		B		C		DESCRIPTION	TRIP/P	CKT. NO.
1	20 A/1	Lighting - TRTMNT / EQ...	8.8 A	0.9 A					95-SS-1	20 A/2	2
3	20 A/1	Lighting - ELEC, CHEM, CL2			2.9 A	0.9 A					4
5	20 A/1	Lighting - EXTERIOR					1.0 A	12.5 A	95-EWH-1	20 A/1	6
7	20 A/1	95-EWH-2	12.5 A	2.4 A					95-GUH-1	20 A/1	8
9	20 A/1	95-GUH-2			2.4 A	0.4 A			95-EF-1 / 95-D-1 / 95-D-3	20 A/1	10
11	20 A/1	95-EF-2 / 95-D-4					6.7 A	0.1 A	95-EF-3 / 95-D-2 / 95-D-5	20 A/1	12
13	20 A/1	Lighting - TOILT / 95-EF-4	0.6 A	3.5 A					FIRE ALARM CIRCUIT	15 A/1	14
15	20 A/1	95-DH-1			8.5 A	8.5 A			95-DH-2	20 A/1	16
17	20 A/1	95-WH-1					5.0 A	3.0 A	Recps - ELECTRICAL 95-105	20 A/1	18
19	20 A/1	Recps - TRTMNT 95-106 (W) +	3.0 A	6.0 A					Recps - TRTMNT 95-106 (N) +	20 A/1	20
21	20 A/1	Recps - TRTMNT 95-106 (E) +			6.0 A	9.0 A			Recps - TRTMNT 95-106 (S) +	20 A/1	22
23	20 A/1	Recps - CHEM RM 95-103					3.0 A	1.5 A	Recps - TOILET 95-104	20 A/1	24
25	20 A/1	Recps - EQ PLTFRM 95-201 +	6.0 A	3.0 A					Recps - CL2 ROOM 95-101	20 A/1	26
27	20 A/1	Recps - M-100-13-1**			7.3 A	7.3 A			Recps - M-95-13-1*	20 A/1	28
29	20 A/1	Recps - P-100-12-1**					1.8 A	1.8 A	Recps - P-95-13-1*	20 A/1	30
31	20 A/1	WIT-100-12-1**	0.0 A	1.8 A					Recps - P-100-13-1 **	20 A/1	32
33	20 A/1	WIT-100-13-1**			0.0 A	1.8 A			Recps - P-95-12-1*	20 A/1	34
35	20 A/1	WIT-95-12-1*					0.0 A	0.0 A	WIT-95-13-1*	20 A/1	36
37	20 A/1	95-LCP-001	13.0 A	5.0 A					AIT-95-18-1	20 A/1	38
39	20 A/1	SPARE			0.0 A	5.6 A					40
41	20 A/1	FIT-95-1-1					2.5 A	5.6 A	95-G-16-1-APP	80 A/3	42
43	20 A/1	FIT-95-3-1	2.5 A	5.6 A							44
45	20 A/1	WIT-95-14-1			1.5 A	1.5 A			WIT-95-14-2	20 A/1	46
47	20 A/1	WIT-100-14-1**					1.5 A	1.5 A	WIT-100-14-2**	20 A/1	48
49	30 A/1	95-LCP-002***	22.0 A	22.0 A					100-LCP-002****	30 A/1	50
51	20 A/1	Recps - *FUTURE*****+			9.0 A	3.0 A			Lighting - *FUTURE*****	20 A/1	52
53	20 A/1	*FUTURE* - GUH****					2.4 A	8.5 A	*FUTURE* - Dehumidifier****	20 A/1	54
55	20 A/1	SPARE	0.0 A	0.0 A					SPARE	20 A/1	56
57	20 A/1	SPARE			0.0 A	0.0 A			SPARE	20 A/1	58
59	25 A/1	SPARE					0.0 A	0.0 A	SPARE	20 A/1	60
61	30 A/1	SPARE	0.0 A	0.0 A					SPARE	20 A/1	62
63	20 A/1	SPARE			0.0 A	0.0 A			SPARE	25 A/1	64
65	/1	SPACE					--	0.0 A	SPARE	30 A/1	66
67	/1	SPACE	--	--					SPACE	/1	68
69	/1	SPACE			--	--			SPACE	/1	70
71	/1	SPACE					--	--	SPACE	/1	72
			14219 VA		9072 VA		7004 VA				
			121.1 A		78.3 A		58.4 A				

NOTES:

Load Classification	Connected Load	Demand Factor	Estimated...	Panel Totals	
Lighting	1576 VA	125.00%	1970 VA		
Receptacles	7020 VA	100.00%	7020 VA	**Total Conn. Load:**	30295 VA
HVAC(EQ)	2516 VA	100.00%	2516 VA	**Total Est. Demand:**	30689 VA
HVAC(EQ)(HEAT)	3288 VA	100.00%	3288 VA	**Total Conn. Current:**	84.1 A
HVAC(MTR)(AC/HEAT)	193 VA	100.00%	193 VA	**Total Est. Demand...**	85.2 A
Spare	2748 VA	100.00%	2748 VA		
HVAC	288 VA	100.00%	288 VA		
Process Equipment	10666 VA	100.00%	10666 VA		
MISC	2000 VA	100.00%	2000 VA		

PANEL SCHEDULE LEGEND:

* RECEPTACLE PROVIDED UNDER PHASE 1 CONTRACT. EQUIPMENT PROVIDED UNDER PHASE 2 CONTRACT.

** RECEPTACLE PROVIDED UNDER PHASE 1 CONTRACT. FUTURE EQUIPMENT TO BE FURNISHED AT A LATER DATE.

*** CIRCUIT BREAKER PROVIDED UNDER PHASE 1 CONTRACT. EQUIPMENT PROVIDED UNDER PHASE 2 CONTRACT.

**** CIRCUIT BREAKER PROVIDED UNDER PHASE 1 CONTRACT. FUTURE EQUIPMENT TO BE FURNISHED AT A LATER DATE.

\+ GFI CIRCUIT

FIXTURE SCHEDULE

TYPE	DESCRIPTION	WATTS	LAMP TYPE	LAMP QTY.	MANUFACTURER	CATALOG NUMBER	NOTE
D2	2' SURFACE ENCLOSED LED INDUSTRIAL - WET LABEL	41	LED/4000K	W/ UNIT	LITHONIA	FEM-L24-6000LM-IMAFD-WD-MVOLT-GZ10-40K-80CRI-WLFEND2	
D4	4' SURFACE ENCLOSED LED INDUSTRIAL - WET LABEL	51	LED/4000K	W/ UNIT	LITHONIA	FEM-L48-8000LM-IMAFD-WD-MVOLT-GZ10-40K-80CRI-WLFEND2	1
D4E	4' SURFACE ENCLOSED LED INDUSTRIAL - WET LABEL	51	LED/4000K	W/ UNIT	LITHONIA	FEM-L48-8000LM-IMAFD-WD-MVOLT-GZ10-40K-80CRI-WLFEND2-E10WMCP	1,2
D8	8' SURFACE ENCLOSED LED INDUSTRIAL - WET LABEL	53	LED/4000K	W/ UNIT	LITHONIA	FEM-L96-9000LM-IMAFD-WD-MVOLT-GZ10-40K-80CRI-WLFEND2	1
D8E	8' SURFACE ENCLOSED LED INDUSTRIAL - WET LABEL	53	LED/4000K	W/ UNIT	LITHONIA	FEM-L96-9000LM-IMAFD-WD-MVOLT-GZ10-40K-80CRI-WLFEND2-E10WMCP	1,2
H1	EXTERIOR LED WALL PACK W/ PHOTOCELL	71	LED/4000K	W/ UNIT	LITHONIA	HLWPC2-P30-7800LM-40K-MVOLT-T2M-BZSDP-80CRI-EM	
X1	SINGLE FACE RED LED EXIT (WITH BATTERY)	2	LED	W/ UNIT	DUAL-LITE	EVC-U-R-W-D4 (EVO)	

GENERAL NOTES:
1. ALL FIXTURES SHALL BE UNIVERSALVOLTAGE UNLESS OTHERWISE INDICATED.
2. ALL LED FIXTURES SHALL BE DESIGNLIGHTS$_{TM}$ CONSORTIUM QUALIFIED.
3. FIXTURES BY MANUFACTURERS OTHER THAN THOSE SHOWN IN THE SCHEDULE SHALL BE CONSIDERD EQUAL PROVIDED THEY ARE OF SIMILAR QUALITY OF CONSTRUCTION AND HAVE ALL FEATURES, OPTIONS AND ACCESSORIES AS THE SCHEDULED FIXTURE.

PLAN NOTES:
1. PROVIDE PENDENT MOUNT WHERE REQUIRED TO AVOID CONFLICT WITH HVAC EQUIPMENT.
2. PROVIDE EMERGENCY BACKUP BATTERY WHERE INDICATED ON PLANS.

PLOT DATE: 12/18/2025 14:10:49 &plotdate Docs\05323007 City of Menomonie WI Well #9\05323007_07_ELECTRICAL_OVERALL_MODEL_R24.rvt

			No	DATE	REVISIONS	BY
PROJECT DATE:	DEC 23, 2025	DRAWN BY: CJC				
		DESIGNED BY: CJC				
		CHECKED BY: LET				

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
PANEL SCHEDULES

PROJECT NO. 05323007.1
SHEET 99E601

95-LCP-001 PLC I-O SCHEDULE

RACK	SLOT	POINT	TYPE	DESCRIPTION	NOTES
01	00	N/A	N/A	TYPE I PROGRAMMABLE LOGIC CONTROLLER PROCESSOR	1
01	01	00	AI	WELL NO.9 INFLUENT FLOW RATE	1
01	01	01	AI	(FUTURE) WELL NO.10 INFLUENT FLOW RATE	1
01	01	02	AI	DETENTION TANK NO.1 LEVEL	1
01	01	03	AI	DETENTION TANK NO.2 LEVEL	1
01	01	04	AI	DETENTION TANK NO.1 FLOW RATE	1
01	01	05	AI	(FUTURE) DETENTION TANK NO.2 FLOW RATE	1
01	01	06	AI	FILTER NO.9 INFLUENT PRESSURE	1
01	01	07	AI	FILTER NO.9 EFFLUENT FLOW RATE	1
01	02	00	AI	FILTER NO.9 EFFLUENT PRESSURE	1
01	02	01	AI	(FUTURE) FILTER NO.10 INFLUENT PRESSURE	1
01	02	02	AI	(FUTURE) FILTER NO.10 EFFLUENT FLOW RATE	1
01	02	03	AI	(FUTURE) FILTER NO.10 EFFLUENT PRESSURE	1
01	02	04	AI	POST FILTER NO.9 FLUORIDE SCALE WEIGHT	1
01	02	05	AI	(FUTURE) POST FILTER NO.10 FLUORIDE SCALE WEIGHT	1
01	02	06	AI	POST FILTER NO.9 FLUORIDE PUMP SPEED FEEDBACK	1
01	02	07	AI	(FUTURE) POST FILTER NO.10 FLUORIDE PUMP SPEED FEEDBACK	1
01	03	00	AI	WELL NO.9 KMNO4 CHEMICAL TANK SCALE WEIGHT	1
01	03	01	AI	(FUTURE) WELL NO.10 KMNO4 CHEMICAL TANK SCALE WEIGHT	1
01	03	02	AI	WELL NO.9 KMNO4 TANK LEVEL	1
01	03	03	AI	(FUTURE) WELL NO.10 KMNO4 TANK LEVEL	1
01	03	04	AI	WELL NO.9 KMNO4 CHEMICAL PUMP SPEED FEEDBACK	1
01	03	05	AI	(FUTURE) WELL NO.10 KMNO4 CHEMICAL PUMP SPEED FEEDBACK	1
01	03	06	AI	CHLORINE GAS CYLINDER NO.1 WEIGHT	1
01	03	07	AI	CHLORINE GAS CYLINDER NO.2 WEIGHT	1
01	04	00	AI	CHLORINE GAS CYLINDER NO.3 WEIGHT	1
01	04	01	AI	(FUTURE) CHLORINE GAS CYLINDER NO.4 WEIGHT	1
01	04	02	AI	(FUTURE) CHLORINE GAS CYLINDER NO.5 WEIGHT	1
01	04	03	AI	(FUTURE) CHLORINE GAS CYLINDER NO.6 WEIGHT	1
01	04	04	AI	CHLORINE GAS ROOM TEMPERATURE	1
01	04	05	AI	CHLORINE GAS CONCENTRATION	1
01	04	06	AI	CHEMICAL ROOM TEMPERATURE	1
01	04	07	AI	TREATMENT TEMPERATURE	1
01	05	00	AI	SPARE	1
01	05	01	AI	SPARE	1
01	05	02	AI	SPARE	1
01	05	03	AI	SPARE	1
01	05	04	AI	SPARE	1
01	05	05	AI	SPARE	1
01	05	06	AI	SPARE	1

95-LCP-001 PLC I-O SCHEDULE

RACK	SLOT	POINT	TYPE	DESCRIPTION	NOTES
01	05	07	AI	SPARE	1
01	06	00	AO	POST FILTER NO.9 FLUORIDE PUMP SPEED COMMAND	1
01	06	01	AO	(FUTURE) POST FILTER NO.10 FLUORIDE PUMP SPEED COMMAND	1
01	06	02	AO	WELL NO.9 KMNO4 CHEMICAL PUMP SPEED COMMAND	1
01	06	03	AO	(FUTURE) WELL NO.10 KMNO4 CHEMICAL PUMP SPEED COMMAND	1
01	06	04	AO	CHLORINE GAS FEEDER (OMNI-VALVE) NO.1 FLOW PROPORTION CONTROL	1
01	06	05	AO	CHLORINE GAS FEEDER (OMNI-VALVE) NO.1 DOSAGE CONTROL	1
01	06	06	AO	CHLORINE GAS FEEDER (OMNI-VALVE) NO.2 FLOW PROPORTION CONTROL	1
01	06	07	AO	CHLORINE GAS FEEDER (OMNI-VALVE) NO.2 DOSAGE CONTROL	1
01	07	00	AO	(FUTURE) CHLORINE GAS FEEDER (OMNI-VALVE) NO.3 FLOW PROPORTION CONTROL	1
01	07	01	AO	(FUTURE) CHLORINE GAS FEEDER (OMNI-VALVE) NO.3 DOSAGE CONTROL	1
01	07	02	AO	(FUTURE) CHLORINE GAS FEEDER (OMNI-VALVE) NO.4 FLOW PROPORTION CONTROL	1
01	07	03	AO	(FUTURE) CHLORINE GAS FEEDER (OMNI-VALVE) NO.4 DOSAGE CONTROL	1
01	07	04	AO	SPARE	1
01	07	05	AO	SPARE	1
01	07	06	AO	SPARE	1
01	07	07	AO	SPARE	1
01	08	00	DI	WELL NO.9 POSITIVE FLOW	1
01	08	01	DI	WELL NO.9 INFLUENT FLOW TOTALIZER	1
01	08	02	DI	(FUTURE) WELL NO.10 INFLUENT FLOW TOTALIZER	1
01	08	03	DI	DETENTION TANK NO.1 BACKUP FLOAT PUMP OFF / LOW LEVEL	1
01	08	04	DI	DETENTION TANK NO.1 BACKUP FLOAT PUMP REQUIRED	1
01	08	05	DI	DETENTION TANK NO.1 BACKUP FLOAT HIGH LEVEL	1
01	08	06	DI	HIGH LIFT PUMP NO.1A POSITIVE FLOW	1
01	08	07	DI	(FUTURE) HIGH LIFT PUMP NO.1B POSITIVE FLOW	1
01	08	08	DI	DETENTION TANK NO.1 FLOW TOTALIZER	1
01	08	09	DI	DETENTION TANK NO.2 BACKUP FLOAT PUMP OFF / LOW LEVEL	1
01	08	10	DI	DETENTION TANK NO.2 BACKUP FLOAT PUMP REQUIRED	1
01	08	11	DI	DETENTION TANK NO.2 BACKUP FLOAT HIGH LEVEL	1
01	08	12	DI	HIGH LIFT PUMP NO.2A POSITIVE FLOW	1
01	08	13	DI	(FUTURE) HIGH LIFT PUMP NO.2B POSITIVE FLOW	1
01	08	14	DI	(FUTURE) DETENTION TANK NO.2 FLOW TOTALIZER	1
01	08	15	DI	FILTER #9 EFFLUENT FLOW TOTAL	1
01	09	00	DI	(FUTURE) FILTER NO.10 EFFLUENT FLOW TOTAL	1
01	09	01	DI	POST FILTER NO.9 FLUORIDE PUMP RUNNING	1

95-LCP-001 PLC I-O SCHEDULE

RACK	SLOT	POINT	TYPE	DESCRIPTION	NOTES
01	09	02	DI	(FUTURE) POST FILTER NO.10 FLUORIDE PUMP RUNNING	1
01	09	03	DI	POST FILTER NO.9 FLUORIDE PUMP GENERAL ALARM	1
01	09	04	DI	(FUTURE) POST FILTER NO.10 FLUORIDE PUMP GENERAL ALARM	1
01	09	05	DI	WELL NO.9 KMNO4 CHEMICAL PUMP RUNNING	1
01	09	06	DI	(FUTURE) WELL NO.10 KMNO4 CHEMICAL PUMP RUNNING	1
01	09	07	DI	WELL NO.9 KMNO4 CHEMICAL PUMP GENERAL ALARM	1
01	09	08	DI	(FUTURE) WELL NO.10 KMNO4 CHEMICAL PUMP GENERAL ALARM	1
01	09	09	DI	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.1 RUNNING	1
01	09	10	DI	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.2 RUNNING	1
01	09	11	DI	CHLORINE GAS CHEMICAL ROOM GAS DETECTION SYSTEM TROUBLE	1
01	09	12	DI	CHEMICAL ROOM EXHAUST FAN RUNNING	1
01	09	13	DI	WELL NO.9 ELECTRICAL ROOM INTRUSION	1
01	09	14	DI	CHEMICAL ROOM INTRUSION	1
01	09	15	DI	CHLORINE GAS ROOM INTRUSION	1
01	10	00	DI	TREATMENT ROOM INTRUSION (SOUTHEAST DOOR)	1
01	10	01	DI	TREATMENT ROOM INTRUSION (DOUBLE DOOR)	1
01	10	02	DI	UTILITY AVAILABLE	1
01	10	03	DI	GENERATOR AVAILABLE	1
01	10	04	DI	GENERATOR EXERCISE	1
01	10	05	DI	ON UTILITY	1
01	10	06	DI	ON GENERATOR	1
01	10	07	DI	STANDBY GENERATOR RUN	1
01	10	08	DI	STANDBY GENERATOR FAIL	1
01	10	09	DI	FIRE DETECTED	1
01	10	10	DI	95-LCP-001 CONTROL POWER FAIL	1
01	10	11	DI	95-LCP-001 UPS FAULT	1
01	10	12	DI	WELL #9 INTRUSION	1
01	10	13	DI	FILTER NO.9 EFFLUENT POSITIVE FLOW	1
01	10	14	DI	(FUTURE) FILTER NO.10 EFFLUENT POSITIVE FLOW	1
01	10	15	DI	WELL NO.9 LEVEL CONTROL ENABLED	1
01	11	00	DI	WELL NO.9 PRESSURE CONTROL ENABLED	1
01	11	01	DI	WELL NO.9 AUTO SELECTION ENABLED	1
01	11	02	DI	SPARE	1
01	11	03	DI	SPARE	1
01	11	04	DI	SPARE	1
01	11	05	DI	SPARE	1
01	11	06	DI	SPARE	1
01	11	07	DI	SPARE	1
01	11	08	DI	SPARE	1

95-LCP-001 PLC I-O SCHEDULE

RACK	SLOT	POINT	TYPE	DESCRIPTION	NOTES
01	11	09	DI	SPARE	1
01	11	10	DI	SPARE	1
01	11	11	DI	SPARE	1
01	11	12	DI	SPARE	1
01	11	13	DI	SPARE	1
01	11	14	DI	SPARE	1
01	11	15	DI	SPARE	1
01	12	00	DO	POST FILTER NO.9 FLUORIDE PUMP REQUIRED	1
01	12	01	DO	(FUTURE) POST FILTER NO.10 FLUORIDE PUMP REQUIRED	1
01	12	02	DO	WELL NO.9 KMNO4 CHEMICAL PUMP REQUIRED	1
01	12	03	DO	(FUTURE) WELL NO.10 KMNO4 CHEMICAL PUMP REQUIRED	1
01	12	04	DO	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.1 REQUIRED	1
01	12	05	DO	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.2 REQUIRED	1
01	12	06	DO	CHEMICAL ROOM EXHAUST FAN REQUIRED	1
01	12	07	DO	WELL NO.9 INTRUSION LIGHT ON / OFF	1
01	12	08	DO	95-LCP-001 PLC SCAN ACTIVITY	1
01	12	09	DO	SPARE	1
01	12	10	DO	SPARE	1
01	12	11	DO	SPARE	1
01	12	12	DO	SPARE	1
01	12	13	DO	SPARE	1
01	12	14	DO	SPARE	1
01	12	15	DO	SPARE	1

PLC I-O SCHEDULE NOTES:

1. I-O POINT FURNISHED, INSTALLED, AND CONFIGURED IN NEW PROGRAMMABLE LOGIC CONTROLLER SYSTEM UNDER THIS CONTRACT.
2. I-O POINT FURNISHED, INSTALLED, AND CONFIGURED IN NEW PROGRAMMABLE LOGIC CONTROLLER SYSTEM UNDER FUTURE CONTRACT.
3. I-O POINT PROVIDED IN MANUFACTURER PANEL.

95-MCC-1 MCC I-O SCHEDULE

MCC COMPARTMENT	MODULE	POINT	TYPE	MODULE TYPE	DESCRIPTION	NOTES
2A	00A	00	DO	OVERLOAD INTEGRAL I/O	BACKWASH BLOWER NO.1 TRIP	1
2A	00A	01	DO	OVERLOAD INTEGRAL I/O	BACKWASH BLOWER NO.1 REQUIRED	1
2A	00A	02	DO	OVERLOAD INTEGRAL I/O	BACKWASH BLOWER NO.1 MOTOR OVERLOAD	1
2A	00B	00	DI	OVERLOAD INTEGRAL I/O	BACKWASH BLOWER NO.1 RUN	1
2A	00B	01	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2A	00B	02	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2A	00B	03	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2A	01A	00	DO	OVERLOAD I/O MODULE	SPARE	1
2A	01A	01	DO	OVERLOAD I/O MODULE	SPARE	1
2A	01B	00	DI	OVERLOAD I/O MODULE	BACKWASH BLOWER NO.1 SCADA SYSTEM CONTROL AVAILABLE	1
2A	01B	01	DI	OVERLOAD I/O MODULE	SPARE	1
2A	01B	02	DI	OVERLOAD I/O MODULE	SPARE	1
2A	01B	03	DI	OVERLOAD I/O MODULE	SPARE	1
2E	00A	00	DO	OVERLOAD INTEGRAL I/O	AERATOR BLOWER NO.1 TRIP	1
2E	00A	01	DO	OVERLOAD INTEGRAL I/O	AERATOR BLOWER NO.1 REQUIRED	1
2E	00A	02	DO	OVERLOAD INTEGRAL I/O	AERATOR BLOWER NO.1 MOTOR OVERLOAD	1
2E	00B	00	DI	OVERLOAD INTEGRAL I/O	AERATOR BLOWER NO.1 RUN	1
2E	00B	01	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2E	00B	02	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2E	00B	03	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2E	01A	00	DO	OVERLOAD I/O MODULE	SPARE	1
2E	01A	01	DO	OVERLOAD I/O MODULE	SPARE	1
2E	01B	00	DI	OVERLOAD I/O MODULE	AERATOR BLOWER NO.1 SCADA SYSTEM CONTROL AVAILABLE	1
2E	01B	01	DI	OVERLOAD I/O MODULE	SPARE	1
2E	01B	02	DI	OVERLOAD I/O MODULE	SPARE	1
2E	01B	03	DI	OVERLOAD I/O MODULE	SPARE	1
2H	00A	00	DO	OVERLOAD INTEGRAL I/O	CHLORINATION BOOSTER PUMP NO.1 TRIP	1
2H	00A	01	DO	OVERLOAD INTEGRAL I/O	CHLORINATION BOOSTER PUMP NO.1 REQUIRED	1
2H	00A	02	DO	OVERLOAD INTEGRAL I/O	CHLORINATION BOOSTER PUMP NO.1 MOTOR OVERLOAD	1
2H	00B	00	DI	OVERLOAD INTEGRAL I/O	CHLORINATION BOOSTER PUMP NO.1 RUN	1
2H	00B	01	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2H	00B	02	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2H	00B	03	DI	OVERLOAD INTEGRAL I/O	SPARE	1
2H	01A	00	DO	OVERLOAD I/O MODULE	SPARE	1
2H	01A	01	DO	OVERLOAD I/O MODULE	SPARE	1
2H	01B	00	DI	OVERLOAD I/O MODULE	CHLORINATION BOOSTER PUMP NO.1 SCADA SYSTEM CONTROL AVAILABLE	1
2H	01B	01	DI	OVERLOAD I/O MODULE	SPARE	1
2H	01B	02	DI	OVERLOAD I/O MODULE	SPARE	1
2H	01B	03	DI	OVERLOAD I/O MODULE	SPARE	1
3A	01A	00	DO	AFD I/O MODULE	WELL PUMP NO.9 REQUIRED	1
3A	01A	01	DO	AFD I/O MODULE	WELL PUMP NO.9 PRE-LUBE REQUIRED	1
3A	01B	00	DI	AFD I/O MODULE	WELL PUMP NO.9 SCADA SYSTEM CONTROL AVAILABLE	1
3A	01B	01	DI	AFD I/O MODULE	WELL PUMP NO.9 AFD START	1
3A	01B	02	DI	AFD I/O MODULE	SPARE	1
3A	01B	03	DI	AFD I/O MODULE	SPARE	1
3A	01B	04	DI	AFD I/O MODULE	SPARE	1
3A	01B	05	DI	AFD I/O MODULE	SPARE	1
3A	02A	00	DO	AFD I/O MODULE	WELL PUMP NO.9 RUN	1
3A	02A	01	DO	AFD I/O MODULE	WELL PUMP NO.9 AFD FAIL	1
3A	02B	00	DI	AFD I/O MODULE	SPARE	1
3A	02B	01	DI	AFD I/O MODULE	SPARE	1
3A	02B	02	DI	AFD I/O MODULE	SPARE	1
4A	01A	00	DO	AFD I/O MODULE	HIGH LIFT PUMP NO.1A REQUIRED	1
4A	01A	01	DO	AFD I/O MODULE	SPARE	1
4A	01B	00	DI	AFD I/O MODULE	HIGH LIFT PUMP NO.1A SCADA SYSTEM CONTROL AVAILABLE	1
4A	01B	01	DI	AFD I/O MODULE	HIGH LIFT PUMP NO.1A AFD START	1

95-MCC-1 MCC I-O SCHEDULE

MCC COMPARTMENT	MODULE	POINT	TYPE	MODULE TYPE	DESCRIPTION	NOTES
4A	01B	02	DI	AFD I/O MODULE	SPARE	1
4A	01B	03	DI	AFD I/O MODULE	SPARE	1
4A	01B	04	DI	AFD I/O MODULE	SPARE	1
4A	01B	05	DI	AFD I/O MODULE	SPARE	1
4A	02A	00	DO	AFD I/O MODULE	HIGH LIFT PUMP NO.1A RUN	1
4A	02A	01	DO	AFD I/O MODULE	HIGH LIFT PUMP NO.1A AFD FAIL	1
4A	02B	00	DI	AFD I/O MODULE	SPARE	1
4A	02B	01	DI	AFD I/O MODULE	SPARE	1
4A	02B	02	DI	AFD I/O MODULE	SPARE	1
5A	01A	00	DO	AFD I/O MODULE	HIGH LIFT PUMP NO.2A REQUIRED	1
5A	01A	01	DO	AFD I/O MODULE	SPARE	1
5A	01B	00	DI	AFD I/O MODULE	HIGH LIFT PUMP NO.2A SCADA SYSTEM CONTROL AVAILABLE	1
5A	01B	01	DI	AFD I/O MODULE	HIGH LIFT PUMP NO.2A AFD START	1
5A	01B	02	DI	AFD I/O MODULE	SPARE	1
5A	01B	03	DI	AFD I/O MODULE	SPARE	1
5A	01B	04	DI	AFD I/O MODULE	SPARE	1
5A	01B	05	DI	AFD I/O MODULE	SPARE	1
5A	02A	00	DO	AFD I/O MODULE	HIGH LIFT PUMP NO.2A RUN	1
5A	02A	01	DO	AFD I/O MODULE	HIGH LIFT PUMP NO.2A AFD FAIL	1
5A	02B	00	DI	AFD I/O MODULE	SPARE	1
5A	02B	01	DI	AFD I/O MODULE	SPARE	1
5A	02B	02	DI	AFD I/O MODULE	SPARE	1
6A	00A	00	DO	OVERLOAD INTEGRAL I/O	(FUTURE) BACKWASH BLOWER NO.2 TRIP	2
6A	00A	01	DO	OVERLOAD INTEGRAL I/O	(FUTURE) BACKWASH BLOWER NO.2 REQUIRED	2
6A	00A	02	DO	OVERLOAD INTEGRAL I/O	(FUTURE) BACKWASH BLOWER NO.2 MOTOR OVERLOAD	2
6A	00B	00	DI	OVERLOAD INTEGRAL I/O	(FUTURE) BACKWASH BLOWER NO.2 RUN	2
6A	00B	01	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6A	00B	02	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6A	00B	03	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6A	01A	00	DO	OVERLOAD I/O MODULE	SPARE	2
6A	01A	01	DO	OVERLOAD I/O MODULE	SPARE	2
6A	01B	00	DI	OVERLOAD I/O MODULE	(FUTURE) BACKWASH BLOWER NO.2 SCADA SYSTEM CONTROL AVAILABLE	2
6A	01B	01	DI	OVERLOAD I/O MODULE	SPARE	2
6A	01B	02	DI	OVERLOAD I/O MODULE	SPARE	2
6A	01B	03	DI	OVERLOAD I/O MODULE	SPARE	2
6E	00A	00	DO	OVERLOAD INTEGRAL I/O	(FUTURE) AERATOR BLOWER NO.2 TRIP	2
6E	00A	01	DO	OVERLOAD INTEGRAL I/O	(FUTURE) AERATOR BLOWER NO.2 REQUIRED	2
6E	00A	02	DO	OVERLOAD INTEGRAL I/O	(FUTURE) AERATOR BLOWER NO.2 MOTOR OVERLOAD	2
6E	00B	00	DI	OVERLOAD INTEGRAL I/O	(FUTURE) AERATOR BLOWER NO.2 RUN	2
6E	00B	01	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6E	00B	02	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6E	00B	03	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6E	01A	00	DO	OVERLOAD I/O MODULE	SPARE	2
6E	01A	01	DO	OVERLOAD I/O MODULE	SPARE	2
6E	01B	00	DI	OVERLOAD I/O MODULE	(FUTURE) AERATOR BLOWER NO.2 SCADA SYSTEM CONTROL AVAILABLE	2
6E	01B	01	DI	OVERLOAD I/O MODULE	SPARE	2
6E	01B	02	DI	OVERLOAD I/O MODULE	SPARE	2
6E	01B	03	DI	OVERLOAD I/O MODULE	SPARE	2
6H	00A	00	DO	OVERLOAD INTEGRAL I/O	(FUTURE) CHLORINATION BOOSTER PUMP NO.2 TRIP	2
6H	00A	01	DO	OVERLOAD INTEGRAL I/O	(FUTURE) CHLORINATION BOOSTER PUMP NO.2 REQUIRED	2
6H	00A	02	DO	OVERLOAD INTEGRAL I/O	(FUTURE) CHLORINATION BOOSTER PUMP NO.2 MOTOR OVERLOAD	2
6H	00B	00	DI	OVERLOAD INTEGRAL I/O	(FUTURE) CHLORINATION BOOSTER PUMP NO.2 RUN	2
6H	00B	01	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6H	00B	02	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6H	00B	03	DI	OVERLOAD INTEGRAL I/O	SPARE	2
6H	01A	00	DO	OVERLOAD I/O MODULE	SPARE	2

95-MCC-1 MCC I-O SCHEDULE

MCC COMPARTMENT	MODULE	POINT	TYPE	MODULE TYPE	DESCRIPTION	NOTES
6H	01A	01	DO	OVERLOAD I/O MODULE	SPARE	2
6H	01B	00	DI	OVERLOAD I/O MODULE	(FUTURE) CHLORINATION BOOSTER PUMP NO.2 SCADA SYSTEM CONTROL AVAILABLE	2
6H	01B	01	DI	OVERLOAD I/O MODULE	SPARE	2
6H	01B	02	DI	OVERLOAD I/O MODULE	SPARE	2
6H	01B	03	DI	OVERLOAD I/O MODULE	SPARE	2
7A	01A	00	DO	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.1B REQUIRED	2
7A	01A	01	DO	AFD I/O MODULE	SPARE	2
7A	01B	00	DI	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.1B SCADA SYSTEM CONTROL AVAILABLE	2
7A	01B	01	DI	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.1B AFD START	2
7A	01B	02	DI	AFD I/O MODULE	SPARE	2
7A	01B	03	DI	AFD I/O MODULE	SPARE	2
7A	01B	04	DI	AFD I/O MODULE	SPARE	2
7A	01B	05	DI	AFD I/O MODULE	SPARE	2
7A	02A	00	DO	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.1B RUN	2
7A	02A	01	DO	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.1B AFD FAIL	2
7A	02B	00	DI	AFD I/O MODULE	SPARE	2
7A	02B	01	DI	AFD I/O MODULE	SPARE	2
7A	02B	02	DI	AFD I/O MODULE	SPARE	2
8A	01A	00	DO	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.2B REQUIRED	2
8A	01A	01	DO	AFD I/O MODULE	SPARE	2
8A	01B	00	DI	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.2B SCADA SYSTEM CONTROL AVAILABLE	2
8A	01B	01	DI	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.2B AFD START	2
8A	01B	02	DI	AFD I/O MODULE	SPARE	2
8A	01B	03	DI	AFD I/O MODULE	SPARE	2
8A	01B	04	DI	AFD I/O MODULE	SPARE	2
8A	01B	05	DI	AFD I/O MODULE	SPARE	2
8A	02A	00	DO	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.2B RUN	2
8A	02A	01	DO	AFD I/O MODULE	(FUTURE) HIGH LIFT PUMP NO.2B AFD FAIL	2
8A	02B	00	DI	AFD I/O MODULE	SPARE	2
8A	02B	01	DI	AFD I/O MODULE	SPARE	2
8A	02B	02	DI	AFD I/O MODULE	SPARE	2

MCC I-O SCHEDULE NOTES:

1. I-O POINT FURNISHED, INSTALLED, AND CONFIGURED IN NEW MOTOR CONTROL CENTER SYSTEM UNDER THIS CONTRACT.
2. I-O POINT FURNISHED, INSTALLED, AND CONFIGURED IN A NEW MOTOR CONTROL CENTER SYSTEM UNDER FUTURE CONTRACT.

PLOT DATE: 12/19/2025 14:19:50 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007_07_ELECTRICAL_OVERALL_MODEL_R24.rvt

			No	DATE	REVISIONS	BY
PROJECT DATE:	DEC 23, 2025	DRAWN BY: CJC				
		DESIGNED BY: CJC				
		CHECKED BY: LET				

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
PLC AND MCC I-O SCHEDULES

PROJECT NO. 05323007.1
SHEET 99E602

PROCESS VALVE ELECTRICAL INSTALLATION AND WIRING SCHEDULE

TAG NUMBER	DESCRIPTION	LOCATION DATA				FIRST SIGNAL/CONTROL HOMERUN			SECOND SIGNAL/CONTROL HOMERUN			POWER HOMERUN			DETAIL	NOTES
		NUMBER	NAME	LEVEL	ROOM	DESTINATION	WIRING TYPE	WIRING	DESTINATION	WIRING TYPE	WIRING	PANEL	CIRCUIT RATING	CIRCUIT WIRING		
STR-95 WELL #9																
CCV-95-14-2	CHLORINE GAS FEEDER (OMNI-VALVE) NO.2	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2								1
CCV-95-14-1	CHLORINE GAS FEEDER (OMNI-VALVE) NO.1	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2								1
CCV-100-14-1	(FUTURE) CHLORINE GAS FEEDER (OMNI-VALVE) NO.3	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2								3
CCV-100-14-2	(FUTURE) CHLORINE GAS FEEDER (OMNI-VALVE) NO.4	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2								3
WCV-95-8-3	FILTER NO.9 TO WASTE VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-8-2	FILTER NO.9 SIMUL-WASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-8-1	FILTER NO.9 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-7-4	FILTER CELL NO.4 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-7-3	FILTER CELL NO.4 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-7-2	FILTER CELL NO.4 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-7-1	FILTER CELL NO.4 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-6-4	FILTER CELL NO.3 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-6-3	FILTER CELL NO.3 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-6-2	FILTER CELL NO.3 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-6-1	FILTER CELL NO.3 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-5-4	FILTER CELL NO.2 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-5-3	FILTER CELL NO.2 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-5-2	FILTER CELL NO.2 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-5-1	FILTER CELL NO.2 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-4-4	FILTER CELL NO.1 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-4-3	FILTER CELL NO.1 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-4-2	FILTER CELL NO.1 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-4-1	FILTER CELL NO.1 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
WCV-95-1-1	WELL NO.9 PRE-LUBE SOLENOID VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D2								1
WCV-100-8-3	(FUTURE) FILTER NO.10 TO WASTE VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-8-2	(FUTURE) FILTER NO.10 SIMUL-WASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-8-1	(FUTURE) FILTER NO.10 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-7-4	(FUTURE) FILTER CELL NO.4 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-7-3	(FUTURE) FILTER CELL NO.4 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-7-2	(FUTURE) FILTER CELL NO.4 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-7-1	(FUTURE) FILTER CELL NO.4 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-6-4	(FUTURE) FILTER CELL NO.3 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-6-3	(FUTURE) FILTER CELL NO.3 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-6-2	(FUTURE) FILTER CELL NO.3 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-6-1	(FUTURE) FILTER CELL NO.3 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-5-4	(FUTURE) FILTER CELL NO.2 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-5-3	(FUTURE) FILTER CELL NO.2 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-5-2	(FUTURE) FILTER CELL NO.2 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-5-1	(FUTURE) FILTER CELL NO.2 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-4-4	(FUTURE) FILTER CELL NO.1 BACKWASH EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-4-3	(FUTURE) FILTER CELL NO.1 BACKWASH SUPPLY VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-4-2	(FUTURE) FILTER CELL NO.1 EFFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
WCV-100-4-1	(FUTURE) FILTER CELL NO.1 INFLUENT VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
ACV-95-7-5	FILTER CELL NO.4 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
ACV-95-6-5	FILTER CELL NO.3 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
ACV-95-5-5	FILTER CELL NO.2 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
ACV-95-4-5	FILTER CELL NO.1 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D6								2
ACV-100-7-5	(FUTURE) FILTER CELL NO.4 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
ACV-100-6-5	(FUTURE) FILTER CELL NO.3 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
ACV-100-5-5	(FUTURE) FILTER CELL NO.2 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3
ACV-100-4-5	(FUTURE) FILTER CELL NO.1 BACKWASH AIR VALVE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	100-LCP-002	24VDC DISCRETE SIGNAL	D6								3

PROCESS VALVE SCHEDULE NOTES:

1. EQUIPMENT PROVIDED AND INSTALLED UNDER ANOTHER DIVISION OF THE SPECIFICATIONS BUT WIRED UNDER DIVISION 26.
2. EQUIPMENT TO BE PROVIDED UNDER PHASE 2 CONTRACT.
3. FUTURE EQUIPMENT TO BE PROVIDED UNDER A LATER CONTRACT.

EQUIPMENT ELECTRICAL INSTALLATION AND WIRING SCHEDULE

TAG NUMBER	DESCRIPTION	LOCATION DATA				FIRST SIGNAL/CONTROL HOMERUN			SECOND SIGNAL/CONTROL HOMERUN			POWER HOMERUN			DETAIL	NOTES
		NUMBER	NAME	LEVEL	ROOM	DESTINATION	WIRING TYPE	WIRING	DESTINATION	WIRING TYPE	WIRING	PANEL	CIRCUIT RATING	CIRCUIT WIRING		
STR-95 WELL #9																
95-EUH-1	CHLORINE ROOM ELECTRIC UNIT HEATER	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM							95-PDP-001	480 V - 30 A / 3 P	3-#10, 1-#10, 1-#10		1
95-D-1	LOUVER - 95-L-1 DAMPER ACTUATOR	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
P-95-12-1	POST FILTER FLUORIDE PUMP	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,2
P-100-12-1	(FUTURE) POST FILTER FLUORIDE PUMP	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		4
95-EWH-2	FLUORIDE ROOM ELECTRIC WALL HEATER	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
M-95-13-1	KMNO4 TANK MIXER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,2,3
P-95-13-1	KMNO4 FEED PUMP	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,2,3
P-100-13-1	(FUTURE) KMNO4 FEED PUMP	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		4
M-100-13-1	(FUTURE) KMNO4 TANK MIXER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		4
95-EUH-2	CHEMICAL ROOM ELECTRIC UNIT HEATER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM							95-PDP-001	480 V - 20 A / 3 P	3-#12, 1-#12, 1-#12		1
95-D-2	LOUVER - 95-L-2 DAMPER ACTUATOR	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,7
95-EWH-1	TOILET ROOM ELECTRIC WALL HEATER	STR-95	WELL #9	GROUND LEVEL	95-104 TOILET							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
95-EF-4	TOILET ROOM EXHAUST FAN	STR-95	WELL #9	GROUND LEVEL	95-104 TOILET							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
95-SS-1B	STR-95 ELECTRICAL ROOM SPLIT A/C-HEAT SYSTEM (INDOOR)	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL											1
95-GUH-1	TREATMENT ROOM ELECTRIC UNIT HEATER 1	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
95-DF-1	DESTRACTIFICATION FAN 1	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-PDP-001	480 V - 20 A / 3 P	3-#12, 1-#12, 1-#12		1
95-GUH-2	TREATMENT ROOM ELECTRIC UNIT HEATER 2	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
95-SS-1A	STR-95 ELECTRICAL ROOM SPLIT A/C-HEAT SYSTEM (OUTDOOR)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-LDP-001	208 V - 20 A / 2 P	2-#12, 1-#12, 1-#12		1
95-WH-1	STR-95 WATER HEATER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1
95-DH-1	TREATMENT ROOM DEHUMIDIFIER NO.1	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,2
95-DH-2	TREATMENT ROOM DEHUMIDIFIER NO.2	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,2
95-EF-1	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.1	STR-95	WELL #9	MEZZANINE	95-201 EQUIPMENT PLATFORM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,5
95-EF-2	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.2	STR-95	WELL #9	MEZZANINE	95-201 EQUIPMENT PLATFORM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,6
95-D-3	95-EF-1 DAMPER ACTUATOR	STR-95	WELL #9	MEZZANINE	95-201 EQUIPMENT PLATFORM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,5
95-D-4	95-EF-2 DAMPER ACTUATOR	STR-95	WELL #9	MEZZANINE	95-201 EQUIPMENT PLATFORM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,6
95-D-5	95-EF-3 DAMPER ACTUATOR	STR-95	WELL #9	MEZZANINE	95-201 EQUIPMENT PLATFORM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,7
95-EF-3	CHEMICAL ROOM EXHAUST FAN	STR-95	WELL #9	MEZZANINE	95-201 EQUIPMENT PLATFORM							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12		1,7

EQUIPMENT ELECTRICAL SCHEDULE NOTES:

1. EQUIPMENT PROVIDED AND INSTALLED UNDER ANOTHER DIVISION OF THE SPECIFICATIONS BUT WIRED UNDER DIVISION 26.
2. PROVIDE DEDICATED RECEPTACLE FOR EQUIPMENT.
3. EQUIPMENT TO BE PROVIDED UNDER PHASE 2 CONTRACT.
4. FUTURE EQUIPMENT TO BE PROVIDED UNDER A LATER CONTRACT.
5. INTERLOCK DAMPER OPERATORS 95-D-1 AND 95-D-3 WITH FAN 95-EF-1.
6. INTERLOCK DAMPER OPERATOR 95-D-4 WITH FAN 95-EF-2.
7. INTERLOCK DAMPER OPERATORS 95-D-2 AND 95-D-5 WITH FAN 95-EF-3.

PLOT DATE: 12/19/2025 14:10:53 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007_07_ELECTRICAL_OVERALL_MODEL_R24.rvt

PROJECT DATE:	DEC 23, 2025
DRAWN BY:	CJC
DESIGNED BY:	CJC
CHECKED BY:	LET

No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
WIRING SCHEDULES

PROJECT NO. 05323007.1
SHEET 99E603

PROCESS INSTRUMENTATION ELECTRICAL INSTALLATION AND WIRING SCHEDULE

TAG NUMBER	DESCRIPTION	LOCATION DATA				FIRST SIGNAL/CONTROL HOMERUN			SECOND SIGNAL/CONTROL HOMERUN			POWER HOMERUN			DETAIL	NOTES
		NUMBER	NAME	LEVEL	ROOM	DESTINATION	WIRING TYPE	WIRING	DESTINATION	WIRING TYPE	WIRING	PANEL	CIRCUIT RATING	CIRCUIT WIRING		
STR-95																
WELL #9																
LSC-95-3-1	DETENTION TANK NO.1 PUMP ON BACKUP FLOAT SWITCH	STR-95	WELL #9	BELOW GRADE	95-107 DETENTION TANK NO.1	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-052	1
LSH-95-3-1	DETENTION TANK NO.1 HIGH-LEVEL BACKUP FLOAT SWITCH	STR-95	WELL #9	BELOW GRADE	95-107 DETENTION TANK NO.1	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-052	1
LT-95-3-1	DETENTION TANK NO.1 SUBMERSIBLE LEVEL TRANSMITTER	STR-95	WELL #9	BELOW GRADE	95-107 DETENTION TANK NO.1	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-000	1
LSL-95-3-1	DETENTION TANK NO.1 LOW-LEVEL BACKUP FLOAT SWITCH	STR-95	WELL #9	BELOW GRADE	95-107 DETENTION TANK NO.1	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-052	1
LSL-100-3-1	DETENTION TANK NO.2 LOW-LEVEL BACKUP FLOAT SWITCH	STR-95	WELL #9	BELOW GRADE	95-108 DETENTION TANK NO.2	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-052	1
LSC-100-3-1	DETENTION TANK NO.2 PUMP ON BACKUP FLOAT SWITCH	STR-95	WELL #9	BELOW GRADE	95-108 DETENTION TANK NO.2	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-052	1
LSH-100-3-1	DETENTION TANK NO.2 HIGH-LEVEL BACKUP FLOAT SWITCH	STR-95	WELL #9	BELOW GRADE	95-108 DETENTION TANK NO.2	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-052	1
LT-100-3-1	DETENTION TANK NO.2 SUBMERSIBLE LEVEL TRANSMITTER	STR-95	WELL #9	BELOW GRADE	95-108 DETENTION TANK NO.2	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-000	1
AE-95-18-1	CHLORINE GAS SENSOR	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	AIT-95-18-1	MFR SIGNAL CABLE	M1							2690-650	1
TT-95-20-1	CHLORINE GAS ROOM TEMPERATURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-900	1
ZS-95-22-3	CHLORINE GAS ROOM INTRUSION SWITCH	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-601	1
WE-95-14-2	CHLORINE GAS CYLINDER NO.1 WEIGH SCALE	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	WIT-95-14-2	MFR SIGNAL CABLE	M1								2
WE-95-14-1B	CHLORINE GAS CYLINDER NO.2 WEIGH SCALE	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	WIT-95-14-1	MFR SIGNAL CABLE	M1								2
WIT-95-14-2	CHLORINE GAS WEIGHT DUAL CHANNEL TRANSMITTER NO.2	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	4
WE-100-14-1A	(FUTURE) CHLORINE GAS CYLINDER NO.3 WEIGH SCALE	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	WIT-100-14-1	MFR SIGNAL CABLE	M1								8
WE-100-14-1B	(FUTURE) CHLORINE GAS CYLINDER NO.4 WEIGH SCALE	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	WIT-100-14-1	MFR SIGNAL CABLE	M1								8
WIT-100-14-1	(FUTURE) CHLORINE GAS WEIGHT DUAL CHANNEL TRANSMITTER NO.3	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2				95-LDP-001	120 V - 20 A / 1 P	1-#10, 1-#10, 1-#10	2690-900	8
WE-95-14-1A	CHLORINE GAS CYLINDER NO.1 WEIGH SCALE	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	WIT-95-14-1	MFR SIGNAL CABLE	M1								2
WIT-95-14-1	CHLORINE GAS WEIGHT DUAL CHANNEL TRANSMITTER NO.1	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	4
YA-95-21-2	FIRE SUPPRESSION SYSTEM ALARM STROBE NO.2	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
XE-95-21-2	FIRE SUPPRESSION SYSTEM SMOKE DETECTOR NO.2	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
HS-95-21-3	FIRE SUPPRESSION SYSTEM MANUAL RELEASE STATION NO.3	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
WE-100-14-2	(FUTURE) CHLORINE GAS CYLINDER NO.6 WEIGH SCALE	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	WIT-95-14-1	MFR SIGNAL CABLE	M1								8
WIT-100-14-2	(FUTURE) CHLORINE GAS WEIGHT DUAL CHANNEL TRANSMITTER NO.4	STR-95	WELL #9	GROUND LEVEL	95-101 CHLORINE ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A2				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	8
WE-95-12-1	POST FILTER FLOURIDE WEIGHT SCALE	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE	WIT-95-12-1	MFR SIGNAL CABLE	M1								2
WIT-95-12-1	POST FILTER FLOURIDE WEIGHT TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE	95-LCP-001	24VDC ANALOG SIGNAL	A1				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	4
WE-100-12-1	(FUTURE) POST FILTER FLOURIDE WEIGHT SCALE	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE	WIT-100-12-1	MFR SIGNAL CABLE	M1								8
WIT-100-12-1	(FUTURE) POST FILTER FLOURIDE WEIGHT TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-102 FLUORIDE	95-LCP-001	24VDC ANALOG SIGNAL	A1				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	8
HS-95-21-2	FIRE SUPPRESSION SYSTEM MANUAL RELEASE STATION NO.2	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
YA-95-21-1	FIRE SUPPRESSION SYSTEM ALARM STROBE NO.1	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
XE-95-21-1	FIRE SUPPRESSION SYSTEM SMOKE DETECTOR NO.1	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
TT-95-20-3	CHEMICAL ROOM TEMPERATURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-900	1
ZS-95-22-2	CHEMICAL ROOM INTRUSION SWITCH	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-601	1
WE-95-13-1	POTASSIUM PERMANGANATE WEIGHT SCALE	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	WIT-95-13-1	MFR SIGNAL CABLE	M1								7
WIT-95-13-1	POTASSIUM PERMANGANATE WEIGHT TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A1				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	7
WE-100-13-1	(FUTURE) POTASSIUM PERMANGANATE WEIGHT SCALE	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	WIT-100-13-1	MFR SIGNAL CABLE	M1								8
WIT-100-13-1	(FUTURE) POTASSIUM PERMANGANATE WEIGHT TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A1				95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	8
LT-95-13-1	POTASSIUM PERMANGANATE TANK LEVEL TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-033	7
LT-100-13-1	(FUTURE) POTASSIUM PERMANGANATE TANK LEVEL TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-103 CHEMICAL ROOM	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-033	8
AIT-95-18-1	CHLORINE GAS SYSTEM ANALYZER/TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D4	95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	1
95-LCP-001	WELL NO.9 LOCAL CONTROL PANEL	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL							95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-800	1
JIT-95-16-1	MAIN SERVICE POWER MONITOR	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL	95-LCP-001	ETHERNET	E1				95-PDP-001	480 V - 30 A / 3 P	3-#10, 1-#10, 1-#10	2690-800	1,5,6
95-ATS-001	WELL NO.9 AUTOMATIC TRANSFER SWITCH	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL	95-LCP-001	24VDC DISCRETE SIGNAL	D10							2690-810	1,6
95-LCP-16-2	WELL NO.9 STANDBY GENERATOR REMOTE ANNUNCIATOR	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL	95-LCP-16-1	MFR SIGNAL CABLE	M1							2690-900	1
ZS-95-22-1	ELECTRICAL ROOM INTRUSION SWITCH	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-601	1
XS-95-3-2	(FUTURE) HIGH LIFT PUMP NO.1B LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-105 ELECTRICAL	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	8
FE-95-1-1	WELL NO.9 FLOW METER SENSOR	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	FIT-95-1-1	MFR SIGNAL CABLE	M1							2690-100	1
FIT-95-1-1	WELL NO.9 FLOW METER TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2	95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-101	1
FS-95-1-1	WELL NO.9 FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-152	1
XS-95-1-1	WELL NO.9 LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	1
FS-95-3-1	HIGH LIFT PUMP NO.1A POSITIVE FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-152	1
FS-100-3-1	HIGH LIFT PUMP NO.2A POSITIVE FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-152	
FE-95-3-1	HIGH LIFT PUMP NO.1A FLOW SENSOR	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	FIT-95-3-1	MFR SIGNAL CABLE	M1							2690-100	1
FIT-95-3-1	HIGH LIFT PUMP NO.1A FLOW TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2	95-LDP-001	120 V - 20 A / 1 P	1-#12, 1-#12, 1-#12	2690-101	1
XS-95-3-1	HIGH LIFT PUMP NO.1A LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	1
XS-100-3-1	HIGH LIFT PUMP NO.2A LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	1
95-LCP-21-1	WELL NO.9 FIRE SUPPRESSION SYSTEM	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-16-1	24VDC DISCRETE SIGNAL	D2	95-LCP-001	24VDC DISCRETE SIGNAL	D2	95-LDP-001	120 V - 15 A / 1 P	1-#12, 1-#12, 1-#12	2690-900	4
TT-95-20-4	TREATMENT TEMPERATURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1							2690-900	1
ZS-95-22-4	TREATMENT INTRUSION SWITCH NO.1 (SOUTHEAST DOOR)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-601	1
ZS-95-22-5	TREATMENT INTRUSION SWITCH NO.2 (DOUBLE DOOR)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-601	1
XS-95-15-1	BACKWASH BLOWER NO.1 LOCAL CONTROL PANEL (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	7
XS-95-2-1	AERATOR BLOWER NO.1 LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	7
XS-100-2-1	(FUTURE) AERATOR BLOWER NO.2 LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	8
FE-95-9-1	FILTER NO.9 EFFLUENT MAGNETIC FLOW SENSOR	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	FIT-95-9-1	MFR SIGNAL CABLE	M1							2690-100	7
FIT-95-9-1	FILTER NO.9 EFFLUENT FLOW TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2				2690-101	7
PI-95-10-2	FILTER NO.9 EFFLUENT PRESSURE GAUGE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT										2690-301	7
PIT-95-10-2	FILTER NO.9 EFFLUENT PRESSURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC ANALOG SIGNAL	A1							2690-301	7
95-LCP-002	TONKA FILTER CONTROL PANEL	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	ETHERNET					95-LDP-001	120 V - 30 A / 1 P	1-#10, 1-#10, 1-#10	2690-800	5,7
XS-95-14-2	CHLORINATION BOOSTER PUMP NO.1 LOCAL CONTROL PANEL (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	7
XS-100-14-1	(FUTURE) CHLORINATION BOOSTER PUMP NO.2 LOCAL CONTROL PANEL (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	8
HS-95-21-1	FIRE SUPPRESSION SYSTEM MANUAL RELEASE STATION NO.1	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
FS-95-3-2	(FUTURE) HIGH LIFT PUMP NO.1B POSITIVE FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-152	8
FS-100-3-2	(FUTURE) HIGH LIFT PUMP NO.2B POSITIVE FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-152	8
XS-100-3-2	(FUTURE) HIGH LIFT PUMP NO.2B LOCAL CONTROL STATION (HOA)	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	8
FE-95-8-1	FILTER NO.9 BACKWASH MAGNETIC FLOW SENSOR	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	FIT-95-8-1	MFR SIGNAL CABLE	M1							2690-100	7
PI-95-10-1	FILTER NO.9 INFLUENT PRESSURE GAUGE	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT										2690-301	7
PIT-95-10-1	FILTER NO.9 INFLUENT PRESSURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC ANALOG SIGNAL	A1							2690-301	7
FIT-95-8-1	FILTER NO.9 EFFLUENT / BACKWASH INFLUENT FLOW TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2				2690-101	7
FE-100-3-1	(FUTURE) DETENTION TANK NO.2 EFFLUENT FLOW SENSOR	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	FIT-100-3-1	MFR SIGNAL CABLE	M1							2690-100	8
FIT-100-3-1	(FUTURE) DETENTION TANK NO.2 EFFLUENT FLOW TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2				2690-101	8
FS-95-9-1	FILTER NO.9 EFFLUENT FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-301	3
95-LCP-003	TONKA LOSS OF HEAD PANEL	STR-95	WELL #9	GROUND LEVEL	95-106 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D4								7
XS-100-15-1	(FUTURE) BACKWASH BLOWER NO.2 LOCAL CONTROL PANEL (HOA)	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	95-MCC-1	24VDC DISCRETE SIGNAL	D4							2690-900	8
FIT-100-1-1	(FUTURE) WELL NO.10 FLOW METER TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	95-LCP-001	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2				2690-101	8
FE-100-1-1	(FUTURE) WELL NO.10 FLOW METER SENSOR	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	FIT-100-1-1	MFR SIGNAL CABLE	M1							2690-100	8
PI-100-10-1	(FUTURE) FILTER NO.10 INFLUENT PRESSURE GAUGE	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT										2690-301	8
PIT-100-10-1	(FUTURE) FILTER NO.10 INFLUENT PRESSURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	100-LCP-002	24VDC ANALOG SIGNAL	A1							2690-301	8
FIT-100-8-1	(FUTURE) FILTER NO.10 EFFLUENT / BACKWASH INFLUENT FLOW TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	100-LCP-002	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2				2690-101	8

PROCESS INSTRUMENTATION SCHEDULE NOTES:

1. EQUIPMENT FURNISHED, INSTALLED, AND WIRED UNDER DIVISION 26.
2. EQUIPMENT FURNISHED AND INSTALLED UNDER ANOTHER DIVISION OF THE SPECIFICATIONS BUT WIRED UNDER DIVISION 26.
3. EQUIPMENT FURNISHED AND WIRED UNDER DIVISION 26 BUT INSTALLED UNDER ANOTHER DIVISION OF THE SPECIFICATIONS.
4. EQUIPMENT FURNISHED UNDER ANOTHER DIVISION OF THE SPECIFICATIONS BUT INSTALLED AND WIRED UNDER DIVISION 26.
5. REFER TO SCADA SYSTEM NETWORK ARCHITECTURE DRAWINGS FOR COMMUNICATION CABLING REQUIREMENTS.
6. REFER TO ONE-LINE DIAGRAM FOR POWER WIRING REQUIREMENTS.
7. EQUIPMENT PROVIDED UNDER PHASE 2 CONTRACT.
8. FUTURE EQUIPMENT TO BE PROVIDED AT A LATER DATE.
9. INSTALL EQUIPMENT PER MANUFACTURER'S GUIDELINES. COORDINATE WITH SYSTEM SUPPLIER ON SIGNAL CABLE REQUIRMENTS.

PLOT DATE: 12/18/2025 14:10:53 Autodesk Docs://05323007 City of Menomonie WI Well #9/05323007_01_ELECTRICAL_OVERALL_MODEL_R24.rvt

			No	DATE	REVISIONS	BY
PROJECT DATE:	DEC 23, 2025	DRAWN BY: CJC				
		DESIGNED BY: CJC				
		CHECKED BY: LET				

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
WIRING SCHEDULES

PROJECT NO. 05323007.1
SHEET 99E604

PROCESS INSTRUMENTATION ELECTRICAL INSTALLATION AND WIRING SCHEDULE

TAG NUMBER	DESCRIPTION	LOCATION DATA				FIRST SIGNAL/CONTROL HOMERUN			SECOND SIGNAL/CONTROL HOMERUN			POWER HOMERUN			DETAIL	NOTES
		NUMBER	NAME	LEVEL	ROOM	DESTINATION	WIRING TYPE	WIRING	DESTINATION	WIRING TYPE	WIRING	PANEL	CIRCUIT RATING	CIRCUIT WIRING		
FIT-100-9-1	(FUTURE) FILTER NO.10 FILTER EFFLUENT FLOW TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	100-LCP-002	24VDC ANALOG SIGNAL	A1	95-LCP-001	24VDC DISCRETE SIGNAL	D2				2690-101	8
PI-100-10-2	(FUTURE) FILTER NO.10 EFFLUENT PRESSURE GAUGE	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT										2690-301	8
PIT-100-10-2	(FUTURE) FILTER NO.10 EFFLUENT PRESSURE TRANSMITTER	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	100-LCP-002	24VDC ANALOG SIGNAL	A1							2690-301	8
FE-100-9-1	(FUTURE) FILTER NO.10 FILTER EFFLUENT MAGNETIC FLOW SENSOR	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	FIT-100-9-1	MFR SIGNAL CABLE	M1							2690-100	8
FE-100-8-1	(FUTURE) FILTER NO.10 EFFLUENT / BACKWASH INFLUENT MAGNETIC FLOW SENSOR	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	FIT-100-8-1	MFR SIGNAL CABLE	M1							2690-100	8
100-LCP-002	(FUTURE) TONKA FILTER CONTROL PANEL	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	95-LCP-001	ETHERNET					95-LDP-001	120 V - 30 A / 1 P	1-#10, 1-#10, 1-#10	2690-800	5,8
FS-100-9-1	FILTER NO.10 EFFLUENT FLOW SWITCH	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	95-LCP-001	24VDC DISCRETE SIGNAL	D2							2690-152	8
100-LCP-003	(FUTURE) TONKA LOSS OF HEAD PANEL	STR-95	WELL #9	GROUND LEVEL	95-109 TREATMENT	95-LCP-002	24VDC DISCRETE SIGNAL	D4								8
YL-95-18-1	CHLORINE ROOM GAS SYSTEM ALARM BEACON	STR-95	WELL #9	GROUND LEVEL	SITE	AIT-95-18-1	24VDC DISCRETE SIGNAL	D2							2690-930	1
XS-95-20-1	CHLORINE GAS CHEMICAL ROOM EXHAUST FAN NO.1 LOCAL CONTROL STATION HOA, RUN LT)	STR-95	WELL #9	GROUND LEVEL	SITE	95-LCP-001	24VDC DISCRETE SIGNAL	D6							2690-900	1
95-LCP-16-1	WELL NO.9 STANDBY GENERATOR CONTROL PANEL	STR-95	WELL #9	GROUND LEVEL	SITE	95-LCP-001	24VDC DISCRETE SIGNAL	D4								1
XS-95-20-3	CHEMICAL ROOM EXHAUST FAN LOCAL CONTROL STATION (HOA, RUN LT)	STR-95	WELL #9	GROUND LEVEL	SITE	95-LCP-001	24VDC DISCRETE SIGNAL	D6							2690-900	1
YA-95-21-3	FIRE SUPPRESSION SYSTEM ALARM HORN / STROBE	STR-95	WELL #9	GROUND LEVEL	SITE	95-LCP-21-1	MFR SIGNAL CABLE	M1								4,9
HS-95-16-1	STANDBY GENERATOR REMOTE E-STOP	STR-95	WELL #9	GROUND LEVEL	SITE	95-LCP-16-1	24VDC DISCRETE SIGNAL	D2							2690-900	1

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PROJECT DATE:	DEC 23, 2025
DRAWN BY:	CJC
DESIGNED BY:	CJC
CHECKED BY:	LET

No	DATE	REVISIONS	BY

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WELL #9 WATER TREATMENT FACILITY - PHASE 1
CITY OF MENOMONIE
DUNN COUNTY, WISCONSIN

STANDARD DETAILS AND SCHEDULES
WIRING SCHEDULES

PROJECT NO. 05323007.1
SHEET 99E605