DAVY ENGINEERING

SPECIFICATIONS

FOR

PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS

ADAMS, MINNESOTA

REVISED FEBRUARY 2026

12009-002.021

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SPECIFICATIONS

FOR

PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS

ADAMS, MINNESOTA

PROFESSIONAL ENGINEER
I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Print Name: Alexander H. Jaromin

Signature: Alex Jaromin

Date: 2-14-25 **P.E. License #: 61138**

DAVY ENGINEERING CO.
CONSULTING ENGINEERS
LA CROSSE, WISCONSIN
PROJECT NO. 12009-002.021
REVISED FEBRUARY 2026

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ADAMS, MINNESOTA

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INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

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INSTRUCTIONS TO BIDDERS FOR CONSTRUCTION CONTRACT

SECTION 1 - DEFINED TERMS

Terms used in these Instructions to Bidders 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 which registers plan holders. Davy Engineering Co., 115 6th St. S., La Crosse, Wisconsin 54601. Telephone: (608) 782-3130. The contact information for the Project Engineer is shown on the title page of the specifications.

SECTION 2 - BIDDING DOCUMENTS

2.1 Bidder shall obtain a complete set of Bidding Requirements and proposed Contract Documents (together, the Bidding Documents). See the Index and 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.

2.2 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.

2.3 Bidder may register as a plan holder and obtain complete sets of Bidding Documents, in the number and format stated in the Advertisement or invitation to bid, from the Issuing Office. Bidders may rely that sets of Bidding Documents obtained from the Issuing Office are complete, unless an omission is blatant. Registered plan holders will receive Addenda issued by Owner.

2.4 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 must also register as plan holders with the 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.

2.5 ELECTRONIC DOCUMENTS. 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 Adobe PDF (Portable Document Format) (.pdf) that is readable by Adobe Acrobat Reader. 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 cannot and do not guarantee that Electronic Documents and reproductions prepared from those versions are identical in every manner to the paper copies.

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.

SECTION 3 - QUALIFICATIONS OF BIDDERS

3.1 To demonstrate Bidder's qualifications to perform the Work, Bidder must submit a Bidder's Statement of Qualifications on the form provided. Submit with the bid in a separate envelope from the bid. On request, the statements will be returned to bidders following award and execution of a construction Contract.

3.2 A Bidder's failure to submit required qualification information may disqualify Bidder from receiving an award.

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

SECTION 4 - PRE-BID CONFERENCE

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

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

5.1 SITE AND OTHER AREAS. 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.

5.2 EXISTING SITE CONDITIONS

5.2.1 SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS

A. The Special Provisions identify the following regarding existing conditions at or adjacent to the Site:

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

2. 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.

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

4. Technical Data contained in such reports and drawings.

B. 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 Special Provisions. 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.

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

D. Geotechnical Baseline Report/Geotechnical Data Report: The Bidding Documents contain a Geotechnical Baseline Report (GBR) and Geotechnical Data Report (GDR).

1. As set forth in the Supplementary Conditions, the GBR describes certain select subsurface conditions that are anticipated to be encountered by Contractor during construction in specified locations ("Baseline Conditions"). The GBR is a Contract Document.

2. The Baseline Conditions in the GBR are intended to reduce uncertainty and the degree of contingency in submitted Bids. However, Bidders cannot rely solely on the Baseline Conditions. Bids should be based on a comprehensive approach that includes an independent review and analysis of the GBR, all other Contract Documents, Technical Data, other available information, and observable surface conditions. Not all potential subsurface conditions are baselined.

3. Nothing in the GBR is intended to relieve Bidders of the responsibility to make their own determinations regarding construction costs, bidding strategies, and Bid prices, nor of the responsibility to select and be responsible for the means, methods, techniques, sequences, and procedures of construction, and for safety precautions and programs incident thereto.

4. As set forth in the Supplementary Conditions, the GDR is a Contract Document containing data prepared by or for the Owner in support of the GBR.

5.2.2 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.

5.3 OTHER SITE-RELATED DOCUMENTS

A. In addition to the documents regarding existing Site conditions referred to in Paragraph 5.02.A, additional documents relating to conditions at or adjacent to the Site that are known to Owner and made available to Bidders for reference may be provided to any Bidder on request.

B. Owner has not verified the contents of these other Site-related documents, and Bidder may not rely on the accuracy of any data or information in such documents. Bidder is responsible for any interpretation or conclusion Bidder draws from the other Site-related documents.

C. The other Site-related documents are not part of the Contract Documents.

D. Bidders are encouraged to review the other Site-related documents, but Bidders will not be held accountable for any data or information in such documents. The requirement to review and take responsibility for documentary Site information is limited to information in (1) the Contract Documents and (2) the Technical Data.

E. No other Site-related documents are available.

5.4 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. All access to the Site other than during a regularly scheduled Site visit must be coordinated through the Owner or Engineer contact: Bidder must conduct the required Site visit during normal working hours.

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 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.

5.5 OWNER'S SAFETY PROGRAM. Site visits and work at the Site may be governed by an Owner safety program. If an Owner safety program exists, it will be noted in the Specifications.

5.6 OTHER WORK AT THE SITE. Reference is made to the specifications 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.

SECTION 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.1 EXPRESS REPRESENTATIONS AND CERTIFICATIONS IN BID FORM, AGREEMENT. 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.

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

SECTION 7 - INTERPRETATIONS AND ADDENDA

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

7.2 Bidder shall submit all questions about the meaning or intent of the Bidding Documents to Engineer in writing. Contact information: Davy Engineering Co., 115 6th St. S., La Crosse, Wisconsin 54601. Telephone: (608) 782-3130. The contact information for the Project Engineer is shown on the title page of the specifications

7.3 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.

7.4 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.

SECTION 8 - BID SECURITY

8.1 A Bid must be accompanied by Bid security made payable to Owner in an amount of **five** (**5%) percent** of Bidder's maximum Bid price (determined by adding the base bid and all alternates) and in the form of a certified check, bank money order or Bid bond issued by a surety meeting the requirements of Paragraph 6.01 of the General Conditions.

8.2 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, 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 and furnish the required Contract security within 10 days after receipt, 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 will be Owner's exclusive remedy if Bidder defaults.

8.3 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 Contract or 91 days after the Bid opening, whereupon Bid security furnished by such Bidders will be released.

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

SECTION 9 - CONTRACT TIMES AND LIQUIDATED DAMAGES

9.1 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 specifications.

9.2 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 General Conditions, Article 4.06.

SECTION 10 - SUBSTITUTE AND "OR EQUAL" ITEMS

10.1 The Contract for the Work, as awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents, and those "or-equal" or substitute or materials and equipment subsequently approved by Engineer prior to the submittal of Bids and identified by Addendum. No item of material or equipment will be considered by Engineer as an "or-equal" or substitute unless written request for approval has been submitted by Bidder and has been received by Engineer within 10 days of the issuance of the Advertisement for Bids or Invitation to Bidders. Each such request must comply with the requirements of Paragraphs 7.05 and 7.06 of the General Conditions, and the review of the request will be governed by the principles in those paragraphs. Each such request shall include the Manufacturer's Certification for Compliance with AIS, when applicable. The burden of proof of the merit of the proposed item is upon Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any such proposed item, such approval will be set forth in an Addendum issued to all registered Bidders. Bidders cannot rely upon approvals made in any other manner.

10.2 All prices that Bidder sets forth in its Bid will 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.

10.3 Where the Buy America, Build America requirements are applicable to the project, any request for substitute or "or equal" shall include the Manufacturer's Certification of compliance with the Build America, Buy America Act (BABAA) requirements mandated by Title IX of the Infrastructure Investment and Jobs Act ("IIJA"), Pub. L. 177-58.

SECTION 11 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

11.1 A Bidder must be prepared to retain specific Subcontractors and Suppliers for the performance of the Work if required to do so by the Bidding Documents or in the Specifications. If a prospective Bidder objects to retaining any such Subcontractor or Supplier and the concern is not relieved by an Addendum, then the prospective Bidder should refrain from submitting a Bid.

11.2 When requested in the Bid Form, Bidders must submit a list of the Subcontractors or Suppliers proposed. If not requested with the bid, Owner may request that the list be submitted within five days after Bid opening.

11.3 If requested by Owner, such list must be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor or Supplier. If Owner or Engineer, after due investigation, has reasonable objection to any proposed Subcontractor or Supplier, Owner may, before the Notice of Award is given, request apparent Successful Bidder to submit an acceptable substitute, in which case apparent Successful Bidder will 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.

11.4 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 and Suppliers. Declining to make requested substitutions will constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor or Supplier, 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 7.07 of the General Conditions.

11.5 Contractor shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom Contractor has reasonable objection. If that involves a base bid equipment item, the objection must be stated in writing at least 10 days before the bid opening.

11.6 The Contractor shall not award work to Subcontractor(s) valued at more than fifty percent (50%) of the Contract Price without the Owner's written approval.

SECTION 12 - PREPARATION OF BID

12.1 The Bid Form is included with the Bidding Documents.

A. All blanks on the Bid Form must be completed in ink and the Bid Form signed in ink. Erasures or alterations must be initialed in ink by the person signing the Bid Form. A Bid price must be indicated for each section, Bid item, alternate, adjustment unit price item, and unit price item listed therein.

B. If the Bid Form expressly indicates that submitting pricing on a specific alternate item is optional, and Bidder elects to not furnish pricing for such optional alternate item, then Bidder may enter the words "No Bid" or "Not Applicable."

12.2 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

12.3 A Bid by a corporation must be executed in the corporate name by a corporate officer (whose title must appear under the signature). The corporate address and state of incorporation must be shown.

12.4 A Bid by a partnership must be executed in the partnership name and signed by a partner (whose title must appear under the signature). The official address of the partnership must be shown.

12.5 A Bid by a limited liability company must be executed in the name of the firm by a member or other authorized person. The state of formation of the firm and the official address of the firm must be shown.

12.6 A Bid by an individual must show the Bidder's name and official address.

12.7 A Bid by a joint venture must 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 must be shown.

12.8 All names must be printed in ink below the signatures.

12.9 The Bid must contain an acknowledgment of receipt of all Addenda, the numbers of which must be filled in on the Bid Form.

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

SECTION 13 - BASIS OF BID

13.1 BASE BID WITH ALTERNATES.

A. Bidders must submit a Bid on a lump sum basis for the base Bid and include a separate price for each alternate described in the Bidding Documents and as provided for in the Bid Form. The price for each alternate will be the amount added to or deleted from the base Bid if Owner selects the alternate.

B. In the comparison of Bids, alternates will be applied in the order of priority as listed in the Bid Form.

C. Award will be based on the Alternate Bids selected by the Owner.

13.2 SECTIONAL BIDS

A. Bidders may submit a Bid on any individual section or any combination of sections, as set forth in the Bid Form.

B. Submission of a Bid on any section signifies Bidder's willingness to enter into a Contract for that section alone at the price offered.

C. If Bidder submits Bids on individual sections and a Bid based on a combination of those sections, such combined Bid need not be the sum of the Bids on the individual sections.

D. Bidders offering a Bid on one or more sections must be capable of completing the Work covered by those sections within the time period stated in the Agreement.

E. Award will be based on the Sectional Bids selected by the Owner.

13.3 UNIT PRICE

A. Bidders must 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 "Total Estimated 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 "Unit Price" offered by the Bidder. The total of all unit price Bid items will be the sum of the "Total Estimated 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.

13.4 ALLOWANCES. For cash allowances the Bid price must 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.

SECTION 14 - SUBMITTAL OF BID

14.1 The Bidding Documents include one separate unbound copy of the Bid Form.. The unbound copy of the Bid Form is to be completed and submitted with the Bid security and the other documents required to be submitted under the terms of Article 2 of the Bid Form.

14.2 If Bidder has obtained the Bidding Documents as Electronic Documents, then Bidder shall prepare its Bid on a paper copy of the Bid Form printed from the Electronic Documents version of the Bidding Documents. The printed copy of the Bid Form must be clearly legible, printed on 8½ inch by 11-inch paper and as closely identical in appearance to the Electronic Document version of the Bid Form as may be practical. The Owner reserves the right to accept Bid Forms which nominally vary in appearance from the original paper version of the Bid Form, providing that all required information and submittals are included with the Bid.

14.3 A Bid must be received no later than the date and time prescribed and at the place indicated in the Advertisement or invitation to bid and must be enclosed in a plainly marked package with the Project title, and, if applicable, the designated portion of the Project for which the Bid is submitted, the name and address of Bidder, and must be accompanied by the Bid security and other required documents. If a Bid is sent by mail or other delivery system, the sealed envelope containing the Bid must be enclosed in a separate package plainly marked on the outside with the notation "BID ENCLOSED." A mailed Bid must be addressed to the location designated in the Advertisement.

14.4 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, may not be accepted and will be returned to the Bidder unopened if not accepted.

SECTION 15 - MODIFICATION AND WITHDRAWAL OF BID

15.1 An unopened 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.

15.2 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.

15.3 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 the Owner that there was a material and substantial mistake in the preparation of its Bid, the Bidder may withdraw its Bid, and the Bid security will be returned. Thereafter, if the Work is rebid, the Bidder will be disqualified from further bidding on the work.

SECTION 16 - OPENING OF BIDS

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. A tabulation of the amounts of the base Bids and major alternates, if any, will be made available to Bidders after the opening of Bids.

SECTION 17 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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.

SECTION 18 - EVALUATION OF BIDS AND AWARD OF CONTRACT

18.1 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.

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

18.3 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, whether in the Bid itself or in a separate communication to Owner or Engineer, then Owner may reject the Bid as nonresponsive.

18.4 If Owner awards the contract for the Work, such award will be to the responsible Bidder submitting the lowest responsive Bid.

18.5 EVALUATION OF BIDS

A. In evaluating Bids, Owner will consider whether 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.

B. For determination of the apparent low Bidder(s) when alternate bids are submitted, Bids will be compared on the basis of the alternate bids selected by the Owner.

C. For determination of the apparent low Bidder(s) when sectional bids are submitted, Bids will be compared on the basis of the sectional bids selected by the Owner.

D. 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

18.6 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.

18.7 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.

SECTION 19 - BONDS AND INSURANCE

19.1 Article 6 of the General Conditions, as may be modified by the Special Provisions, sets forth Owner's requirements as to performance and payment bonds, other required bonds (if any), and insurance. When the Successful Bidder delivers the executed Agreement to Owner, it must be accompanied by required bonds and insurance documentation.

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

SECTION 20 - SIGNING OF AGREEMENT

When Owner issues a Notice of Award to the Successful Bidder, it will be accompanied by the unexecuted counterparts of the Agreement along with the other Contract Documents as identified in the Agreement. Within 10 days thereafter, Successful Bidder must 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 10 days thereafter, Owner will 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.

SECTION 21 - SALES AND USE TAXES

Unless Owner is exempt for state sales and use taxes on materials and equipment to be incorporated in the Work, said taxes shall be included in the Bid.

SECTION 22 - CONTRACTS TO BE ASSIGNED

Owner as "Buyer" may execute a contract with others for the procurement of goods and special services. The materials and equipment provided for in the procurement contract are to be furnished and delivered to the Site (or other location) for installation by Contractor. The said procurement contract will be assigned by Owner to Contractor as set forth in the Agreement. Contractor will accept the assignment and assume responsibility for the "Seller," who will become a Supplier to Contractor. Those goods or special services to be procured directly by Owner are identified in the Special Provisions or Bid Form.

OFFICIAL NOTICE TO CONTRACTORS

PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS

ADAMS, MINNESOTA

The City of Adams, Minnesota, will receive sealed bids for the construction of the following items up until **1:00 PM CDT, Tuesday, March 24, 2026,** at the City Hall, 303 West Main Street, Adams, Minnesota 55909, at which time and place all bids will be publicly opened and read aloud.

MAJOR BID ITEMS

Proposal #1 – General/Mechanical
Proposal #2 – Electrical & Controls
Proposal #3 – Well Pump
Proposal #4 – Watermain Improvements
Proposal #5 – Combination Bid

Bidding Documents are on file with the City Clerk, City of Adams, Minnesota. Bidding Documents are available at http://www.davyengineering.com/ by clicking on the Bidding tab. Once you are at the bidding page, select the appropriate project where you may then download the complete set of digital bidding documents for $40.00. Hard copy Bidding Documents may be obtained from Davy Engineering Co., Consulting Engineers, 115 6th St. S., La Crosse, Wisconsin 54601, phone (608) 782-3130, upon receipt of a nonrefundable $150.00 per set.

The City of Adams, Minnesota, reserves the right to reject any or all bids, to waive any informality in bidding, and to accept the bid most advantageous to the City. No bid shall be withdrawn after the opening of bids without the consent of the City for a period of sixty (60) days after the scheduled time of closing bids.

A certified check payable to the City of Adams or bid bond executed by the bidder and a licensed surety company in an amount equal to at least 5% of the maximum bid shall accompany each bid as a guarantee that if the bid is accepted, the bidder will execute and file the proposed contract and bonds within ten (10) days after the award of the contract.

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.

The City of Adams encourages DBE's, including MBE's and WBE's, to submit bid proposals. American Iron and Steel (AIS) requirements are applicable to this project.

Published by the authority of the City Council, City of Adams, Minnesota.

Brian Anderson, Mayor

Jake Goodale, City Clerk

DAVY ENGINEERING CO.
CONSULTING ENGINEERS
LA CROSSE, WISCONSIN

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MUST ACCOMPANY BID

MN RESPONSIBLE CONTRACTOR CERTIFICATION

The Contractor shall meet the following minimum criteria to be eligible to be awarded a construction contract as the lowest responsible bidder. A subcontractor must meet the minimum criteria to be eligible to be awarded a subcontract on a project regardless of the value of the subcontract.

MINIMUM CRITERIA. "Responsible contractor" means a contractor that conforms to the responsibility requirements in the solicitation document for its portion of the work on the project and verifies that it meets the following minimum criteria:

1. a. Contractor is in compliance with workers' compensation and unemployment insurance requirements.
   b. Contractor is in compliance with the Minnesota Department of Revenue and Department of Employment and Economic Development registration requirements if it has employees.
   c. Contractor has a valid federal tax identification number or a valid Social Security number if an individual.
   d. Contractor has filed a certificate of authority to transact business in Minnesota with the secretary of state, if a foreign corporation or cooperative.
2. Contractor or related entity is in compliance with and, during the three-year period before submitting this verification, has not violated section 177.24, 177.25, 177.41 to 177.44, 181.13, 181.14, or 181.722, and has not violated United States Code, title 29, sections 201 to 219, or United States Code, title 40, sections 3141 to 3148. For purposes of this clause, a violation occurs when a contractor or related entity:
   a. repeatedly fails to pay statutorily required wages or penalties on one or more separate projects for a total underpayment of $25,000 or more within the three-year period provided that a failure to pay is "repeated" only if it involves two or more separate and distinct occurrences of underpayment during the three-year period;
   b. has been issued an order to comply by the commissioner of labor and industry that has become final;
   c. has been issued at least two determination letters within the three-year period by the Department of Transportation finding an underpayment by the contractor or related entity to its own employees;
   d. has been found by the commissioner of labor and industry to have repeatedly or willfully violated any of the sections referenced in this clause pursuant to section 177.27;
   e. has been issued a ruling or findings of underpayment by the administrator of the Wage and Hour Division of the United States Department of Labor that have become final or have been upheld by an administrative law judge or the Administrative Review Board; or
   f. has been found liable for underpayment of wages or penalties or misrepresenting a construction worker as an independent contractor in an action brought in a court having jurisdiction. Provided that, if the contractor or related entity contests a determination of underpayment by the Department of Transportation in a contested case proceeding, a violation does not occur until the contested case proceeding has concluded with a determination that the contractor or related entity underpaid wages or penalties;
3. Contractor or related entity is in compliance with and, during the three-year period before submitting this verification, has not violated section 181.723 or chapter 326B. For purposes of this clause, a violation occurs when a contractor or related entity has been issued a final administrative or licensing order;
4. Contractor or related entity has not, more than twice during the three-year period before submitting the verification, had a certificate of compliance under section 363A.36 revoked or suspended based on the provisions of section 363A.36, with the revocation or suspension becoming final because it was upheld by the Office of Administrative Hearings or was not appealed to the office;
5. Contractor or related entity has not received a final determination assessing a monetary sanction from the Department of Administration or Transportation for failure to meet targeted group business, disadvantaged business enterprise, or veteran-owned business goals, due to a lack of good faith effort, more than once during the three-year period before submitting this verification;
6. Contractor or related entity is not currently suspended or debarred by the federal government or the State of Minnesota or any of its departments, commissions, agencies, or political subdivisions that have authority to debar a contractor;

7. All subcontractors and motor carriers that the Contractor intends to use to perform project work have verified to the Contractor through a signed statement under oath by an owner or officer that they meet the minimum criteria listed in clauses (1) to (6).

Any violations, suspensions, revocations, or sanctions, as defined in clauses (2) to (5), occurring prior to July 1, 2014, shall not be considered in determining whether a contractor or related entity meets the minimum criteria.

SUBCONTRACTOR VERIFICATION. A prime contractor or subcontractor shall include a list of all of its first-tier subcontractors that it intends to retain for work on the project. Prior to execution of a construction contract, and as a condition precedent to the execution of a construction contract, the apparent successful prime contractor shall submit to the contracting authority a supplemental verification under oath confirming compliance with subdivision 3, clause (7). Each contractor or subcontractor shall obtain from all subcontractors with which it will have a direct contractual relationship a signed statement under oath by an owner or officer verifying that they meet all of the minimum criteria in subdivision 3 prior to execution of a construction contract with each subcontractor. If a prime contractor or any subcontractor retains additional subcontractors on the project after submitting its verification of compliance, the prime contractor or subcontractor shall obtain verifications of compliance from each additional subcontractor with which it has a direct contractual relationship and shall submit a supplemental verification confirming compliance within 14 days of retaining the additional subcontractors. A prime contractor shall submit to the contracting authority upon request copies of the signed verifications of compliance from all subcontractors of any tier. A prime contractor and subcontractors shall not be responsible for the false statements of any subcontractor with which they do not have a direct contractual relationship. A prime contractor and subcontractors shall be responsible for false statements by their first-tier subcontractors with which they have a direct contractual relationship only if they accept the verification of compliance with actual knowledge that it contains a false statement.

VERIFICATION OF COMPLIANCE. *A contractor responding to a solicitation document of a contracting authority shall submit to the contracting authority a signed statement under oath by an owner or officer verifying compliance with each of the minimum criteria in subdivision 3, with the exception of clause 7, at the time that it responds to the solicitation document. A contracting authority may accept a signed statement under oath as sufficient to demonstrate that a contractor is a responsible contractor and shall not be held liable for awarding a contract in reasonable reliance on that statement. A prime contractor, subcontractor or motor carrier that fails to verify compliance with any one of the required minimum criteria or makes a false statement under oath in a verification of compliance shall be ineligible to be awarded a construction contract on the project for which the verification was submitted. A false statement under oath verifying compliance with any of the minimum criteria may result in termination of a construction contract that has already been awarded to a prime contractor or subcontractor or motor carrier that submits a false statement. A contracting authority shall not be liable for declining to award a contract or terminating a contract based on a reasonable determination that the contractor failed to verify compliance with the minimum criteria or falsely stated that it meets the minimum criteria. A verification of compliance need not be notarized. An electronic verification of compliance made and submitted as part of an electronic bid shall be an acceptable verification of compliance under this section provided that it contains an electronic signature as defined in section 325L.02, paragraph (h).*

Any prime contractor or subcontractor that does not meet the minimum criteria or fails to verify that it meets those criteria is not a responsible contractor and is not eligible to be awarded a construction contract for the project or to perform work on the project. A false statement under oath verifying compliance with any of the minimum criteria shall render the prime contractor or subcontractor that makes the false statement ineligible to be awarded a construction contract on the project and may result in termination of a contract awarded to a prime contractor or subcontractor that submits a false statement. A prime contractor shall submit to the contracting authority upon request copies of the signed verifications of compliance from all subcontractors of any tier.

The undersigned, an owner or officer of Contractor verifies, under oath, compliance with the MINIMUM CRITERIA.

Contractor: _____

By: _____
(Authorized Signature)

Name: _____

Title: _____

Date: _____

Project: Pumphouse #5 Construction & Watermain Improvements

NOTE: Include list of subcontractors on Bid Form.

BID FORM FOR CONSTRUCTION CONTRACT
PROPOSAL #1 – GENERAL & MECHANICAL
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MN

BIDS WILL BE RECEIVED UP UNTIL: **1:00 PM, TUESDAY, MARCH 24, 2026**
The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SECTION 1 - OWNER AND BIDDER

1.01 OWNER. This Bid is submitted to:

City Council
City of Adams
303 West Main Street
Adams, MN, 55909

1.02 BIDDER: 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.

SECTION 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.** Responsible Contractor Certification;
- **C.** AIS Bid Certification;
- **D.** Required Bidder Qualification Statement with supporting data.

SECTION 3 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

3.01 BID ACCEPTANCE PERIOD. This Bid will remain subject to acceptance for the number days after the Bid opening specified in the Official Notice to Contractors, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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

3.03 RECEIPT OF ADDENDA. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

SECTION 4 - BASIS OF BID—LUMP SUM

4.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

A. PROPOSAL #1 – GENERAL & MECHANICAL

For furnishing all labor, materials and equipment to construct the new pumphouse complete and ready for operation along with the access drive and connecting watermain as shown in the Plans. This contract includes all construction except that specifically included in Proposal #2 – Electrical and Controls, Proposal #3 – Well Pump, and Proposal #4 – Watermain Improvements. **LUMP SUM BID.**

TOTAL BASE BID – Proposal #1:

Total _____ **Dollars ($**_____**)**

USE WORDS *USE NUMBERS*

SCHEDULE OF SUBCONTRACTORS

The Bidder shall provide the names of any subcontractors proposed for $25,000.00 or greater work on the project. Deviation from the listed subcontractor will not be permitted except by adequate justification and written change order.

Item	Subcontractor
Mechanical	_____
Grading/Excavating	_____
Masonry	_____
Roofing	_____
Other _____	_____
Other _____	_____

SECTION 6 - TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.08 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder agrees that the Work will be substantially complete on or before the following Milestones:

Milestone	**Date**
Substantial Completion	June 1, 2027
Ready for Final Payment in accordance with Paragraph 15.08 of the General Conditions	June 30, 2027

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

SECTION 7 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

7.01 BIDDER'S REPRESENTATIONS. In submitting this Bid, Bidder represents the following:

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

B. 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.

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

D. 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 Specifications, with respect to the Technical Data in such reports and drawings.

E. 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 Specifications, with respect to Technical Data in such reports and drawings.

F. 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 Specifications 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.

G. 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.

H. 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.

I. 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.

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

K. 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.

7.02 BIDDER'S CERTIFICATIONS. The Bidder certifies the following:

A. 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.

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

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

D. 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:

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.

2. 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.

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.

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.

END OF PAGE

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)

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:

_____

_____

_____

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BID FORM FOR CONSTRUCTION CONTRACT
PROPOSAL #2 – ELECTRICAL AND CONTROLS
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MN

BIDS WILL BE RECEIVED UP UNTIL: **1:00 PM, TUESDAY, MARCH 24, 2026**
The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SECTION 1 - OWNER AND BIDDER

1.01 OWNER. This Bid is submitted to:

City Council
City of Adams
303 West Main Street
Adams, MN, 55909

1.02 BIDDER: 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.

SECTION 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.** Responsible Contractor Certification;
- **C.** AIS Bid Certification;
- **D.** Required Bidder Qualification Statement with supporting data.

SECTION 3 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

3.01 BID ACCEPTANCE PERIOD. This Bid will remain subject to acceptance for the number days after the Bid opening specified in the Official Notice to Contractors, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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

3.03 RECEIPT OF ADDENDA. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

SECTION 4 - BASIS OF BID—LUMP SUM

4.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

A. PROPOSAL #2 – ELECTRICAL & CONTROLS

For furnishing all labor, equipment and materials for all electrical work and control systems. Work also includes electrical connections for equipment furnished or installed by others. **LUMP SUM BID.**

TOTAL BASE BID – Proposal #2:

Total _____ **Dollars ($**_____**)**

USE WORDS *USE NUMBERS*

SCHEDULE OF BASE BID EQUIPMENT MANUFACTURERS

The Base Bid shall include the manufacturers listed below:

Equipment	Base Bid Manufacturer
Motor Control Center	Altronex
Remote Terminal Unit (RTU)	S&M Controls
Generator & Transfer Switch	Blue Star Power Systems

APPROVED ALTERNATE EQUIPMENT MANUFACTURERS

The Bidder may offer an alternate bid (add or deduct) for furnishing and installing the following equipment items in lieu of the base bid manufacturer(s). All items of work (piping, cutting, patching, structure changes, etc.) necessary to incorporate the alternate equipment item in the location designed shall be included in the bid price. Reference to a brand name and model for a particular item of equipment does not waive the requirements to comply with the specifications. All equipment including designated base bid and approved alternates shall fully meet specified requirements. Bids on equipment that have not been pre-approved will not be considered.

Deviation from the awarded manufacturers will not be permitted except by adequate justification and written change order.

Equipment	Approved Alternate Manufacturer	Add or (Deduct) from Base Bid
MCC & RTU	Energenecs	
MCC & RTU	Automatic Systems	
Generator & Transfer Switch	Kohler	
Generator & Transfer Switch	Generac Industrial	
MCC & RTU		
Generator & Transfer Switch		

Award will be based on the low bid after selection of Alternate Bids by the Owner.

SECTION 5 - TIME OF COMPLETION

5.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.08 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

5.02 Bidder agrees that the Work will be substantially complete on or before the following Milestones:

Milestone	**Date**
Substantial Completion	March 31, 2027
Ready for Final Payment in accordance with Paragraph 15.08 of the General Conditions	April 30, 2027

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

SECTION 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 BIDDER'S REPRESENTATIONS. In submitting this Bid, Bidder represents the following:

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

B. 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.

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

D. 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 Specifications, with respect to the Technical Data in such reports and drawings.

E. 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 Specifications, with respect to Technical Data in such reports and drawings.

F. 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 Specifications 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.

G. 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.

H. 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.

I. 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.

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

K. 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. The Bidder certifies the following:

A. 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.

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

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

D. 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:

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.

2. 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.

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.

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.

END OF PAGE

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)

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:

_____

_____

_____

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BID FORM FOR CONSTRUCTION CONTRACT
PROPOSAL #3 – WELL PUMP
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MN

BIDS WILL BE RECEIVED UP UNTIL: **1:00 PM, TUESDAY, MARCH 24, 2026**
The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SECTION 1 - OWNER AND BIDDER

1.01 OWNER. This Bid is submitted to:

City Council
City of Adams
303 West Main Street
Adams, MN, 55909

1.02 BIDDER: 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.

SECTION 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. Responsible Contractor Certification;
C. AIS Bid Certification;
D. Required Bidder Qualification Statement with supporting data.
E. Pump Information Forms

SECTION 3 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

3.01 BID ACCEPTANCE PERIOD. This Bid will remain subject to acceptance for the number days after the Bid opening specified in the Official Notice to Contractors, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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

3.03 RECEIPT OF ADDENDA. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

SECTION 4 - BASIS OF BID—UNIT PRICES

4.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

A. PROPOSAL #3 – WELL & TURBINE PUMP WORK

For furnishing all labor, equipment and materials to provide one (1) turbine pump and accessories and modifications to the well head for Well #5. **LUMP SUM BID.**

Total _____ **Dollars ($**_____**)**

USE WORDS *USE NUMBERS*

The Bidder shall provide the Manufacturer's Name and Model number of the proposed pump, list the Energy Guarantee and complete and submit the Pump Information forms.

MANUFACTURER _____

WELL PUMP #5 MODEL _____

The Bidder shall also complete and submit the Pump Information Form.

SECTION 5 - TIME OF COMPLETION

5.01 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.

5.02 Bidder agrees that the Work will be substantially complete on or before the following Milestones:

Milestone	**Date**
Substantial Completion	March 31, 2027
Ready for Final Payment in accordance with Paragraph 15.08 of the General Conditions	April 30, 2027

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

SECTION 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 BIDDER'S REPRESENTATIONS. In submitting this Bid, Bidder represents the following:

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

B. 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.

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

D. 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 Specifications, with respect to the Technical Data in such reports and drawings.

E. 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 Specifications, with respect to Technical Data in such reports and drawings.

F. 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 Specifications 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.

G. 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.

H. 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.

I. 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.

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

K. 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. The Bidder certifies the following:

A. 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.

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

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

D. 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:

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.

2. 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.

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.

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.

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)

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:

_____

_____

_____

TURBINE PUMP INFORMATION FORM

WELL PUMP #5

ADAMS, MINNESOTA

MUST ACCOMPANY PROPOSAL #3 BID

Make of pump _____

Maximum brake horsepower of the pump _____

Pump Column:

Material _____

Type of finish or paint _____

Size (O.D. and I.D.) _____

Weight without couplings per lineal foot _____

Weight with couplings per lineal foot` _____

Outside diameter of couplings _____

Suction Pipe:

Material _____

Type of finish or paint _____

Size (O.D. and I.D.) _____

Number of bowl assembly _____

Height of bowl assembly _____

Outside diameter of bowls _____

Weight of bowl assembly _____

Electric Motor:

Make _____

Rated horsepower _____

Speed RPM _____

Efficiency:

Full load _____

3/4 load _____

1/2 load _____

Power Factor:

Full load _____

3/4 load _____

1/2 load _____

Over-all kWh input per one thousand (1,000) gallons of water pumped when pumping against the following static water pressures, with the understanding that the kWh input against the total dynamic head constitutes the bidding guarantee. Measurement will be made from electric to water meter. Contractor shall insert total design head in Item 3 and shall insert changes for five (5) foot increments in T.D.H., for heads higher and lower than the design condition, in item 1-2-4-5.

1. _____ feet_____kWh/1000 gals. _____

2. _____ feet_____kWh/1000 gals. _____

3. _____ feet_____kWh/1000 gals. _____

4. _____ feet_____kWh/1000 gals. _____

5. _____ feet_____kWh/1000 gals. _____

The capacity of the pump for water level differences as stated above, when operating at a speed not exceeding eighteen hundred (1800) RPM, shall be at:

_____ feet _____

_____ feet _____

_____ feet _____

_____ feet _____

_____ feet _____

BID FORM FOR CONSTRUCTION CONTRACT
PROPOSAL #4 – WATERMAIN IMPROVEMENTS
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MN

BIDS WILL BE RECEIVED UP UNTIL: **1:00 PM, TUESDAY, MARCH 24, 2026**
The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SECTION 1 - OWNER AND BIDDER

1.01 OWNER. This Bid is submitted to:

City Council
City of Adams
303 West Main Street
Adams, MN, 55909

1.02 BIDDER: 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.

SECTION 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. Responsible Contractor Certification;
C. AIS Bid Certification;
D. Required Bidder Qualification Statement with supporting data.

SECTION 3 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

3.01 BID ACCEPTANCE PERIOD. This Bid will remain subject to acceptance for the number days after the Bid opening specified in the Official Notice to Contractors, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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

3.03 RECEIPT OF ADDENDA. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

SECTION 4 - BASIS OF BID—UNIT PRICES

4.01 Bidder will perform the following Work at the indicated unit prices.

4.02 UNIT PRICE BIDS – WATERMAIN REPLACEMENT

SECTION A - WATERMAIN

No.	Est. Qty.	Unit	Item	Unit Price	Total Estimated Price
1	325	lin. ft.	8-Inch C900 PVC Watermain SDR 18, Directional Drilled		
2	800	lin. ft.	8-Inch C900 PVC Watermain SDR 18, Trenched		
3	30	lin. ft.	6-inch C900 PVC Watermain SDR 18, Water Service		
4	4	ea.	Connect to Existing Watermain		
5	4	ea.	8-Inch Gate Valve and Box		
6	2	ea.	6-Inch Gate Valve and Box		
7	700	lbs.	Fittings		
8	3	ea.	Fire Hydrant		
9	45	lin. ft.	6-Inch Hydrant Lead		
10	1	ea.	Connect to Existing 6-inch Water Service		
11	30	lin. ft.	2-Inch Water Service		
12	1	ea.	2-Inch Curb Stop		
13	1	ea.	2-Inch Corporation Stop		
14	1	ea.	Connect to Existing 2-inch Water Service		
15	45	lin. ft.	1-Inch Water Service		
16	2	ea.	1-Inch Curb Stop		
17	2	ea.	1-Inch Corporation Stop		
18	2	ea.	Connect to Existing 1-inch Water Service		
19	2	ea.	Connect to Existing 1-inch Water Service		
20	3	ea.	Tracer Wire Magnesium Grounding Anode		
21	3	ea.	Tracer Wire Locator Boxes		
22	2000	cu. yd.	Unsuitable Subgrade Replacement		
23	16	ea.	Density Tests		
			Total Section A (Items 1-23)		

END OF PAGE

SECTION B – STREET RESTORATION

No.	Est. Qty.	Unit	Item	Unit Price	Total Estimated Price
1	1	LS	Temporary Traffic Control and Roadway Maintenance		
2	615	lin. ft.	Sawcut Existing Asphalt Pavement		
3	920	sq. yd.	Excavation of Existing Pavement		
4	920	sq. yd.	Subgrade Preparation		
5	15	ton	HMA STH 56, Surface Course, 2.5"		
6	15	ton	HMA STH 56, Binder Course, 2.5"		
7	75	ton	HMA, Surface Course, 1.5"		
8	75	ton	HMA, Binder Course, 1.5"		
9	400	ton	Aggregate Base, 8"		
10	610	lin. ft.	Curb and Gutter, Type L		
11	615	sq. ft.	Sidewalk		
12	180	sq. ft.	PCC Driveway/Apron Remove and Reinstall		
13	1	ea.	Stabilized Construction Entrance		
14	1	LS	Dust Control		
15	1	ea.	Erosion Control Management		
16	4	ea.	Storm Drain Inlet Protection		
17	30	lin. ft.	Erosion Control Log Type Straw		
18	500	lin. ft.	Silt Fence		
19	1	LS	Remove and Reinstall Storm Sewer/Inlet on STH 56		
20	150	cu. yd.	Topsoil Borrow		
21	800	sq. yd.	Site Restoration (Fertilize, Seed, & Mulch)		
			Total Section B (Items 1-21)		

TOTAL BASE BID PRICE (Section A + B)

	$
(Use Words)	***(Use Numbers)***

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
2. estimated quantities are not guaranteed and 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.

SECTION 5 - TIME OF COMPLETION

5.01 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.

5.02 Bidder agrees that the Work will be substantially complete on or before the following Milestones:

Milestone	**Date**
Substantial Completion	November 15, 2026
Ready for Final Payment in accordance with Paragraph 15.08 of the General Conditions	December 15, 2026

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

SECTION 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 BIDDER'S REPRESENTATIONS. In submitting this Bid, Bidder represents the following:

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

B. 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.

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

D. 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 Specifications, with respect to the Technical Data in such reports and drawings.

E. 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 Specifications, with respect to Technical Data in such reports and drawings.

F. 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 Specifications 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.

G. 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.

H. 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.

I. 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.

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

K. 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. The Bidder certifies the following:

A. 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.

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

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

D. 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:

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.

2. 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.

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.

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.

END OF PAGE

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)

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:

_____

_____

_____

BID FORM FOR CONSTRUCTION CONTRACT
PROPOSAL #5 – COMBINATION BID
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN REPLACEMENT
ADAMS, MN

BIDS WILL BE RECEIVED UP UNTIL: **1:00 PM, TUESDAY, MARCH 24, 2026**
The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

SECTION 1 - OWNER AND BIDDER

1.01 OWNER. This Bid is submitted to:

City Council
City of Adams
303 West Main Street
Adams, MN, 55909

1.02 BIDDER: 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.

SECTION 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.** Responsible Contractor Certification;
- **C.** AIS Bid Certification;
- **D.** Required Bidder Qualification Statement with supporting data.

SECTION 3 - BIDDER'S ACKNOWLEDGEMENTS: ACCEPTANCE PERIOD, INSTRUCTIONS, AND RECEIPT OF ADDENDA

3.01 BID ACCEPTANCE PERIOD. This Bid will remain subject to acceptance for the number days after the Bid opening specified in the Official Notice to Contractors, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

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

3.03 RECEIPT OF ADDENDA. Bidder hereby acknowledges receipt of the following Addenda:

Addendum Number	Addendum Date

SECTION 4 - BASIS OF BID—LUMP SUM

4.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

PROPOSAL #5 – COMBINATION BID

Bidders may offer a deduction if awarded more than one Proposal.

A. Deduction if awarded Proposal # ____and Proposal #____.

Lump Sum Deduction_____

B. Deduction if awarded Proposal # ____ and Proposal # ____.

Lump Sum Deduction_____

C. Deduction if awarded Proposal # ____ and Proposal # ____, and Proposal # ____.

Lump Sum Deduction_____

D. Deduction if awarded Proposal # ____, Proposal # ____, and Proposal # ____.

Lump Sum Deduction_____

E. Deduction if awarded Proposal # ____, Proposal # ____, Proposal # ____, and Proposal # ____.

Lump Sum Deduction_____

F. Deduction if awarded Proposal # ____, Proposal # ____, Proposal # ____, and Proposal # ____.

Lump Sum Deduction_____

END OF PAGE

SECTION 5 - TIME OF COMPLETION

5.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.08 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

5.02 Bidder agrees that the Work will be substantially complete on or before the following Milestones:

MILESTONE:	DATE:
Proposal #1 – General & Mechanical	
Substantial Completion	June 1, 2027
Ready for Final Payment	June 30, 2027
Proposal #2 – Electrical & Controls	
Substantial Completion	March 31, 2027
Ready for Final Payment	April 30, 2027
Proposal #3 – Well Pump Work	
Substantial Completion	March 31, 2027
Ready for Final Payment	April 30, 2027
Proposal #4 – Watermain Improvements	
Substantial Completion	November 15, 2026
Ready for Final Payment	December 15, 2026

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

SECTION 6 - BIDDER'S REPRESENTATIONS AND CERTIFICATIONS

6.01 BIDDER'S REPRESENTATIONS. In submitting this Bid, Bidder represents the following:

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

B. 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.

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

D. 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 Specifications, with respect to the Technical Data in such reports and drawings.

E. 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 Specifications, with respect to Technical Data in such reports and drawings.

F. 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 Specifications 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.

G. 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.

H. 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.

I. 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.

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

K. 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. The Bidder certifies the following:

A. 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.

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

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

D. 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:

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.

2. 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.

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.

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.

END OF PAGE

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)

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:

_____

_____

_____

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DEPARTMENT OF REVENUE

IC134

Contractor Affidavit

This Contractor Affidavit must be certified by the Minnesota Department of Revenue before the state of Minnesota or any of its subdivisions can make final payment to contractors. For more detailed information, see the instructions on the back of this form.

Please type or print clearly. This information will be used for returning the completed form.

Company name	Daytime phone	Minnesota tax ID number
Address	Total contract amount $	Month/year work began
City State ZIP code	Amount still due $	Month/year work ended

Project number	Project location			
Project owner	Address	City	State	ZIP code

Did you have employees work on this project? ☐ Yes ☐ No. If no, who did the work?

Check the box that describes your involvement in the project and fill in all information requested.

☐ **Sole contractor**

☐ **Subcontractor**

Name of contractor who hired you

Address

☐ **Prime contractor—**If you subcontracted out any work on this project, all of your subcontractors must submit their own Contractor Affidavits and have them certified by the Department of Revenue *before* you can submit your Contractor Affidavit. For each subcontractor you had, fill in the information below and attach a copy of each subcontractor's certified Contractor Affidavit. If you need more space, attach a separate sheet.

Business name	Address	Owner/Officer

I declare that all information I have filled in on this form is true and complete to the best of my knowledge and belief. I authorize the Department of Revenue to disclose pertinent information relating to this project, including sending copies of this form, to the prime contractor if I am a subcontractor, and to any subcontractors if I am a prime contractor, and to the contracting agency.

Contractor's signature | Title | Date

Mail to: Minnesota Revenue, Mail Station 6610, St. Paul, MN 55146-6610
Phone: 651-282-9999 or 1-800-657-3594

Certificate of Compliance

Based on records of the Minnesota Department of Revenue, I certify that the contractor who has signed this Contractor Affidavit has fulfilled all the requirements of Minnesota Statutes 290.92 and 270C.66 concerning the withholding of Minnesota income tax from wages paid to employees relating to contract services with the state of Minnesota and/or its subdivisions.

Department of Revenue approval *Date*

DEPARTMENT OF REVENUE

Form IC134 Instructions

Contractor Affidavit

No state agency or local unit of government can make final payment to a contractor until the Department of Revenue has certified that the contractor and any subcontractor have fulfilled the requirements of Minnesota withholding tax laws.

If you are a prime contractor, a contractor or a subcontractor who did work on a project for the state of Minnesota or any of its local government subdivisions — such as a county, city or school district — you must submit a Contractor Affidavit to the Department of Revenue to receive a certificate of compliance.

Use of Information

The Department of Revenue needs **all** the requested information to determine if you have met the state income tax withholding requirements. If all required information is not provided, Form IC134 will be returned to you for completion.

All information on this Contractor Affidavit is private by state law. It cannot be given to others without your permission, except to the Internal Revenue Service, other states that guarantee the same privacy and certain government agencies as provided by law.

Minnesota Tax ID Number

You must have a Minnesota tax ID number if you have employees who work in Minnesota. You must enter your Minnesota tax ID number on Form IC134.

If you don't have a Minnesota tax ID number, apply online at www.revenue.state.mn.us or by calling our Business Registration Office at 651-282-5225 or 1-800-657-3605.

If you have no employees and did all the work yourself, you do not need a Minnesota tax ID number. Instead, enter your Social Security number in the space for Minnesota tax ID number and explain who did the work.

Submit Contractor Affidavit

Form IC134 cannot be processed by the Department of Revenue until you finish the work. If you submit the form before the project is completed, it will be returned to you unprocessed.

If any withholding payments are due to the state, Minnesota law requires certified payments before we approve your Form IC134.

If you are a subcontractor or sole contractor, submit the form when you have completed your part of the project.

If you are a prime contractor, submit the form when the entire project is completed and you have received certified Contractor Affidavits from all of your subcontractors.

If you're a prime contractor and a subcontractor on the same project

If you were hired as a subcontractor to do work on a project, and you subcontracted all or a part of your portion of the project to another contractor, you are a prime contractor as well. Complete both the subcontractor and prime contractor areas on a single Form IC134.

You may submit your Contractor Affidavit either electronically **or** by mail. This affidavit must be certified and returned before the state or any of its subdivisions can make final payment for your work.

For an immediate response: Complete and submit your Contractor Affidavit electronically. Go to www.revenue.state.mn.us and choose **Withholding Tax**. Under the File and Pay tab, click on Contractor Affidavit Information for Government Projects.

You may complete and mail Form IC134 to: Minnesota Revenue, Mail Station 6610, St. Paul, MN, 55146-6610. If you have fulfilled the requirements of Minnesota withholding tax laws, the department will sign your Form IC134 and return it to you.

To receive your final payment, submit the certified Contractor Affidavit to the government unit for which the work was done. If you are a subcontractor, submit the certified Contractor Affidavit to your prime contractor to receive your final payment.

Information and Assistance

Additional forms and information, including fact sheets and frequently asked questions, are available on our website.

Website: www.revenue.state.mn.us

Email: withholding.tax@state.mn.us

Phone: 651-282-9999 or 1-800-657-3594

This information is available in alternate formats.

DEPARTMENT OF REVENUE

Form SDE, Exemption from Surety Deposits for Non-Minnesota Contractors

Please type or print clearly.

Non-Minnesota Contractor			Minnesota Tax ID Number	
Address			Contact Person	
City	State	ZIP Code	Daytime Phone	Email Address

Name of Contract Owner		Contact Person	Daytime Phone	
Contract Owner's Address		City	State	ZIP Code
Project Number	Project Location Address	City	State	ZIP Code
Total Contract Amount		Contract Start Date	Projected Contract Completion Date	

I request exemption from surety deposits under Minnesota Statute 290.9705 for this reason (check one box only):

- ☐ I have a bond secured by an insurance company licensed in Minnesota. Attach Form SDB, *Non-Minnesota Contractor's Bond*.
- ☐ I have a cash surety. Bank or other financial institution: _____ Account number: _____
- ☐ I have done construction work in Minnesota during the past three calendar years and have fully complied with Minnesota income, sales and use, corporate franchise, and withholding tax laws during that time.

I hereby certify that I have the legal authority to sign this form on behalf of the Non-Minnesota Contractor, and that the information is correct and complete to the best of my knowledge and belief. I authorize the Minnesota Department of Revenue: 1) to disclose pertinent return information to the Surety Company that issued the bond for this project If needed in order to collect on the bond; and 2) to disclose pertinent return information to the Contract Owner for this project if needed concerning the surety deposit and its withholding.

Non-Minnesota Contractor's Signature	Title	Date

Email or mail this completed form to:

Email: Contractor.Compliance@state.mn.us

Mail: Minnesota Department of Revenue
Mail Station 6501
600 N. Robert St.
St. Paul, MN 55146-6501

Form SDE Instructions

When to Complete Form SDE

Complete and file Form SDE, *Exemption from Surety Deposits for Non-Minnesota Contractors*, with the Minnesota Department of Revenue before starting a construction project in Minnesota if all of these apply:

- You are a non-Minnesota construction contractor
- You have one or more contracts expected to exceed $50,000 for construction work done in Minnesota
- You qualify for a surety deposit exemption (see Exemption Requirements)

You must have a Minnesota Tax ID Number to request an exemption. If you do not have a Minnesota Tax ID number:

- Apply online at www.revenue.state.mn.us
- Call the department at 651-282-5225 or 1-800-657-3605

Surety Deposit Requirement

If a business or government agency hires or contracts with you, they must withhold 8% (.08) from their payments to you as a Minnesota surety deposit if both of these apply:

- The work is being performed in Minnesota
- Total payments on the contract will exceed $50,000

Note: All payments – including the first $50,000 – are subject to the 8% withholding.

Exemption Requirements

You may qualify for an exemption from the surety deposit requirements if one of these is true:

- You have done construction work in Minnesota during the past three calendar years and have filed all returns and paid all amounts due, including Minnesota income, withholding, corporate franchise, and sales and use tax.
- You give the department a bond that is secured by an insurance company licensed in Minnesota and is equal to 8% of the contract amount. The bond remains in effect until you satisfy all tax liabilities. You may complete Form SDB, Non-Minnesota Contractor's Bond, to send this bond to the department.
- You give the department a cash surety. A cash surety is evidence of a savings account, deposit, or certificate of deposit in, or issued by, a state bank, national bank, or savings and loan association doing business in Minnesota. You may keep any interest and dividends earned on the principal amount.

If You're Exempt

If you qualify for an exemption, we will send you a Surety Deposit Withholding Waiver. Make a copy for your records and give the original letter to the business or government agency you are working for.

If You're Not Exempt

If you do not qualify for an exemption, the business or government agency you are working for must withhold and remit 8% of each payment to you.

To have the deposits refunded to you, complete Form SDR, *Refund of Surety Deposits for Non-Minnesota Contractors*. If we determine that you have complied with all applicable Minnesota income, withholding, and sales and use tax laws for the periods covered by the deposit, we will send you a refund plus interest.

Information and Assistance

Additional forms and information, including fact sheets and frequently asked questions, are available on our website. Website: www.revenue.state.mn.us

Email: withholding.tax@state.mn.us

Phone: 651-282 9999 or 1-800-657-3594

This information is available in alternate formats.

Use of Information

The information you enter on this form may be private or nonpublic under state law. We use it to determine if you qualify for a surety deposit exemption under Minn. Stat. § 290.9705. You are not required to provide the information requested; however, we are unable to process the exemption from surety deposits unless the form is complete. We cannot share any such private or nonpublic information without your written consent, authorization by law, or court order.

AGREEMENT
BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION CONTRACT

This Agreement is by and between **[name of contracting entity]** ("Owner") and **[name of contracting entity]** ("Contractor").

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

Owner and Contractor hereby agree as follows:

ARTICLE 1.0 - WORK

1.1 Contractor shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows: **[Brief description of Work]**

ARTICLE 2.0 - THE PROJECT

2.1 The Project, of which the Work under the Contract Documents is a part, is generally described as follows: **[Brief description of Project]**

ARTICLE 3.0 - ENGINEER

3.1 The Owner has retained **Davy Engineering Co., Inc.**("Engineer") to act as Owner's representative, assume all duties and responsibilities of Engineer, and have the rights and authority assigned to Engineer in the Contract.

3.2 The part of the Project that pertains to the Work has been designed by **Davy Engineering Co., Inc.**

ARTICLE 4.0 - CONTRACT TIMES

4.1 TIME IS OF THE ESSENCE. 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.

4.2 CONTRACT TIMES: DATES. Parts of the Work must be completed on or before the following Milestone(s):

Milestones	**Date**
Substantial Completion	
Ready for Final Payment in accordance with Paragraph 15.08 of the General Conditions	

4.3 LIQUIDATED DAMAGES. Contractor and Owner recognize that time is of the essence as stated in Paragraph 4.01 above and that Owner will suffer financial and other losses if the Work is not completed and Milestones not achieved within the Contract Times, as duly modified. 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 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):

A. Substantial Completion. Contractor shall pay Owner **(GC 4.06(B))** 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.

B. Completion of Remaining Work. After Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times (as duly adjusted pursuant to the Contract) for completion

and readiness for final payment, Contractor shall pay Owner **(GC 4.06(B))** for each day that expires after such time until the Work is completed and ready for final payment.

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

4.4 SPECIAL DAMAGES. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion established in this Agreement.

ARTICLE 5.0 - CONTRACT PRICE

5.1 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 Work other than Unit Price Work, a lump sum of $**[number]**.

B. 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).

UNIT PRICE WORK					
Item No.	**Unit**	**Description**	**Estimated Quantity**	**Unit Price**	**Extended Price**
				$	$
				$	$
				$	$
				$	$
				$	$
Total Section A					$

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.

C. Total Award this Contract (subject to final Unit Price adjustment) $[number].

ARTICLE 6.0 - PAYMENT PROCEDURES

6.1 SUBMITTAL AND PROCESSING OF PAYMENTS. Contractor shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by Engineer as provided in the General Conditions.

6.2 PROGRESS PAYMENTS; RETAINAGE. Owner shall make progress payments on the basis of Contractor's Applications for Payment 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.

A. 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.

1. 95 percent of Work completed (with the balance being retainage).

2. 95 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage

Upon Substantial Completion, Owner shall pay an amount sufficient to increase total payments to Contractor to **100%** percent of the Work completed, less such amounts set off by Owner pursuant to Paragraph 15.01.E of the General Conditions, and less **200%** percent 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.

6.3 FINAL PAYMENT. 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.

6.4 INTEREST. All amounts not paid when due will bear interest at the rate of **5.0%** percent per annum.

ARTICLE 7.0 - CONTRACT DOCUMENTS

7.1 CONTENTS

A. The Contract Documents consist of all the following:

1. Official Notice to Contractors (Advertisement for Bids)

2. Addenda

3. This Agreement.

4. Bonds:

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

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

5. Bid Form (Exhibit)

6. General Conditions (Section I).

7. Specifications as listed in the table of contents (SECTIONS).

8. Attachments as listed in the table of contents (ATTACHMENTS)

9. Plans/Drawings (not attached but incorporated by reference) consisting of **[number]** sheets

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

    a. Work Change Directives.

    b. Change Orders.

    c. Field Orders.

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 8.0 - REPRESENTATIONS, CERTIFICATIONS, AND STIPULATIONS

8.1 CONTRACTOR'S REPRESENTATIONS. To induce Owner to enter this Contract, Contractor makes the following representations:

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

B. 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.

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

D. 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 Contract Documents, with respect to the Technical Data in such reports and drawings.

E. 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 Contract Documents, with respect to Technical Data in such reports and drawings.

F. 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 Contract Documents 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.

G. Based on the information and observations referred to in the preceding paragraph, 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.

H. 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.

I. 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.

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

K. 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.

8.2 CONTRACTOR'S CERTIFICATIONS. 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:

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 or in the Contract execution;

B. "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, (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;

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; and

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.

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:

_____
(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Owner's Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

Contractor:

_____
(typed or printed name of organization)

By: _____
(individual's signature)

Date: _____
(date signed)

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Attest: _____
(individual's signature)

Title: _____
(typed or printed)

Address for giving notices:

_____

_____

_____

Contractor's Designated Representative:

Name: _____
(typed or printed)

Title: _____
(typed or printed)

Address:

_____

_____

_____

Phone: _____

Email: _____

PERFORMANCE BOND

Contractor	**Surety**
Name:	Name:
Address *(principal place of business)*:	Address *(principal place of business)*:
Owner	**Contract**
Name:	Description *(name and location)*:
Mailing address *(principal place of business)*:	Contract Price:
	Effective Date of Contract:

Bond

Bond Amount: **(100% Contract Price)**

Date of Bond:

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Modifications

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

CONTRACTOR AS PRINCIPAL	**SURETY**
Company: _____	Company: _____
By: _____ (Authorized Signature)	By: _____ (Authorized Signature) (Attach Power of Attorney)
Name: _____	Name: _____
Title: _____	Title: _____
Attest: _____ (Authorized Signature)	Attest: _____ (Authorized Signature)
_____ (Title)	_____ (Title)

APPROVED BY OWNER

By: _____ (Authorized Signature)

Name: _____

Title: _____

Modifications to this Bond are as follows:

_____

_____

_____

_____

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.

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 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.
   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.

PAYMENT BOND

Contractor	**Surety**
Name: Address *(principal place of business)*:	Name: Address *(principal place of business)*:
Owner	**Contract**
Name: Mailing address *(principal place of business)*:	Description *(name and location)*: Contract Price: Effective Date of Contract:

Bond

Bond Amount: **(100% Contract Price)**

Date of Bond:

(Date of Bond cannot be earlier than Effective Date of Contract)

Modifications to this Bond form:

☐ None ☐ See Modifications

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

CONTRACTOR AS PRINCIPAL

Company: _____

By: _____
(Authorized Signature)

Name: _____

Title: _____

Attest: _____
(Authorized Signature)

_____
(Title)

SURETY

Company: _____

By: _____
(Authorized Signature) (Attach Power of Attorney)

Name: _____

Title: _____

Attest: _____
(Authorized Signature)

_____
(Title)

APPROVED BY OWNER

By: _____
(Authorized Signature)

Name: _____

Title: _____

Modifications to this Bond are as follows:

_____

_____

_____

_____

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.

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
      5.1.1 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
      5.1.2 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 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:
      16.1.1 The name of the Claimant;
      16.1.2 The name of the person for whom the labor was done, or materials or equipment furnished;
      16.1.3 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;
      16.1.4 A brief description of the labor, materials, or equipment furnished;
      16.1.5 The date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
      16.1.6 The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
      16.1.7 The total amount of previous payments received by the Claimant; and
      16.1.8 The total amount due and unpaid to the Claimant for labor, materials, or equipment furnished as of the date of the Claim.
   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.

MINNESOTA
PUBLIC FACILITIES AUTHORITY

BID SOLICIATION CONTRACT PACKET

For projects not requiring BABA compliance

For recipients with projects funded through State Fiscal Year 2026 Clean Water and Drinking Water Intended Use Plans that are not equivalency projects (not subject to Build America, Buy America (BABA) Act requirements).

Clean Water Revolving Fund
Drinking Water Revolving Fund

Posted January 2026

This packet and the appropriate federal Davis Bacon and Minnesota prevailing wages must be PHYSICALLY included in all bidding solicitation and contract documents, including subcontracts.

Minnesota Public Facilities Authority
1st National Bank Building|332 Minnesota St. Suite W820|Saint Paul, MN 55101-1378
651-259-7469|800-657-3858 TOLL FREE|651-296-8833 FAX| MN.PFA@state.mn.us
An equal opportunity employer and service provider

1 General Information and Resources

This packet lists required contract conditions that apply to Clean Water and Drinking Water State Revolving Fund projects. Note: Build America, Buy America (BABA) Act requirements apply to equivalency projects only.

Non-equivalency projects utilize this Bid Solicitation Contract Packet.

Please review this packet prior to bidding. This packet and the appropriate federal Davis Bacon and Minnesota prevailing wages must be physically included in all bidding solicitations and contract documents, including subcontracts.

Use the 2026 Clean Water Revolving Fund (CWSRF) and Drinking Water State Revolving Fund (DWSRF) Applicant Guidance and Information handbook as a resource for this contract packet. The handbook is posted to the MPFA website.

2 General Contract Provisions

2.1 Project Sign and Public Notice Posting

2.1.1 Physical Project Signs

MPFA does not require physical signs for SRF-funded projects.

2.1.2 Clean Water Council Funded Project Signs

Projects funded with Clean Water Funds must comply with funding identification requirements of the Clean Water Council. This applies to CW and DW SRF projects funded with Point Source Implementation Grant (PSIG) program dollars.

2.1.3 Project Funding Notice

MPFA requires posting of funding awards by all recipients. Post the MPFA-provided notice on the Recipient's website or in a public area of their local unit of government offices. Retain the notice in your project files.

2.2 Project Costs

The Recipient acknowledges eligible and ineligible costs as noted below. Travel-related expenses are not reimbursable. They must be built into a contractor's base or employee rates and be directly related to the construction project.

Eligible Costs	Ineligible Costs
Construction and capital costs for items identified in MPCA and MDH project certifications.	Costs associated with seeking, coordinating or securing other financing for the project.
Engineering costs, including planning, design, construction and start-up.	Operation and maintenance of the sewer or water system.
Land costs (see Miscellaneous Administrative Items) and costs associated with complying with the Uniform Act, including appraisals and related legal costs, are eligible costs.	Administrative costs of a board, sanitary district or governmental unit.
Reasonable costs associated with labor standards, BABA and AIS compliance.	Indirect costs.
Legal costs associated with establishment of the revenue stream for repayment of MPFA financing, such as development of sewer/water ordinance and special assessments, or review of construction contracts.	MPCA or MDH permits.
Reasonable costs to set up and implement long-term financial and asset management tools.	Non-capital costs. Travel related costs including mileage, meals, and lodging: Travel related costs can be eligible project costs if they are necessary and directly related to the capital project, but they must be built into the contractor's base or employee hourly rates.
Financing costs directly associated with MPFA financing: bond counsel costs for preparation of General Obligation Bond and related documents, limited financial advisor fees for establishing	

a dedicated source of revenue.	
Eligible Costs-LSLR	**Ineligible Costs-LSLR**
Directly connected to the planning, design, and replacement of lead service lines. Removal of lead or galvanized goosenecks, pigtails, and connectors. Replacement of curb stops, curb stop boxes, and other service line appurtenances that are removed as part of a full LSLR. Site restoration, including landscaping, sidewalks, driveways, etc. if the removal was necessary to replace the lead service line. Reasonable costs associated with labor standards, Build America, Buy American (BABA), and American Iron and Steel compliance. Temporary pitcher filters or point-of-use (POU) devices certified by an American National Standards Institute accredited certifier to reduce lead for a designated period after LSLR replacement is complete. Outreach and engagement activities, including translation services.	Corrosion control activities and measures. Premise/interior plumbing. Water meters. Funding for bottled water.

2.3 Reporting

2.3.1 The Contract Packet

This packet includes information on state and federal laws related to procurement, pre-bid and post bid requirements, required contract language for bid and contract documents and reporting forms.

The proper Contract Packet must be physically incorporated into the bid and contract documents along with the appropriate State and Federal prevailing wage rates. IMPORTANT: The Contractor must provide information to the recipient for required reporting and to document compliance with specific contract conditions such as:

- ☐ American Iron & Steel (certifications, letters, de minimis tracking).
- ☐ DBE/M/WBE fair share efforts.
- ☐ Prevailing Wages (both state and federal).

2.3.2 Records

The Recipient must keep all project accounts and records for the MPFA-funded project (water and/or sewer fund) in accordance with Generally Accepted Accounting Principles (GAAP). Financial statements must comply with GASB 34 (Governmental Accounting Standards Board) standards related to the reporting of infrastructure assets.

3 DISADVANTAGED BUSINESS ENTERPRISES (DBE)

EPA issued Recipient/Applicant Information Notice (RAIN) 2025-GO2 immediately suspending major components of its DBE regulations at 40 CFR Part 33 for all EPA awards. The notice suspends requirements for fair share objectives (goals for DBE participation) under 40 CFR Part 33 Subpart D, recipient reporting requirements under 40 CFR 33.502, and compliance and enforcement provisions under 40 CFR Part 33.105 and collection of EPA form 5700-52A as a condition of closeout. The General Term and Condition "Utilization of Disadvantaged Business Enterprises: is revised and applicable to all recipients of EPA funding and supersedes all previously existing DBE terms and conditions.

The following requirements remain in effect:

- Compliance with 40 CFR Part 33 regarding DBE program rules.
- Six good faith efforts (described on in Section 4.1 below).
- Fair share objectives applied to procurements after they are approved.
- Recordkeeping where recipients maintain records related to their DBE utilization efforts, including a bidders list.
- Contract administration provisions.

3.1 Good Faith Efforts

Borrowers and their prime contractors must follow, document, and maintain documentation of their good faith efforts as listed below to ensure that Disadvantage Business Enterprises (DBEs) have the opportunity to participate in the project. This applies to procurement for **construction, equipment, supplies and services.**

The Six Good Faith Efforts:

1. Outreach and Recruitment: Ensure that DBEs are made aware of contracting opportunities to the fullest extent practicable through outreach and recruitment activities. This includes placing DBEs on solicitation lists and actively soliciting them whenever they are potential sources.
2. Information Availability: Make information on forthcoming opportunities available to DBEs and arrange time frames for contracts and establish delivery schedules, where the requirements permit, in a way that encourages and facilitates participation by DBEs in the competitive process. This includes, whenever possible, posting solicitation for bids or proposals for a minimum of 30 calendar days before the bid or proposal closing date.
3. Subcontracting Considerations: Consider whether firms competing for large contracts could subcontract with DBEs. This may involve dividing total requirements into smaller tasks or quantities to permit maximum participation by DBEs in the competitive process.
4. Encourage Consortia: Encourage contracting with a consortium of DBEs when a contract is too large for one of these firms to handle individually, thereby promoting collaboration among DBEs.
5. Utilizing Assistance Services: Use the services and assistance of the SBA and the U. S. Department of Commerce Minority Business Development Agency to support DBE participation.
6. Replacement Subcontractors: If a DBE subcontractor fails to complete work under the subcontract for any reason, the recipient must require the prime contractor to employ the six good faith efforts when soliciting a replacement subcontractor. These requirements are designed to promote fair competition and ensure DBEs have a meaningful opportunity to participate in federally funded

projects. Recipients must document compliance with these efforts and report their accomplishments to the EPA as part of their obligations under federal law.

3.2 Certified M/WBE Firms

M/WBE firms certified by the Minnesota Unified Certification Program, the SBA, or the US Department of Transportation can be counted towards the M/WBE reporting to MPFA. See "How do I find information on DOT's and SBA's certification programs?"

Frequently Asked Questions for Disadvantaged Business Enterprises | US EPA

US DOT Office of Small and Disadvantaged Business Utilization | US Department of Transportation

Women-Owned Small Business Federal Contract program (sba.gov)

8(a) Business Development program (sba.gov)

Verifying firm M/WBE status: Check the *Minnesota Unified Certification Program Directory* or the *SBA Dynamic Small Business Search Directory*. Links are listed below.

Minnesota Unified Certification Program: http://mnucp.metc.state.mn.us/ includes a free search engine that lists certified DBE contractors and suppliers. Links to this directory are on the MN Department of Transportation website: http://www.dot.state.mn.us/civilrights/

The SBA **Dynamic Small Business Search**: search engine that lists businesses with 8(a) Certifications; Small Disadvantaged Business Certifications; HUBZone Certifications and DBE Certifications. Check contractor detail to see what current certifications are in place. Dynamic Small Business Search can be found at this link https://www.sba.gov/partners/contracting-officials/small-business-procurement under "Finding Contractors".

3.2.1 Other Minority/Women Business Enterprises Resources

- *A*ssociation of Women Contractors http://www.awcmn.org/
- Diversity Information Resources, Inc. www.diversityinforesources.com
- Metropolitan Economic Development Association http://www.meda.net/
- Minority Business Development Agency (U. S. Department of Commerce) http://www.mbda.gov/

3.2.2 Minnesota Targeted Business Vendors (State Funded Projects)

The Minnesota Department of Administration maintains a directory for Targeted Group Economically Disadvantaged and Veteran-Owned (TG/ED/VO) businesses Equity in Procurement (TG/ED/VO) Directory / Minnesota Office of State Procurement (mn.gov). The Environmental Protection Agency does not consider Minnesota Department of Administration TG/ED/VO listings as meeting EPA certification requirements; thus TG/ED/VO vendors cannot be counted as M/WBE vendors by the Environmental Protection Agency. However, state-funded projects are encouraged to consider and provide procurement opportunities to vendors on this list.

4. American Iron and Steel

4.1 AIS Resources

EPA main AIS webpage: State Revolving Fund American Iron and Steel (AIS) Requirement | US EPA

March 20, 2014 Guidance: ais-final-guidance-3-20-14.pdf (epa.gov)

4.2 Sample American Iron and Steel Contract Language

The AIS language below is a sample from the Environmental Protection Agency's March 20, 2014 memorandum (http://water.epa.gov/grants_funding/aisrequirement.cfm). Include actual AIS language into project specifications and construction contracts and sub-contracts.

PER EPA: 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 STATE REVOLVING FUNDS (SRF). 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 Minnesota Public Facilities Authority (the "Authority") 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 that 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 Contractor pursuant to this Agreement. The Contractor hereby represents and warrants to and for the benefit of the Purchaser and the Authority 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 Authority. Notwithstanding any other provision of this Agreement, any failure to comply with this paragraph by the Contractor shall permit the Purchaser or the Authority to recover as damages against the Contractor any loss, expense or cost (including without limitation attorneys' fees) incurred by the Purchaser or the Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Authority or any damages owed to the Authority by the Purchaser). While the Contractor has no direct contractual privity with the Authority, as a lender to the Purchaser for the funding of its project, the Purchaser and the Contractor agree that the Authority 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 Authority.

4.3 American Iron and Steel De Minimis Waiver Tracking Form

The Environmental Protection Agency (EPA) granted a national waiver for de minimis incidental components of eligible water infrastructure projects

To use the de minimis waiver, SRF recipients "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." Borrowers must maintain documentation (i.e., invoices) for the de minimis items in the project file and submit a summary report to the PFA at project conclusion, or sooner, if available. An example tracking form for AIS de minimis is included on the next page.

Minnesota State Revolving Funds (CWRF and DWRF)
Use of American Iron and Steel - De Minimis Final Utilization and Certification Form

Use of American Iron & Steel is required for CWRF and DWRF-funded projects. The Environmental Protection Agency has issued a public interest waiver for De Minimis incidental components. The assistance recipient wishing to use this waiver should consult with their contractor(s) to maintain an itemized list of components covered under De Minimis. At the conclusion of the project, this form must be completed and retained in the assistance recipient's project files and a copy provided to the Public Facilities Authority. **It is strongly recommended that you maintain a list as the project progresses**. Please print clearly or type. EPA Deminimis Waiver:

http://www.epa.gov/cwsrf/de-minimis-waiver-pursuant-section-436-pl-113-76-consolidated-appropriations-act

PFA Borrower: _____ Loan #: _____

Project Name: _____

NOTE: The De Minimis waiver is only applicable to the cost of materials for the entire project. Do not include other project costs (labor, installation costs, etc.) in the "Total Cost of Materials". The cost of a material must include delivery to the site and any applicable tax. Must have sufficient documentation to support all costs included in this calculation.

Funds used for 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.

Total Cost of Materials: _____ 5% Limit: _____ 1% limit: _____

Manufacturer & Component Description	Part/Model #	Quantity (if applicable)	Cost per Unit (if applicable)	Component's Total Cost	How is Cost Documented?*

Use additional sheets as necessary

Total Cost of Components deemed to be De Minimis: _____

If approaching the 5% or 1% limits, contact PFA immediately

* Documentation must demonstrate confirmation of the components' actual costs (invoice, etc.).

Completed by:

Name: _____ Title: _____

Signature: _____ Date: _____

4.4 American Iron and Steel Documentation

Contractors must comply with and provide documentation that shows compliance with AIS requirements. Product certifications letters need to include the following five items:

1. Identify the product. The letter should list the specific product(s) delivered to the project site.
2. Identify where the product was made. The letter should include the location(s) of the foundry/mill/factory where the product was manufactured (City and State).
3. To whom was the product delivered? The letter should include the name of the project and the jurisdiction where the product was delivered.
4. The signature of a company representative.
5. Specifically reference the American Iron and Steel requirements.

5 Federal and State Prevailing Wages

Both Federal Davis Bacon prevailing wages and State of Minnesota prevailing wages (Minnesota Statute, sections 177.41-177.43) apply to this project. Payment of the wages, fringe benefits and overtime rates that are most beneficial to the employees are required. **All worker classifications must have a state and federal prevailing wage.** Overtime is governed by Minnesota Prevailing Wage Statutes at M.S. 177.42 which requires overtime for over 8 hours per day and for more than 40 hours per week, thus any employee working more than 8 hours in one day is entitled to overtime.

Both the proper Federal (Davis-Bacon) and State of Minnesota Prevailing Wage rates and contract conditions must be physically incorporated into the bidding and contract documents.

Obtain required State posters from the Minnesota Department of Labor and Industry at http://www.dli.mn.gov/about-department/workplace-posters

Obtain federal posters at http://www.dol.gov/whd/regs/compliance/posters/davis.htm

Weekly certified payroll submittal is required under the Federal Davis Bacon laws.

6. Contract Conditions

This project is being financed in whole or in part by the MPFA through the Clean Water or Drinking Water State Revolving Fund. The MPFA recipient is required to comply with certain state and federal laws, rules and regulations and to ensure that their contractor(s) also complies with these laws, regulations, rules, including, but not limited to the items below which will be included in all contracts and subcontracts.

6.1 General Contract Conditions

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, ensures access to facilities or programs regardless of race, color, national origin, sex, age or handicap.

2. Executive Orders 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 over $10,000.

3. 40 CFR Part 33 Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency (EPA) Financial Assistance Agreements.

4. 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 U.S.C. 437d); a 1993 appropriations act; Public Law 101-549, Title X of the Clean Air Acts Amendments of 1990 (42 U.S.C. 7601 note). Encourages recipients to award construction, supply and professional service contracts to minority and women's business enterprises (MBE/WBE) and small businesses and requires recipients to utilize affirmative steps in procurement.

5. 40 CFR Part 33 Participation by Disadvantaged Business Enterprises in Procurement under Environmental Protection Agency (EPA) Financial Assistance Agreements.

6. Executive Orders 12549 and 12689, 2 CFR Part 180, and 2 CFR Part 1532, Subparts B and C prohibit entering into contracts or sub-contracts with individuals or businesses who are debarred or suspended. Before contracts are awarded, MPFA Recipients must check the status of all contractors (construction and professional services) and must require contractors to check the status of subcontractors and suppliers for contracts expected to be equal to or over $25,000 via the U. S. General Services Administration System for Award Management website SAM.gov | Home or search the internet for sam.gov. Recipients must verify the status on the Minnesota Department of Administration's listing: Suspended/Debarred Vendors / Minnesota Office of State Procurement (mn.gov).

7. Section 602(b)(6) of the Federal Water Pollution Control Act, as amended and section 1450(e) of the Safe Drinking Water Act (42 U.S.C. 300j-9(e)) require that all laborers and mechanics employed by contractors or subcontractors be paid wages at rates not less than those prevailing for the same type of work as determined by the U. S. Secretary of Labor in accordance with the Davis-Bacon Act (46 Stat. 1494; 40 U.S.C., sec. 276a through 276a-5). Reorganization Plan Number 14 of 1950 (15 F.R. 3176) and section 2 of the Davis-Bacon Act of June 13, 1934, as amended (48 Stat. 948; 40 U.S.C. 276c).

8. Section 608 of the Federal Clean Water Act, as amended and the Safe Drinking Water Act, as amended by America's Water Infrastructure Act of 2018 that requires all of the iron and steel products used in the CWSRF and DWSRF Projects are to be produced in the United States ("Use of American Iron and Steel Requirement"), unless (i) the Borrower has requested and obtained a waiver from EPA pertaining to the Project or (ii) the MPFA has otherwise advised the Borrower in writing that the American Iron and Steel Requirement is not applicable to the project.

9. 2 CFR 200.216 Prohibition on certain telecommunications and video surveillance services or equipment (implementing Section 889 of Public Law 115-232).

10. Minnesota Statutes, Section 471.345, Uniform Municipal Contracting Law.

11. Minnesota Statutes, Section 574.26 to 574.32, the Public Contractors' Performance and Payment Bond Act, as applicable

12. Minnesota Statutes sections 176.181-176.182. Requires recipients and subcontractors to have worker's compensation insurance coverage.

13. Minnesota Statutes sections 177.41-177.43 and Minnesota Rules 5200.1000 to 5200.1120 (prevailing wage rate law and rules). Requires that contractors pay laborers and mechanics prevailing wages established by the Minnesota Department of Labor and Industry for public works projects.

14. Minnesota Statutes 290.9705. Requires that 8 percent of payments made to out-of-state contractors be withheld once cumulative payments made to the contractor for work done in Minnesota exceed $50,000 in a calendar year, unless an exemption is granted by the Department of Revenue.

15. Minnesota Statutes, Chapter 16C.285, Responsible Contractor Requirements.

16. Minnesota Statutes Sec. 363A.36, Minnesota Department of Human Rights' (MDHR) affirmative action plan requirements for contracts exceeding $250,000. An affirmative action plan and a workforce certificate for affected contractors is required prior to bidding (Apply for a Workforce Certificate / Minnesota.gov (mn.gov)).

17. Minnesota Statutes Section 363A.43, Minnesota Department of Human Rights (MDHR) equal pay certificate. Required for agreements and contracts for goods and services exceeding $1,000,000 with a business that has 40 or more full-time employees in Minnesota or a state where the business has its primary place of business on a single day during the prior 12 months, unless the business has an equal pay certificate, or it has certified in writing that it is exempt.
18. Minnesota Statutes Section 181.59, Discrimination on Account of Race, Creed, or Color Prohibited in Contract.

BID CERTIFICATION
AMERICAN IRON & STEEL
MUST BE SUBMITTED WITH BID

Owner: City of Adams, MN Funding Authority: MN DWRF & PFA

Project: Pumphouse #5 Construction & Watermain Improvements

The Contractor acknowledges to and for the benefit of the Owner and the Funding Authority that it understands the goods and services under this Agreement are being funded with monies made available by the Funding Authority that have statutory requirements commonly known as "Use of 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 Contractor pursuant to this Agreement.

The Contractor hereby represents and warrants to and for the benefit of the Owner and the Funding Authority that (a) the Contractor has reviewed and understands the American Iron and Steel Requirement specified in Section 608 of the Clean Water Act and Section 1452(a)(4) of the Safe Drinking Water Act, (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 Owner or the Funding Authority.

Notwithstanding any other provision of this Agreement, any failure to comply with this requirement by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation engineering or attorney's fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). While the Contractor has no direct contractual privity with the Funding Authority, as a lender or awardee to the Owner for the funding of its project, the Owner and the Contractor agree that the Funding Authority 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 Funding Authority.

_____	_____
Contractor	Contractor's Authorized Representative Signature
_____	_____
Date	Printed Name

6.3 Federal Davis Bacon Prevailing Wages – Required Contract Conditions

NOTE: Both federal Davis Bacon prevailing wages and State of Minnesota prevailing wages (Minnesota Statute, sections 177.41-177.43) apply to this project. Payment of the wages, fringe benefits and overtime rates that are most beneficial to the employees are required.

Federal posters can be obtained at http://www.dol.gov/whd/regs/compliance/posters/davis.htm

The "recipient" referred to throughout the Davis Bacon contract conditions is the MPFA Borrower. The "MPFA" is the Minnesota Public Facilities Authority.

This language must be included in all Davis Bacon covered construction contracts and subcontracts. (29 CFR Part 5.5)

(a) The Recipient shall insert in full in any contract in excess of $2,000 which is entered into for the actual construction, alteration and/or repair, including painting and decorating, of a treatment work under the CWRF or a construction project under the DWRF, financed in whole or in part from Federal funds or in accordance with guarantees of a Federal agency or financed from funds obtained by pledge of any contract of a Federal agency to make a loan, grant or annual contribution (except where a different meaning is expressly indicated), and which is subject to the labor standards provisions of any of the acts listed in Sec. 5.1 the following clauses:

(1) **Minimum wages**. (i) All laborers and mechanics employed or working upon the site of the work will be paid unconditionally and not less often than once a week, and without subsequent deduction or rebate on any account (except such payroll deductions as are permitted by regulations issued by the Secretary of Labor under the Copeland Act (29 CFR part 3)), the full amount of wages and bona fide fringe benefits (or cash equivalents thereof) due at time of payment computed at rates not less than those contained in the wage determination of the Secretary of Labor which is attached hereto and made a part hereof, regardless of any contractual relationship which may be alleged to exist between the contractor and such laborers and mechanics.

Contributions made or costs reasonably anticipated for bona fide fringe benefits under section 1(b)(2) of the Davis-Bacon Act on behalf of laborers or mechanics are considered wages paid to such laborers or mechanics, subject to the provisions of paragraph (a)(1)(iv) of this section; also, regular contributions made or costs incurred for more than a weekly period (but not less often than quarterly) under plans, funds, or programs which cover the particular weekly period, are deemed to be constructively made or incurred during such weekly period. Such laborers and mechanics shall be paid the appropriate wage rate and fringe benefits on the wage determination for the classification of work actually performed, without regard to skill, except as provided in Sec. 5.5(a)(4). Laborers or mechanics performing work in more than one classification may be compensated at the rate specified for each classification for the time actually worked therein: Provided, that the employer's payroll records accurately set forth the time spent in each classification in which work is performed. The wage determination (including

any additional classification and wage rates conformed under paragraph (a)(1)(ii) of this section) and the Davis-Bacon poster (WH-1321) shall be posted at all times by the contractor and its subcontractors at the site of the work in a prominent and accessible place where it can be easily seen by the workers.

Recipients may obtain wage determinations from the U. S. Department of Labor's web site, https://beta.sam.gov/.

(ii)(A) The Recipient, on behalf of EPA, shall require that any class of laborers or mechanics, including helpers, which is not listed in the wage determination and which is to be employed under the contract shall be classified in conformance with the wage determination. The Recipient's award official shall approve an additional classification and wage rate and fringe benefits therefore only when the following criteria have been met:

(1) The work to be performed by the classification requested is not performed by a classification in the wage determination; and

(2) The classification is utilized in the area by the construction industry; and

(3) The proposed wage rate, including any bona fide fringe benefits, bears a reasonable relationship to the wage rates contained in the wage determination.

(B) If the contractor and the laborers and mechanics to be employed in the classification (if known), or their representatives, and the Recipient agree on the classification and wage rate (including the amount designated for fringe benefits where appropriate), documentation of the action taken and the request, including the local wage determination shall be sent by the Recipient to the Administrator of the Wage and Hour Division, Conformance and CBA Update public email address:

WHD-CBACONFORMANCE_INCOMING@dol.gov and to the EPA DB Regional Coordinator concurrently at (USEPA REGION 5, 77 West Jackson Boulevard Mail Code: MC-10J, Chicago, IL 60604-3507. The Administrator, or an authorized representative, will approve, modify, or disapprove every additional classification action within 30 days of receipt and so advise the Recipient or will notify the Recipient within the 30-day period that additional time is necessary.

(C) In the event the contractor, the laborers or mechanics to be employed in the classification or their representatives, and the Recipient do not agree on the proposed classification and wage rate (including the amount designated for fringe benefits, where appropriate), the award official shall refer the request and the local wage determination, including the views of all interested parties and the recommendation of the Recipient's award official, to the Administrator for determination. The request shall be sent to the EPA DB Coordinator concurrently. The Administrator, or an authorized representative, will issue a determination within 30 days of receipt and so advise the contracting officer or will notify the contracting officer within the 30-day period that additional time is necessary.

(D) The wage rate (including fringe benefits where appropriate) determined pursuant to paragraphs (a)(1)(ii) (B) or (C) of this section, shall be paid to all workers performing work in the classification under this contract from the first day on which work is performed in the classification.

(iii) Whenever the minimum wage rate prescribed in the contract for a class of laborers or mechanics includes a fringe benefit which is not expressed as an hourly rate, the contractor shall either pay the benefit as stated in the wage determination or shall pay another bona fide fringe benefit or an hourly cash equivalent thereof.

(iv) If the contractor does not make payments to a trustee or other third person, the contractor may consider as part of the wages of any laborer or mechanic the amount of any costs reasonably anticipated in providing bona fide fringe benefits under a plan or program, provided, that the Secretary of Labor has found, upon the written request of the contractor, that the applicable standards of the Davis-Bacon Act have been met. The Secretary of Labor may require the contractor to set aside assets in a separate account for meeting obligations under the plan or program.

(2) **Withholding**. The Recipient shall upon its own action or upon written request of the PFA, EPA award official or an authorized representative of the Department of Labor withhold or cause to be withheld from the contractor under this contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to Davis-Bacon prevailing wage requirements, which is held by the same prime contractor, so much of the accrued payments or advances as may be considered necessary to pay laborers and mechanics, including apprentices, trainees, and helpers, employed by the contractor or any subcontractor the full amount of wages required by the contract. In the event of failure to pay any laborer or mechanic, including any apprentice, trainee, or helper, employed or working on the site of the work, all or part of the wages required by the contract, the Recipient may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds until such violations have ceased.

(3) **Payrolls and basic records**. (i) Payrolls and basic records relating thereto shall be maintained by the contractor during the course of the work and preserved for a period of three years thereafter for all laborers and mechanics working at the site of the work. Such records shall contain the name, address, and social security number of each such worker, his or her correct classification, hourly rates of wages paid (including rates of contributions or costs anticipated for bona fide fringe benefits or cash equivalents thereof of the types described in section 1(b)(2)(B) of the Davis-Bacon Act), daily and weekly number of hours worked, deductions made and actual wages paid. Whenever the Secretary of Labor has found under 29 CFR 5.5(a)(1)(iv) that the wages of any laborer or mechanic include the amount of any costs reasonably anticipated in providing benefits under a plan or program described in section 1(b)(2)(B) of the Davis-Bacon Act, the contractor shall maintain records which show that the commitment to provide such benefits is enforceable, that the plan or program is financially

responsible, and that the plan or program has been communicated in writing to the laborers or mechanics affected, and records which show the costs anticipated or the actual cost incurred in providing such benefits. Contractors employing apprentices or trainees under approved programs shall maintain written evidence of the registration of apprenticeship programs and certification of trainee programs, the registration of the apprentices and trainees, and the ratios and wage rates prescribed in the applicable programs.

(ii)(A) The contractor shall submit weekly for each week in which any contract work is performed a copy of all payrolls to the Recipient. Such documentation shall be available on request of the PFA or EPA. The payrolls shall set out accurately and completely all of the information required to be maintained under 29 CFR 5.5(a)(3)(i), **except that full social security numbers and home addresses shall not be included on weekly payrolls**. Instead, the payrolls shall only need to include an individually identifying number for each employee (e.g., the last four digits of the employee's social security number). The required weekly payroll information may be submitted in any form desired. Optional Form WH-347 and instructions are available for this purpose from the Wage and Hour Division Web site at WHD | U.S. Department of Labor (dol.gov) or its successor site. The prime contractor is responsible for the submission of copies of payrolls by all subcontractors. Contractors and subcontractors shall maintain the full social security number and current address of each covered worker and shall provide them upon request to the Recipient for transmission to the PFA or EPA, if requested by EPA, the PFA, the contractor, or the Wage and Hour Division of the Department of Labor for purposes of an investigation or audit of compliance with prevailing wage requirements. It is not a violation of this section for a prime contractor to require a subcontractor to provide addresses and social security numbers to the prime contractor for its own records, without weekly submission to the Recipient.

(B) Each payroll submitted shall be accompanied by a ``Statement of Compliance,'' signed by the contractor or subcontractor or his or her agent who pays or supervises the payment of the persons employed under the contract and shall certify the following:

(1) That the payroll for the payroll period contains the information required to be provided under Sec. 5.5 (a)(3)(ii) of Regulations, 29 CFR part 5, the appropriate information is being maintained under Sec. 5.5 (a)(3)(i) of Regulations, 29 CFR part 5, and that such information is correct and complete;

(2) That each laborer or mechanic (including each helper, apprentice, and trainee) employed on the contract during the payroll period has been paid the full weekly wages earned, without rebate, either directly or indirectly, and that no deductions have been made either directly or indirectly from the full wages earned, other than permissible deductions as set forth in Regulations, 29 CFR part 3;

(3) That each laborer or mechanic has been paid not less than the applicable wage rates and fringe benefits or cash equivalents for the classification of work performed, as specified in the applicable wage determination incorporated into the contract.

(C) The weekly submission of a properly executed certification set forth on the reverse side of Optional Form WH-347 shall satisfy the requirement for submission of the ``Statement of Compliance'' required by paragraph (a)(3)(ii)(B) of this section.

(D) The falsification of any of the above certifications may subject the contractor or subcontractor to civil or criminal prosecution under section 1001 of title 18 and section 231 of title 31 of the United States Code.

(iii) The contractor or subcontractor shall make the records required under paragraph (a)(3)(i) of this section available for inspection, copying, or transcription by authorized representatives of the PFA, EPA or the Department of Labor, and shall permit such representatives to interview employees during working hours on the job. If the contractor or subcontractor fails to submit the required records or to make them available, the Federal agency or PFA may, after written notice to the contractor, sponsor, applicant, or owner, take such action as may be necessary to cause the suspension of any further payment, advance, or guarantee of funds. Furthermore, failure to submit the required records upon request or to make such records available may be grounds for debarment action pursuant to 29 CFR 5.12.

(4) **Apprentices and trainees**-(i) Apprentices. Apprentices will be permitted to work at less than the predetermined rate for the work they performed when they are employed pursuant to and individually registered in a bona fide apprenticeship program registered with the U.S. Department of Labor, Employment and Training Administration, Office of Apprenticeship Training, Employer and Labor Services, or with a State Apprenticeship Agency recognized by the Office, or if a person is employed in his or her first 90 days of probationary employment as an apprentice in such an apprenticeship program, who is not individually registered in the program, but who has been certified by the Office of Apprenticeship Training, Employer and Labor Services or a State Apprenticeship Agency (where appropriate) to be eligible for probationary employment as an apprentice. The allowable ratio of apprentices to journeymen on the job site in any craft classification shall not be greater than the ratio permitted to the contractor as to the entire work force under the registered program. Any worker listed on a payroll at an apprentice wage rate, who is not registered or otherwise employed as stated above, shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any apprentice performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. Where a contractor is performing construction on a project in a locality other than that in which its program is registered, the ratios and wage rates (expressed in percentages of the journeyman's hourly rate) specified in the contractor's or subcontractor's registered program shall be observed. Every apprentice must be paid at not less than the rate specified in the registered program for the apprentice's level of progress, expressed as a percentage of the journeymen hourly rate specified in the applicable wage determination. Apprentices shall be paid fringe benefits in accordance with the provisions of the apprenticeship program. If the apprenticeship program does not specify fringe benefits, apprentices must be paid the full amount of fringe benefits listed on the wage determination for the applicable classification. If the Administrator

determines that a different practice prevails for the applicable apprentice classification, fringes shall be paid in accordance with that determination. In the event the Office of Apprenticeship Training, Employer and Labor Services, or a State Apprenticeship Agency recognized by the Office, withdraws approval of an apprenticeship program, the contractor will no longer be permitted to utilize apprentices at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(ii) Trainees. Except as provided in 29 CFR 5.16, trainees will not be permitted to work at less than the predetermined rate for the work performed unless they are employed pursuant to and individually registered in a program which has received prior approval, evidenced by formal certification by the U.S. Department of Labor, Employment and Training Administration. The ratio of trainees to journeymen on the job site shall not be greater than permitted under the plan approved by the Employment and Training Administration. Every trainee must be paid at not less than the rate specified in the approved program for the trainee's level of progress, expressed as a percentage of the journeyman hourly rate specified in the applicable wage determination. Trainees shall be paid fringe benefits in accordance with the provisions of the trainee program. If the trainee program does not mention fringe benefits, trainees shall be paid the full amount of fringe benefits listed on the wage determination unless the Administrator of the Wage and Hour Division determines that there is an apprenticeship program associated with the corresponding journeyman wage rate on the wage determination which provides for less than full fringe benefits for apprentices. Any employee listed on the payroll at a trainee rate who is not registered and participating in a training plan approved by the Employment and Training Administration shall be paid not less than the applicable wage rate on the wage determination for the classification of work actually performed. In addition, any trainee performing work on the job site in excess of the ratio permitted under the registered program shall be paid not less than the applicable wage rate on the wage determination for the work actually performed. In the event the Employment and Training Administration withdraws approval of a training program, the contractor will no longer be permitted to utilize trainees at less than the applicable predetermined rate for the work performed until an acceptable program is approved.

(iii) Equal employment opportunity. The utilization of apprentices, trainees and journeymen under this part shall be in conformity with the equal employment opportunity requirements of Executive Order 11246, as amended, and 29 CFR part 30.

(5) **Compliance with Copeland Act requirements**. The contractor shall comply with the requirements of 29 CFR Part 3, which are incorporated by reference in this contract.

(6) **Subcontracts**. The contractor or subcontractor shall insert in any subcontracts the clauses contained in 29 CFR 5.5(a)(1) through (10) and such other clauses as the EPA determines may be appropriate, and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for the compliance by any subcontractor or lower tier subcontractor with all the contract clauses in 29 CFR 5.5.

(7) **Contract termination: debarment**. A breach of the contract clauses in 29 CFR 5.5 may be grounds for termination of the contract, and for debarment as a contractor and a subcontractor as provided in 29 CFR 5.12.

(8) **Compliance with Davis-Bacon and Related Act requirements**. All rulings and interpretations of the Davis-Bacon and Related Acts contained in 29 CFR parts 1, 3, and 5 are herein incorporated by reference in this contract.

(9) **Disputes concerning labor standards**. Disputes arising out of the labor standards provisions of this contract shall not be subject to the general disputes clause of this contract. Such disputes shall be resolved in accordance with the procedures of the Department of Labor set forth in 29 CFR parts 5, 6, and 7. Disputes within the meaning of this clause include disputes between the contractor (or any of its subcontractors) and the Recipient, PFA, EPA, the U.S. Department of Labor, or the employees or their representatives.

(10) **Certification of eligibility**. (i) By entering into this contract, the contractor certifies that neither it (nor he or she) nor any person or firm who has an interest in the contractor's firm is a person or firm ineligible to be awarded Government contracts by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(ii) No part of this contract shall be subcontracted to any person or firm ineligible for award of a Government contract by virtue of section 3(a) of the Davis-Bacon Act or 29 CFR 5.12(a)(1).

(iii) The penalty for making false statements is prescribed in the U.S. Criminal Code, 18 U.S.C. 1001.

(b) **Contract Work Hours and Safety Standards Act**. The Recipient shall insert the following clauses set forth in paragraphs (b)(1), (2), (3), and (4) of this section in full in any contract in an amount in excess of $100,000 and subject to the overtime provisions of the Contract Work Hours and Safety Standards Act. These clauses shall be inserted in addition to the clauses required by 29 CFR Sec. 5.5(a) or 29 CFR 4.6. As used in this paragraph, the terms laborers and mechanics include watchmen and guards.

(1) **Overtime requirements.** No contractor or subcontractor contracting for any part of the contract work which may require or involve the employment of laborers or mechanics shall require or permit any such laborer or mechanic in any workweek in which he or she is employed on such work to work in excess of forty hours in such workweek unless such laborer or mechanic receives compensation at a rate not less than one and one-half times the basic rate of pay for all hours worked in excess of forty hours in such workweek.

(2) **Violation; liability for unpaid wages; liquidated damages.** In the event of any violation of the clause set forth in paragraph (b)(1) of this section the contractor and any subcontractor responsible therefor shall be liable for the unpaid wages. In addition, such contractor and subcontractor shall be liable to the United States (in the case of work done under contract for the District of Columbia or a territory, to such District or to such territory), for liquidated

damages. Such liquidated damages shall be computed with respect to each individual laborer or mechanic, including watchmen and guards, employed in violation of the clause set forth in paragraph (b)(1) of this section, in the sum of $10 for each calendar day on which such individual was required or permitted to work in excess of the standard workweek of forty hours without payment of the overtime wages required by the clause set forth in paragraph (b)(1) of this section.

(3) **Withholding for unpaid wages and liquidated damages.** The Recipient, upon its own action or upon written request of the PFA, EPA Award Official or an authorized representative of the Department of Labor shall withhold or cause to be withheld, from any moneys payable on account of work performed by the contractor or subcontractor under any such contract or any other Federal contract with the same prime contractor, or any other federally-assisted contract subject to the Contract Work Hours and Safety Standards Act, which is held by the same prime contractor, such sums as may be determined to be necessary to satisfy any liabilities of such contractor or subcontractor for unpaid wages and liquidated damages as provided in the clause set forth in paragraph (b)(2) of this section.

(4) **Subcontracts.** The contractor or subcontractor shall insert in any subcontracts the clauses set forth in paragraph (b)(1) through (4) of this section and also a clause requiring the subcontractors to include these clauses in any lower tier subcontracts. The prime contractor shall be responsible for compliance by any subcontractor or lower tier subcontractor with the clauses set forth in paragraphs (b)(1) through (4) of this section.

(c) In addition to the clauses contained in paragraph (b), in any contract subject only to the Contract Work Hours and Safety Standards Act and not to any of the other statutes cited in 29 CFR Sec. 5.1, the Recipient shall insert a clause requiring that the contractor or subcontractor shall maintain payrolls and basic payroll records during the course of the work and shall preserve them for a period of three years from the completion of the contract for all laborers and mechanics, including guards and watchmen, working on the contract. Such records shall contain the name and address of each such employee, social security number, correct classifications, hourly rates of wages paid, daily and weekly number of hours worked, deductions made, and actual wages paid. Further, the Recipient shall insert in any such contract a clause providing that the records to be maintained under this paragraph shall be made available by the contractor or subcontractor for inspection, copying, or transcription by authorized representatives of the PFA, EPA and the Department of Labor, and the contractor or subcontractor will permit such representatives to interview employees during working hours on the job.

"General Decision Number: MN20260236 01/02/2026

Superseded General Decision Number: MN20250236

State: Minnesota

Construction Types: Heavy and Highway

Counties: Dodge, Fillmore, Freeborn, Goodhue, Houston, Mower, Olmsted, Rice, Steele, Wabasha and Winona Counties in Minnesota.

Heavy and Highway Construction Projects

Please refer to Minnesota Rules 5200.1100, 5200.1101, and 5200.1102 for definitions of labor classifications on this wage determination, and direct any questions regarding such classifications to the Branch of Construction Wage Determinations.

Modification Number	Publication Date
0	01/02/2026

SAMN2024-006 11/18/2024

	Rates	Fringes
ARTICULATED HAULER	$ 44.67	26.90
ASBESTOS ABATEMENT WORKER	$ 36.23	22.26
BLASTER	$ 42.01	26.01
BOILERMAKER	$ 48.35	31.93
BOOM TRUCK	$ 47.25	26.90
BRICKLAYER	$ 36.05	19.68
CARPENTER	$ 49.82	29.92
CARPET LAYER (LINOLEUM)	$ 35.32	14.03
CEMENT MASON	$ 57.21	13.26
ELECTRICIAN	$ 48.37	26.13
FLAG PERSON	$ 39.01	26.01
GROUND PERSON	$ 33.40	16.30
HEATING AND FROST INSULATORS	$ 43.90	23.05
IRONWORKER	$ 44.85	35.72
LABORER: Common or General (GENERAL LABOR WORK)	$ 39.01	26.01
LABORER: Landscape (GARDENER, SOD LAYER AND NURSERY OPERATOR)	$ 30.04	21.16
LABORER: Skilled (ASSISTING		

SKILLED CRAFT JOURNEYMAN).....$ 39.01 26.01

LANDSCAPING EQUIPMENT
(INCLUDES HYDRO SEEDER OR
MULCHER, SOD ROLLER, FARM
TRACTOR WITH ATTACHMENT
SPECIFICALLY SEEDING,
SODDING, OR PLANT, AND
TWO-FRAMED FORKLIFT
(EXCLUDING FRONT,
POSIT-TRACK, AND SKID STEER
LOADERS), NO EARTHWORK OR
GRADING FOR ELEVATIONS).....$ 30.04 21.16

LINEMAN.....$ 46.32 20.12

MILLWRIGHT.....$ 41.70 31.81

OFF-ROAD TRUCK.....$ 44.67 26.40

PAINTER (INCLUDING HAND
BRUSHED, HAND SPRAYED, AND
THE TAPING OF PAVEMENT
MARKINGS).....$ 34.78 24.83

PAVEMENT MARKING OR MARKING
REMOVAL EQUIPMENT ((ONE OR
TWO PERSON OPERATORS);
SELF-PROPELLED TRUCK OR
TRAILER MOUNTED UNITS).....$ 33.91 23.49

Piledriver (INCLUDING
VIBRATORY DRIVER OR EXTRACTOR
FOR PILING AND SHEETING
OPERATIONS).....$ 49.46 30.23

PIPEFITTER/STEAMFITTER.....$ 55.94 34.50

PIPELAYER (WATER, SEWER AND
GAS).....$ 42.51 26.01

PLUMBER.....$ 50.16 28.23

POWER EQUIPMENT OPERATOR:
(Highway/Heavy Group 2).....$ 45.61 26.90
HELICOPTER PILOT; CONCRETE PUMP; ALL CRANES WITH OVER 135-FOOT BOOM, EXCLUDING JIB; DRAGLINE, CRAWLER, HYDRAULIC BACKHOE (TRACK OR WHEEL MOUNTED) AND/OR OTHER SIMILAR EQUIPMENT WITH SHOVEL-TYPE CONTROLS THREE CUBIC YARDS AND OVER MANUFACTURER.S RATED CAPACITY INCLUDING ALL ATTACHMENTS; GRADER OR MOTOR PATROL; PILE DRIVING; TUGBOAT 100 H.P. AND OVER WHEN LICENSE REQUIRED

POWER EQUIPMENT OPERATOR:
(Highway/Heavy Group 3).....$ 45.01 26.90
ASPHALT BITUMINOUS STABILIZER PLANT; CABLEWAY; CONCRETE MIXER, STATIONARY PLANT; DERRICK (GUY OR STIFFLEG)(POWER)(SKIDS OR STATIONARY); DRAGLINE, CRAWLER, HYDRAULIC BACKHOE (TRACK OR WHEEL MOUNTED) AND/OR SIMILAR EQUIPMENT WITH SHOVEL-TYPE CONTROLS, UP TO THREE CUBIC YARDS MANUFACTURER.S RATED CAPACITY INCLUDING ALL ATTACHMENTS; DREDGE OR ENGINEERS, DREDGE (POWER) AND ENGINEER; FRONT END LOADER, FIVE CUBIC YARDS AND OVER INCLUDING ATTACHMENTS; LOCOMOTIVE CRANE OPERATOR; MIXER (PAVING) CONCRETE PAVING, ROAD MOLE, INCLUDING MUCKING OPERATIONS, CONWAY OR SIMILAR TYPE; MECHANIC ON POWER

EQUIPMENT; TRACTOR, BOOM TYPE; TANDEM SCRAPER; TRUCK CRANE, CRAWLER CRANE; TUGBOAT 100 H.P AND OVER

POWER EQUIPMENT OPERATOR:
(Highway/Heavy Group 4).....$ 44.67 26.90
AIR TRACK ROCK DRILL; AUTOMATIC ROAD MACHINE (CMI OR SIMILAR); BACKFILLER OPERATOR; CONCRETE BATCH PLANT OPERATOR; BITUMINOUS ROLLERS, RUBBER TIRED OR STEEL DRUMMED (EIGHT TONS AND OVER); BITUMINOUS SPREADER AND FINISHING MACHINES (POWER), INCLUDING PAVERS, MACRO SURFACING AND MICRO SURFACING, OR SIMILAR TYPES (OPERATOR AND SCREED PERSON); BROKK OR R.T.C. REMOTE CONTROL OR SIMILAR TYPE WITH ALL ATTACHMENTS; CAT CHALLENGER TRACTORS OR SIMILAR TYPES PULLING ROCK WAGONS, BULLDOZERS AND SCRAPERS; CHIP HARVESTER AND TREE CUTTER; CONCRETE DISTRIBUTOR AND SPREADER FINISHING MACHINE, LONGITUDINAL FLOAT, JOINT MACHINE, AND SPRAY MACHINE; CONCRETE MIXER ON JOBSITE; CONCRETE MOBIL; CRUSHING PLANT (GRAVEL AND STONE) OR GRAVEL WASHING, CRUSHING AND SCREENING PLANT; CURB MACHINE; DIRECTIONAL BORING MACHINE; DOPE MACHINE (PIPELINE); DRILL RIGS, HEAVY ROTARY OR CHURN OR CABLE DRILL; DUAL TRACTOR; ELEVATING GRADER; FORK LIFT OR STRADDLE CARRIER; FORK LIFT OR LUMBER STACKER; FRONT END, SKID STEER OVER 1 TO 5 C YD; GPS REMOTE OPERATING OF EQUIPMENT; HOIST ENGINEER (POWER); HYDRAULIC TREE PLANTER; LAUNCHER PERSON (TANKER PERSON OR PILOT LICENSE); LOCOMOTIVE; MILLING, GRINDING, PLANNING, FINE GRADE, OR TRIMMER MACHINE; MULTIPLE MACHINES, SUCH AS AIR COMPRESSORS, WELDING MACHINES, GENERATORS, PUMPS; PAVEMENT BREAKER OR TAMPING MACHINE (POWER DRIVEN) MIGHTY MITE OR SIMILAR TYPE; PICKUP SWEEPER, ONE CUBIC YARD AND OVER HOPPER CAPACITY; PIPELINE WRAPPING, CLEANING OR BENDING MACHINE; POWER PLANT ENGINEER, 100 KWH AND OVER; POWER ACTUATED HORIZONTAL BORING MACHINE, OVER SIX INCHES; PUGMILL; PUMPCRETE; RUBBER-TIRED FARM TRACTOR WITH BACKHOE INCLUDING ATTACHMENTS; SCRAPER; SELF-PROPELLED SOIL STABILIZER; SLIP FORM (POWER DRIVEN) (PAVING); TIE TAMPER AND BALLAST MACHINE; TRACTOR, BULLDOZER; TRACTOR, WHEEL TYPE, OVER 50 H.P. WITH PTO UNRELATED TO LANDSCAPING; TRENCHING MACHINE (SEWER, WATER, GAS) EXCLUDES WALK BEHIND TRENCHER; TUB GRINDER, MORBARK, OR SIMILAR TYPE; WELL POINT DISMANTLING OR INSTALLATION

POWER EQUIPMENT OPERATOR:
(Highway/Heavy Group 5).....$ 41.36 26.90
AIR COMPRESSOR, 600 CFM OR OVER; BITUMINOUS ROLLER (UNDER EIGHT TONS); CONCRETE SAW (MULTIPLE BLADE) (POWER OPERATED); FORM TRENCH DIGGER (POWER); FRONT END, SKID STEER UP TO 1C YD; GUNITE GUNALL; HYDRAULIC LOG SPLITTER; LOADER (BARBER GREENE OR SIMILAR TYPE); POST HOLE DRIVING MACHINE/POST HOLE AUGER; POWER ACTUATED AUGER AND BORING MACHINE; POWER ACTUATED JACK; PUMP; SELF-PROPELLED CHIP SPREADER (FLAHERTY OR SIMILAR); SHEEP FOOT COMPACTOR WITH BLADE . 200 H.P. AND OVER; SHOULDERING MACHINE (POWER) APSCO OR SIMILAR TYPE INCLUDING SELF-PROPELLED SAND AND CHIP SPREADER; STUMP CHIPPER AND TREE CHIPPER; TREE FARMER (MACHINE)

POWER EQUIPMENT OPERATOR:
(Highway/Heavy Group 6).....$ 40.02 26.90
CAT, CHALLENGER, OR SIMILAR TYPE OF TRACTORS, WHEN PULLING DISK OR ROLLER; CONVEYOR; DREDGE DECK HAND; FIRE PERSON OR TANK CAR HEATER; GRAVEL SCREENING PLANT (PORTABLE NOT CRUSHING OR WASHING); GREASER (TRACTOR); LEVER PERSON; OILER (POWER SHOVEL, CRANE, TRUCK CRANE, DRAGLINE, CRUSHERS, AND MILLING MACHINES, OR OTHER SIMILAR HEAVY EQUIPMENT); POWER SWEEPER; SHEEP FOOT ROLLER AND ROLLERS ON GRAVEL COMPACTION, INCLUDING VIBRATING ROLLERS; TRACTOR, WHEEL TYPE, OVER 50 H.P., UNRELATED TO LANDSCAPING

SHEET METAL WORKER.....$ 57.96 34.57

Survey Field Technician
(OPERATE TOTAL STATION, GPS
RECEIVER, LEVEL, ROD OR RANGE
POLES, STEEL TAPE
MEASUREMENT; MARK AND DRIVE
STAKES; HAND OR POWER DIGGING
FOR AND IDENTIFICATION OF
MARKERS OR MONUMENTS; PERFORM
AND CHECK CALCULATIONS;
REVIEW AND UNDERSTAND
CONSTRUCTION PLANS AND LAND
SURVEY MATERIALS).....$ 28.18 20.07

TRAFFIC CONTROL PERSON
(TEMPORARY SIGNAGE).....$ 30.51 21.84

TRUCK DRIVER (Group 1).....$ 33.00 14.40
MECHANIC; TRACTOR TRAILER DRIVER; TRUCK DRIVER (HAULING MACHINERY INCLUDING OPERATION OF HAND AND POWER OPERATED WINCHES)

TRUCK DRIVER (Group 2).....$ 54.24 0.01
FOUR OR MORE AXLE UNIT, STRAIGHT BODY TRUCK

TRUCK DRIVER (Group 3).....$ 32.00 13.00
BITUMINOUS DISTRIBUTOR DRIVER; BITUMINOUS DISTRIBUTOR (ONE PERSON OPERATION); THREE AXLE UNITS

TRUCK DRIVER (Group 4).....$ 35.74 21.76
BITUMINOUS DISTRIBUTOR SPRAY OPERATOR (REAR AND OILER); DUMP PERSON; GREASER; PILOT CAR DRIVER; RUBBER-TIRED, SELF-PROPELLED PACKER UNDER 8 TONS; TWO AXLE UNIT; SLURRY OPERATOR; TANK TRUCK HELPER (GAS, OIL, ROAD OIL, AND WATER); TRACTOR OPERATOR, UNDER 50 H.P.

Tunnel Miner.....$ 33.51 22.39

UNDERGROUND AND OPEN DITCH
LABORER (EIGHT FEET BELOW
STARTING GRADE LEVEL).....$ 40.51 26.01

WIRING SYSTEM TECHNICIAN.....$ 47.73 22.24

WIRING SYSTEMS INSTALLER.....$ 26.49 12.40

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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6.5 State of Minnesota Prevailing Wages: Required Contract Conditions

Pursuant to Minnesota Statutes 177.41 to 177.44 and corresponding Minnesota Rules 5200.1000 to 5200.1120, this contract is subject to the prevailing wages as established by the Minnesota Department of Labor and Industry. Specifically, all contractors and subcontractors must pay all laborers and mechanics the established prevailing wages for work performed under the contract. Failure to comply with the aforementioned may result in civil or criminal penalties. The applicable wage determination must be incorporated into proposals and all contracts.

Payrolls/Records

The contractor and subcontractor shall furnish to the OWNER copies of any or all payrolls not more than 14 days after the end of each pay period. The payrolls must contain all of the data required by Minnesota Statutes Section 177.30. Subcontractors must furnish payrolls to the contractor. The OWNER may examine all records relating to wages paid laborers or mechanics on work to which Minnesota Statutes Sections 177.41 to 177.44 apply.

Posting of Wage Rates/Required Posters

Each contractor and subcontractor performing work on a public project shall post on the project the applicable prevailing wage rates and hourly basic rates of pay for the county or area within which the project is being performed, including the effective date of any changes thereof, in at least one conspicuous place for the information of the employees working on the project. The information so posted shall include a breakdown of contributions for health and welfare benefits, vacation benefits, pension benefits, and any other economic benefits required to be paid.

For more information regarding prevailing wage and its application, contact:

Minnesota Department of Labor and Industry
Prevailing Wage unit
443 Lafayette Road North
St. Paul, MN 55155
Phone: (651) 284-5091
E-mail: dli.prevwage@state.mn.us
Web: www.dli.mn.gov

MINNESOTA DEPARTMENT OF LABOR AND INDUSTRY PREVAILING WAGES FOR STATE FUNDED CONSTRUCTION PROJECTS

THIS NOTICE MUST BE POSTED ON THE JOBSITE IN A CONSPICUOUS PLACE

Construction Type: Highway and Heavy

Region Number: 06

Counties within region:

- DODGE-20
- FILLMORE-23
- FREEBORN-24
- GOODHUE-25
- HOUSTON-28
- MOWER-50
- OLMSTED-55
- RICE-66
- STEELE-74
- WABASHA-79
- WINONA-85

Effective: 2025-11-03 Revised: 2025-12-01

This project is covered by Minnesota prevailing wage statutes. Wage rates listed below are the minimum hourly rates to be paid on this project.

All hours worked in excess of eight (8) hours per day or forty (40) hours per week shall be paid at a rate of one and one half (1 1/2) times the basic hourly rate. *Note: Overtime pay after eight (8) hours on the project must be paid even if the worker does not exceed forty (40) hours in the work week.*

Violations on MnDOT highways and road projects should be reported to:

Department of Transportation
Office of Construction
Transportation Building MS650
John Ireland Blvd
St. Paul, MN 55155
(651) 366-4209

All other prevailing wage violations and questions should be sent to:

Department of Labor and Industry
Prevailing Wage Section
443 Lafayette Road N
St Paul, MN 55155
(651) 284-5091
DLI.PrevWage@state.mn.us

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
LABORERS (101 - 112) (SPECIAL CRAFTS 701 - 730)					
101	LABORER, COMMON (GENERAL LABOR WORK)	2025-11-03	39.01	26.01	65.02
102	LABORER, SKILLED (ASSISTING SKILLED CRAFT JOURNEYMAN)	2025-11-03	39.01	26.01	65.02

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
103	LABORER, LANDSCAPING (GARDENER, SOD LAYER AND NURSERY OPERATOR)	2025-11-03	31.66	22.78	54.44
104	FLAG PERSON	2025-11-03	39.01	26.01	65.02
105	WATCH PERSON	2025-11-03	29.11	22.19	51.30
106	BLASTER	2025-11-03	42.01	26.01	68.02
107	PIPELAYER (WATER, SEWER AND GAS)	2025-11-03	42.51	26.01	68.52
108	TUNNEL MINER	2025-11-03	33.51	22.39	55.90
109	UNDERGROUND AND OPEN DITCH LABORER (EIGHT FEET BELOW STARTING GRADE LEVEL)	2025-11-03	40.51	26.01	66.52
110	SURVEY FIELD TECHNICIAN (OPERATE TOTAL STATION, GPS RECEIVER, LEVEL, ROD OR RANGE POLES, STEEL TAPE MEASUREMENT; MARK AND DRIVE STAKES; HAND OR POWER DIGGING FOR AND IDENTIFICATION OF MARKERS OR MONUMENTS; PERFORM AND CHECK CALCULATIONS; REVIEW AND UNDERSTAND CONSTRUCTION PLANS AND LAND SURVEY MATERIALS). THIS CLASSIFICATION DOES NOT APPLY TO THE WORK PERFORMED ON A PREVAILING WAGE PROJECT BY A LAND SURVEYOR WHO IS LICENSED PURSUANT TO MINNESOTA STATUTES, SECTIONS 326.02 TO 326.15.	2025-11-03	28.18	20.07	48.25
111	TRAFFIC CONTROL PERSON (TEMPORARY SIGNAGE)	2025-11-03	26.42	0.08	26.50
112	QUALITY CONTROL TESTER (FIELD AND COVERED OFF-SITE FACILITIES; TESTING OF AGGREGATE, ASPHALT, AND CONCRETE MATERIALS); LIMITED TO MN DOT HIGHWAY AND HEAVY CONSTRUCTION PROJECTS WHERE THE MN DOT HAS RETAINED QUALITY ASSURANCE PROFESSIONALS TO REVIEW AND	2025-11-03	19.70	0.13	19.83

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
	INTERPRET THE RESULTS OF QUALITY CONTROL TESTERS. SERVICES PROVIDED BY THE CONTRACTOR.				
SPECIAL EQUIPMENT (201 - 204)					
201	ARTICULATED HAULER	2025-11-03	46.25	29.40	75.65
		2026-05-04	47.68	31.00	78.68
202	BOOM TRUCK	2025-11-03	48.96	29.40	78.36
203	LANDSCAPING EQUIPMENT, INCLUDES HYDRO SEEDER OR MULCHER, SOD ROLLER, FARM TRACTOR WITH ATTACHMENT SPECIFICALLY SEEDING, SODDING, OR PLANT, AND TWO-FRAMED FORKLIFT (EXCLUDING FRONT, POSIT-TRACK, AND SKID STEER LOADERS), NO EARTHWORK OR GRADING FOR ELEVATIONS	2025-11-03	41.37	29.40	70.77
		2026-05-04	42.60	31.00	73.60
204	OFF-ROAD TRUCK	2025-11-03	44.67	26.40	71.07
205	PAVEMENT MARKING OR MARKING REMOVAL EQUIPMENT (ONE OR TWO PERSON OPERATORS); SELF-PROPELLED TRUCK OR TRAILER MOUNTED UNITS.	2025-11-03	33.91	23.49	57.40
HIGHWAY/HEAVY POWER EQUIPMENT OPERATOR					
GROUP 2		2025-11-03	47.24	29.40	76.64
		2026-05-04	48.71	31.00	79.71
302	HELICOPTER PILOT (HIGHWAY AND HEAVY ONLY)				
303	CONCRETE PUMP (HIGHWAY AND HEAVY ONLY)				
304	ALL CRANES WITH OVER 135-FOOT BOOM, EXCLUDING JIB (HIGHWAY AND HEAVY ONLY)				
305	DRAGLINE, CRAWLER, HYDRAULIC BACKHOE (TRACK OR WHEEL MOUNTED) AND/OR OTHER SIMILAR EQUIPMENT WITH SHOVEL-TYPE CONTROLS THREE CUBIC YARDS AND OVER MANUFACTURER.S RATED CAPACITY INCLUDING ALL ATTACHMENTS. (HIGHWAY AND HEAVY ONLY)				
306	GRADER OR MOTOR PATROL				
307	PILE DRIVING (HIGHWAY AND HEAVY ONLY)				
308	TUGBOAT 100 H.P. AND OVER WHEN LICENSE REQUIRED (HIGHWAY AND HEAVY ONLY)				

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
GROUP 3		2025-11-03	46.61	29.40	76.01
		2026-05-04	48.05	31.00	79.05
309	ASPHALT BITUMINOUS STABILIZER PLANT				
310	CABLEWAY				
311	CONCRETE MIXER, STATIONARY PLANT (HIGHWAY AND HEAVY ONLY)				
312	DERRICK (GUY OR STIFFLEG)(POWER)(SKIDS OR STATIONARY) (HIGHWAY AND HEAVY ONLY)				
313	DRAGLINE, CRAWLER, HYDRAULIC BACKHOE (TRACK OR WHEEL MOUNTED) AND/OR SIMILAR EQUIPMENT WITH SHOVEL-TYPE CONTROLS, UP TO THREE CUBIC YARDS MANUFACTURER.S RATED CAPACITY INCLUDING ALL ATTACHMENTS (HIGHWAY AND HEAVY ONLY)				
314	DREDGE OR ENGINEERS, DREDGE (POWER) AND ENGINEER				
315	FRONT END LOADER, FIVE CUBIC YARDS AND OVER INCLUDING ATTACHMENTS. (HIGHWAY AND HEAVY ONLY)				
316	LOCOMOTIVE CRANE OPERATOR				
317	MIXER (PAVING) CONCRETE PAVING, ROAD MOLE, INCLUDING MUCKING OPERATIONS, CONWAY OR SIMILAR TYPE				
318	MECHANIC . WELDER ON POWER EQUIPMENT (HIGHWAY AND HEAVY ONLY)				
319	TRACTOR . BOOM TYPE (HIGHWAY AND HEAVY ONLY)				
320	TANDEM SCRAPER				
321	TRUCK CRANE . CRAWLER CRANE (HIGHWAY AND HEAVY ONLY)				
322	TUGBOAT 100 H.P AND OVER (HIGHWAY AND HEAVY ONLY)				
GROUP 4		2025-11-03	46.25	29.40	75.65
		2026-05-04	47.68	31.00	78.68
323	AIR TRACK ROCK DRILL				
324	AUTOMATIC ROAD MACHINE (CMI OR SIMILAR) (HIGHWAY AND HEAVY ONLY)				
325	BACKFILLER OPERATOR				
326	CONCRETE BATCH PLANT OPERATOR (HIGHWAY AND HEAVY ONLY)				
327	BITUMINOUS ROLLERS, RUBBER TIRED OR STEEL DRUMMED (EIGHT TONS AND OVER)				
328	BITUMINOUS SPREADER AND FINISHING MACHINES (POWER), INCLUDING PAVERS, MACRO SURFACING AND MICRO SURFACING, OR SIMILAR TYPES (OPERATOR AND SCREED PERSON)				
329	BROKK OR R.T.C. REMOTE CONTROL OR SIMILAR TYPE WITH ALL ATTACHMENTS				
330	CAT CHALLENGER TRACTORS OR SIMILAR TYPES PULLING ROCK WAGONS, BULLDOZERS AND SCRAPERS				
331	CHIP HARVESTER AND TREE CUTTER				
332	CONCRETE DISTRIBUTOR AND SPREADER FINISHING MACHINE, LONGITUDINAL FLOAT, JOINT MACHINE, AND SPRAY MACHINE				
333	CONCRETE MIXER ON JOBSITE (HIGHWAY AND HEAVY ONLY)				
334	CONCRETE MOBIL (HIGHWAY AND HEAVY ONLY)				
335	CRUSHING PLANT (GRAVEL AND STONE) OR GRAVEL WASHING, CRUSHING AND SCREENING PLANT				
336	CURB MACHINE				
337	DIRECTIONAL BORING MACHINE				
338	DOPE MACHINE (PIPELINE)				

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
339	DRILL RIGS, HEAVY ROTARY OR CHURN OR CABLE DRILL (HIGHWAY AND HEAVY ONLY)				
340	DUAL TRACTOR				
341	ELEVATING GRADER				
342	FORK LIFT OR STRADDLE CARRIER (HIGHWAY AND HEAVY ONLY)				
343	FORK LIFT OR LUMBER STACKER (HIGHWAY AND HEAVY ONLY)				
344	FRONT END, SKID STEER OVER 1 TO 5 C YD				
345	GPS REMOTE OPERATING OF EQUIPMENT				
346	HOIST ENGINEER (POWER) (HIGHWAY AND HEAVY ONLY)				
347	HYDRAULIC TREE PLANTER				
348	LAUNCHER PERSON (TANKER PERSON OR PILOT LICENSE)				
349	LOCOMOTIVE (HIGHWAY AND HEAVY ONLY)				
350	MILLING, GRINDING, PLANNING, FINE GRADE, OR TRIMMER MACHINE				
351	MULTIPLE MACHINES, SUCH AS AIR COMPRESSORS, WELDING MACHINES, GENERATORS, PUMPS (HIGHWAY AND HEAVY ONLY)				
352	PAVEMENT BREAKER OR TAMPING MACHINE (POWER DRIVEN) MIGHTY MITE OR SIMILAR TYPE				
353	PICKUP SWEEPER, ONE CUBIC YARD AND OVER HOPPER CAPACITY(HIGHWAY AND HEAVY ONLY)				
354	PIPELINE WRAPPING, CLEANING OR BENDING MACHINE				
355	POWER PLANT ENGINEER, 100 KWH AND OVER (HIGHWAY AND HEAVY ONLY)				
356	POWER ACTUATED HORIZONTAL BORING MACHINE, OVER SIX INCHES				
357	PUGMILL				
358	PUMPCRETE (HIGHWAY AND HEAVY ONLY)				
359	RUBBER-TIRED FARM TRACTOR WITH BACKHOE INCLUDING ATTACHMENTS (HIGHWAY AND HEAVY ONLY)				
360	SCRAPER				
361	SELF-PROPELLED SOIL STABILIZER				
362	SLIP FORM (POWER DRIVEN) (PAVING)				
363	TIE TAMPER AND BALLAST MACHINE				
364	TRACTOR, BULLDOZER (HIGHWAY AND HEAVY ONLY)				
365	TRACTOR, WHEEL TYPE, OVER 50 H.P. WITH PTO UNRELATED TO LANDSCAPING (HIGHWAY AND HEAVY ONLY)				
366	TRENCHING MACHINE (SEWER, WATER, GAS) EXCLUDES WALK BEHIND TRENCHER (HIGHWAY AND HEAVY ONLY)				
367	TUB GRINDER, MORBARK, OR SIMILAR TYPE				
368	WELL POINT DISMANTLING OR INSTALLATION (HIGHWAY AND HEAVY ONLY)				
GROUP 5		2025-11-03	42.77	29.40	72.17
		2026-05-04	44.06	31.00	75.06
369	AIR COMPRESSOR, 600 CFM OR OVER (HIGHWAY AND HEAVY ONLY)				
370	BITUMINOUS ROLLER (UNDER EIGHT TONS)				
371	CONCRETE SAW (MULTIPLE BLADE) (POWER OPERATED)				
372	FORM TRENCH DIGGER (POWER)				

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
373	FRONT END, SKID STEER UP TO 1C YD				
374	GUNITE GUNALL (HIGHWAY AND HEAVY ONLY)				
375	HYDRAULIC LOG SPLITTER				
376	LOADER (BARBER GREENE OR SIMILAR TYPE)				
377	POST HOLE DRIVING MACHINE/POST HOLE AUGER				
378	POWER ACTUATED AUGER AND BORING MACHINE				
379	POWER ACTUATED JACK				
380	PUMP (HIGHWAY AND HEAVY ONLY)				
381	SELF-PROPELLED CHIP SPREADER (FLAHERTY OR SIMILAR)				
382	SHEEP FOOT COMPACTOR WITH BLADE . 200 H.P. AND OVER				
383	SHOULDERING MACHINE (POWER) APSCO OR SIMILAR TYPE INCLUDING SELF-PROPELLED SAND AND CHIP SPREADER				
384	STUMP CHIPPER AND TREE CHIPPER				
385	TREE FARMER (MACHINE)				
GROUP 6		2025-11-03	41.37	29.40	70.77
		2026-05-04	42.60	31.00	73.60
387	CAT, CHALLENGER, OR SIMILAR TYPE OF TRACTORS, WHEN PULLING DISK OR ROLLER				
388	CONVEYOR (HIGHWAY AND HEAVY ONLY)				
389	DREDGE DECK HAND				
390	FIRE PERSON OR TANK CAR HEATER (HIGHWAY AND HEAVY ONLY)				
391	GRAVEL SCREENING PLANT (PORTABLE NOT CRUSHING OR WASHING)				
392	GREASER (TRACTOR) (HIGHWAY AND HEAVY ONLY)				
393	LEVER PERSON				
394	OILER (POWER SHOVEL, CRANE, TRUCK CRANE, DRAGLINE, CRUSHERS, AND MILLING MACHINES, OR OTHER SIMILAR HEAVY EQUIPMENT) (HIGHWAY AND HEAVY ONLY)				
395	POWER SWEEPER				
396	SHEEP FOOT ROLLER AND ROLLERS ON GRAVEL COMPACTION, INCLUDING VIBRATING ROLLERS				
397	TRACTOR, WHEEL TYPE, OVER 50 H.P., UNRELATED TO LANDSCAPING				
TRUCK DRIVERS					
GROUP 1		2025-11-03	38.80	24.70	63.50
		2026-05-01	40.64	25.40	66.04
601	MECHANIC . WELDER				
602	TRACTOR TRAILER DRIVER				
603	TRUCK DRIVER (HAULING MACHINERY INCLUDING OPERATION OF HAND AND POWER OPERATED WINCHES)				
GROUP 2		2025-11-03	38.16	24.70	62.86
		2026-05-01	39.97	25.40	65.37

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
604	FOUR OR MORE AXLE UNIT, STRAIGHT BODY TRUCK				
GROUP 3		2025-11-03	35.50	21.75	57.25
605	BITUMINOUS DISTRIBUTOR DRIVER				
606	BITUMINOUS DISTRIBUTOR (ONE PERSON OPERATION)				
607	THREE AXLE UNITS				
GROUP 4		2025-11-03	35.74	21.76	57.50
608	BITUMINOUS DISTRIBUTOR SPRAY OPERATOR (REAR AND OILER)				
609	DUMP PERSON				
610	GREASER				
611	PILOT CAR DRIVER				
612	RUBBER-TIRED, SELF-PROPELLED PACKER UNDER 8 TONS				
613	TWO AXLE UNIT				
614	SLURRY OPERATOR				
615	TANK TRUCK HELPER (GAS, OIL, ROAD OIL, AND WATER)				
616	TRACTOR OPERATOR, UNDER 50 H.P.				
SPECIAL CRAFTS					
701	HEATING AND FROST INSULATORS	2025-11-03	43.90	23.05	66.95
702	BOILERMAKERS	2025-11-03	48.35	31.93	80.28
703	BRICKLAYERS	2025-11-03	36.05	19.68	55.73
704	CARPENTERS	2025-11-03	47.57	32.17	79.74
		2026-05-01	50.76	32.17	82.93
705	CARPET LAYERS (LINOLEUM)	2025-11-03	35.32	14.03	49.35
706	CEMENT MASONS	2025-11-03	56.13	14.34	70.47
707	ELECTRICIANS	2025-11-03	49.49	27.25	76.74
711	GROUND PERSON	2025-11-03	33.40	16.30	49.70
712	IRONWORKERS	2025-11-03	46.35	37.86	84.21
		2026-05-03	49.50	37.86	87.36
713	LINEMAN	2025-11-03	46.32	20.12	66.44

LABOR CODE AND CLASS		EFFECT DATE	BASIC RATE	FRINGE RATE	TOTAL RATE
714	MILLWRIGHT	2025-11-03	41.70	31.81	73.51
715	PAINTERS (INCLUDING HAND BRUSHED, HAND SPRAYED, AND THE TAPING OF PAVEMENT MARKINGS)	2025-11-03	48.00	29.09	77.09
		2026-05-04	50.50	29.09	79.59
716	PILEDRIVER (INCLUDING VIBRATORY DRIVER OR EXTRACTOR FOR PILING AND SHEETING OPERATIONS)	2025-11-03	47.71	31.98	79.69
		2026-05-01	50.90	31.98	82.88
717	PIPEFITTERS . STEAMFITTERS	2025-11-03	59.09	36.45	95.54
		2026-05-01	64.09	36.45	100.54
719	PLUMBERS	2025-11-03	49.91	33.58	83.49
721	SHEET METAL WORKERS	2025-11-03	57.96	34.57	92.53
723	TERRAZZO WORKERS	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			
724	TILE SETTERS	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			
725	TILE FINISHERS	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			
727	WIRING SYSTEM TECHNICIAN	2025-11-03	51.07	23.52	74.59
728	WIRING SYSTEMS INSTALLER	2025-11-03	26.49	12.40	38.89
729	ASBESTOS ABATEMENT WORKER	2025-11-03	36.23	22.26	58.49
730	SIGN ERECTOR	FOR RATE CALL 651-284-5091 OR EMAIL DLI.PREVWAGE@STATE.MN.US			

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PROJECT COMPLETION CERTIFICATION
AIS AND BABA

Owner: City of Adams, MN Funding Authority: MN DWRF & PFA

Project: Pumphouse #5 Construction & Watermain Improvements

Projects financed in part or whole by the Funding Authority are required to follow the domestic procurement requirements provided in the American Iron and Steel or Build America, Buy America regulations.

The checked program applies to the Project:

☒ American Iron and Steel, Section 608 of the Clean Water Act and Section 1452(a)(4) of the Safe Drinking Water Act.

☐ Build America, Buy America Act (BABA), P.L. 117-58, §§ 70901-52.

CONTRACTOR'S CERTIFICATION

I am the authorized representative of the Contractor named below and I hereby certify that with respect to the above-named project, unless the project was determined to be exempt from the requirement:

- we reviewed and understand the applicable domestic procurement requirement.
- all our purchase agreements and subcontracts include a clause requiring compliance with the applicable domestic procurement requirement.
- all products contained in the project were produced in the United States in a manner that complies with the applicable domestic procurement requirement, unless a waiver of the requirement was approved.
- we understand that any failure to comply with the applicable domestic procurement requirement shall permit the Owner or the Funding Authority to recover as damages against the contractor any loss, expense, or cost (including without limitation engineering or attorney's fees) incurred by the Owner or the Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner).

_____	_____
Contractor	Contractor's Authorized Representative Signature
_____	_____
Date	Printed Name

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SECTION I
GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Note: These General Conditions are a MODIFIED version of EJCDC® C700 "Standard General Conditions of the Construction Contract" (Copyright © 2018 by the National Society of Professional Engineers, American Council of Engineering Companies, and American Society of Civil Engineers) and include significant revisions to adapt to the particular circumstances of the Project. Those portions of the text that originated in copyrighted EJCDC documents remain subject to the copyright. This is not a standard document.

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GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 DEFINED TERMS. 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.

A. Addenda/Addendum. Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.

B. 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.

C. 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.

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

E. Bidder. An individual or entity that submits a Bid to Owner.

F. Bidding Documents. The Bidding Requirements, the proposed Contract Documents, and all Addenda.

G. 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.

H. 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.

I. 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.

J. Claim

1. 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 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.

2. 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.

3. 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.

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

K. 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.

L. Contract. The entire and integrated written contract between Owner and Contractor concerning the Work.

M. Contract Documents. Those items so designated in the Agreement, and which together comprise the Contract.

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

O. 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.

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

Q. Cost of the Work. See Paragraph 13.01 for definition.

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

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

T. 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.

U. 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, 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.

V. Engineer. The entity named as such in the Agreement:

Davy Engineering Co., Inc.
115 6th St. S
La Crosse, WI 54601
Telephone: (608) 782-3130
www.davyinc.com

W. 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.

X. 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.

1. 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.

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

3. 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.

Y. 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.

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

AA. 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.

BB. Notice of Award. The notice by Owner to a Bidder of Owner's acceptance or award of the Bid.

CC. 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. Delivery of the dated, executed Agreement to the Contractor shall be considered a Notice to Proceed unless otherwise specified.

DD. 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.

EE. 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.

FF. 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.

GG. 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 Engineer.

HH. 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.

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

JJ. 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.

KK. 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.

LL. 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.

MM. Special Provisions. The part of the Contract that amends or supplements these General Conditions. Not all projects include Special Provisions.

NN. 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.

OO. 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.

PP. 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.

QQ. 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 thereof) is complete, in accordance with the Contract Documents, and 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. Substantial Completion requires that all parts of the Work (or a specified part thereof) be completed other than corrective actions.

RR. Successful Bidder. The Bidder to which the Owner makes an award of contract.

SS. Supplementary Conditions. The part of the Contract that amends or supplements these General Conditions. Not all projects include Supplementary Conditions.

TT. 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.

UU. Technical Data

1. Those items expressly identified as Technical Data in the Specifications, 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.

2. 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.

3. 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.

VV. 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.

WW. Unit Price Work. Work to be paid for on the basis of unit prices.

XX. 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.

YY. 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.

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.

H. *Abbreviations Used*

DNR – *Wisconsin, Iowa, or Minnesota Department of Natural Resources*
PCA or MPCA – *Minnesota Pollution Control Agency*
EPA – *Environmental Protection Agency*
AASHO – *American Association of State Highway Officials*
ANSI – *American National Standards Institute*
ASME – *American Society of Mechanical Engineers*
ASTM – *American Society for Testing and Materials*
AWWA – *American Water Works Association*
SSPC – *Steel Structures Painting Council*
OSHA – *Federal Occupational Safety and Health Act*

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 Specifications 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. Owner shall furnish to Contractor one printed copy 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.

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.

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. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate may 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.

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, proportional 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.

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

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

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.

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

1. 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

2. 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. 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.

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.

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.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 COMMENCEMENT OF CONTRACT TIMES; NOTICE TO PROCEED. The Contract Times will commence to run on the Effective Date of the Contract or, if a Notice to Proceed is given, on the day indicated in the Notice to Proceed.

4.02 STARTING THE WORK. 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. 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, 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.

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.

4.06 LIQUIDATED DAMAGES

A. Contractor and Owner recognize that time is of the essence of this Contract and that Owner will suffer financial and other losses if the Work is not completed or Milestones not achieved within the times specified, 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 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 100% of the amount specified for each day that expires after the time (as duly adjusted pursuant to the Contract) specified 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 100% of the amount specified for each day that expires after such time until the Work is completed and Ready for Final Payment.

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

Milestones: Contractor shall pay Owner 100% of the amount specified for each day that expires after the time specified above for achievement of each Milestone, until that Milestone is achieved.

Unless otherwise provided, the amount of damages shall be determined as follows:

Original Contract Amount		**Daily Charge per Calendar Day**
From More Than	**To and include**	
$ -	$ 250,000.00	$ 500.00
$ 250,000.00	$ 500,000.00	$ 750.00
$ 500,000.00	$ 1,000,000.00	$ 1,000.00
$ 1,000,000.00	$ 2,000,000.00	$ 1,500.00
$ 2,000,000.00	$ 5,000,000.00	$ 2,000.00
$ 5,000,000.00		$ 2,500.00

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.

4.07 SPECIAL DAMAGES. Contractor shall reimburse Owner (1) for any fines or penalties imposed on Owner as a direct result of the Contractor's failure to attain Substantial Completion according to the Contract Times, and (2) for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative

services needed after the time specified in Paragraph 4.02 for Substantial Completion (as duly adjusted pursuant to the Contract), until the Work is substantially complete.

After Contractor achieves Substantial Completion, if Contractor shall neglect, refuse, or fail to complete the remaining Work within the Contract Times, Contractor shall reimburse Owner for the actual costs reasonably incurred by Owner for engineering, construction observation, inspection, and administrative services needed after the time specified in Paragraph 4.02 for Work to be completed and ready for final payment (as duly adjusted pursuant to the Contract), until the Work is completed and ready for final payment.

The special damages imposed in this paragraph are supplemental to any liquidated damages for delayed completion.

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

5.01 AVAILABILITY OF LANDS. 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.

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 or 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) 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.

C. 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.

D. 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 Specifications 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 Specifications 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.47.b.

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.

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. 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:

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

2. 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,

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

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

1. 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;

2. 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

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.

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.

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 Specifications, the cost of all of the following is 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.

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. 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:

1. 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;

2. 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

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

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.

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.

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 or (b) obtained from available records. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 HAZARDOUS ENVIRONMENTAL CONDITIONS AT SITE

A. Reports and Drawings. The Specifications 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 Specifications 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.47.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 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 or expanded by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to 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. Contractor shall furnish a 100% Performance Bond and a 100% 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.

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

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.

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.

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.

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.

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.

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.

6.02 INSURANCE—GENERAL PROVISIONS

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

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 Specifications, 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 Specifications.

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.

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 Specifications 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 Specifications.

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

1. include at least the specific coverages required;

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, 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 Special Provisions.

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.

D. 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	
Each accident	$100,000
Each employee	$100,000
Policy limit	$100,000

E. 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.

F. 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:

1. Products and completed operations coverage.

   a. Such insurance must be maintained for ten (10) years after final payment.

   b. Contractor shall furnish Owner and each other additional insured (as identified in the Special Provisions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and five (5) 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 04 13 and CG 20 37 04 13 (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.

G. 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.

H. Commercial General Liability—Minimum Policy Limits

Commercial General Liability	Policy limits of not less than:
General Aggregate	$2,000,000
Products—Completed Operations Aggregate	$1,000,000
Personal and Advertising Injury	$1,000,000
Bodily Injury and Property Damage—Each Occurrence	$1,000,000

I. 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	
Each Person	$1,000,000
Each Accident	$1,000,000
Property Damage	
Each Accident	$1,000,000
[or]	
Combined Single Limit	
Combined Single Limit (Bodily Injury and Property Damage)	$2,000,000

J. 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

K. Using Umbrella or Excess Liability Insurance to Meet CGL and Other Policy Limit Requirements. Contractor may meet the policy limits specified for employer's liability, commercial general liability, and automobile liability through the primary policies alone, or through combinations of the primary insurance policy's policy limits and partial attribution of the policy limits of an umbrella or excess liability policy that is at least as broad in coverage as that of the underlying policy, as specified herein. If such umbrella or excess liability policy was required under this Contract, at a specified minimum policy limit, such umbrella or excess policy must retain a minimum limit of **$5,000,000** after accounting for partial attribution of its limits to underlying policies, as allowed above.

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.

Contractor's Professional Liability	Policy limits of not less than:
Each Claim	$1,000,000
Annual Aggregate	$1,000,000

N. Railroad Protective Liability Insurance. Prior to commencing any Work within 50 feet of railroad-owned and controlled property, Contractor shall (1) endorse its commercial general liability policy with ISO CG 24 17, removing the contractual liability exclusion for work within 50 feet of a railroad, (2) purchase and maintain railroad protective liability insurance meeting the railroad's requirements, (3) furnish a copy of the endorsement to Owner, and (4) submit a copy of the railroad protective policy and other railroad-required documentation to the railroad, and notify Owner of such submittal.

Railroad Protective Liability Insurance	Policy limits of not less than:
Each Claim	$1,000,000
Aggregate	$1,000,000

O. Unmanned Aerial Vehicle Liability Insurance. If Contractor uses unmanned aerial vehicles (UAV—commonly *referred* to as drones) at the Site or in support of any aspect of the Work, Contractor shall obtain UAV liability insurance in the amounts stated; name Owner, Engineer, and all individuals and entities identified in the Supplementary Conditions as additional insureds; and provide a certificate to Owner confirming Contractor's compliance with this requirement. Such insurance will provide coverage for property damage, bodily injury or death, and invasion of privacy.

Unmanned Aerial Vehicle Liability Insurance	Policy limits of not less than:
Each Claim	$1,000,000
General Aggregate	$1,000,000

6.04 BUILDER'S RISK AND OTHER PROPERTY INSURANCE

A. Builder's Risk. Unless otherwise provided in the Specifications, the 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 Specifications or required by Laws and Regulations). Where there are multiple contractors on the same building project, the General Contractor shall provide coverage for the full project. The specific requirements applicable to the builder's risk insurance are set forth in the Specifications. Installation floater insurance is not a substitute for builder's risk insurance.

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.

C. Property Insurance for Substantially Complete Facilities. Promptly after Substantial Completion and notice by Contractor, Owner will obtain property insurance for such substantially completed Work and maintain such property insurance at least until the Work is complete. 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.

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 Contractor (directly, if it is the purchaser of the builder's risk policy, or through Owner) 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.

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. If this coverage is subject to a sublimit, such sublimit will be a minimum of $500,000.

6. allow for the waiver of the insurer's subrogation rights, as set forth in this Contract.

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."

10. include, in addition to the Contract Price amount, the value of the equipment and materials to be installed by the Contractor but furnished by the Owner or third parties.

11. If debris removal in connection with repair or replacement of insured property is subject to a coverage sublimit, such sublimit will be a minimum of $100,000.

G. Builder's Risk and Other Property Insurance Deductibles. The purchaser of any required builder's risk, installation floater, or other property insurance will be responsible for costs not covered because of the application of a policy deductible.

1. The builder's risk policy (or if applicable the installation floater) will be subject to a deductible amount of no more than $10,000 for direct physical loss in any one occurrence.

H. Installation Floater

1. For projects that are pipeline and/or streets only, Contractor may provide and maintain installation floater insurance in lieu of Builder's Risk insurance. The installation floater shall be on a broad form or "all risk" policy providing coverage for materials, supplies, machinery, fixtures, and equipment that will be incorporated into the Work ("Covered Property"). Coverage under the Contractor's installation floater will include loss from covered "all risk" causes (perils) to Covered Property:

a. of the Contractor, and Covered Property of others that is in Contractor's care, custody, and control;

b. while in transit to the Site, including while at temporary storage sites;

c. while at the Site awaiting and during installation, erection, and testing;

d. continuing at least until the installation or erection of the Covered Property is completed, and the Work into which it is incorporated is accepted by Owner.

2. The installation floater coverage cannot be contingent on an external cause or risk or limited to property for which the Contractor is legally liable.

3. The installation floater coverage will be in an amount sufficient to protect Contractor's interest in the Covered Property. The Contractor will be solely responsible for any deductible carried under this coverage.

4. This policy will include a waiver of subrogation applicable to Owner, Contractor, Engineer, all Subcontractors, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them.

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 Specifications), 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 Specifications 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 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 Specifications 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. 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.

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.

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

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 CONTRACTOR'S MEANS AND METHODS OF CONSTRUCTION. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

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. 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.

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. The resident superintendent shall be able to effectively communicate with all the Contractor's onsite personnel and communicate with the Owner and Engineer in English.

7.03 LABOR; WORKING HOURS. 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.

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.

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. 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.

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.

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 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

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. 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 must not award work valued at more than fifty percent (50%) of the Contract Price to Subcontractor(s) without prior written approval of the 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.

Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.

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.

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.

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.

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.

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.

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.

Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.

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.

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.

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.

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. 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.

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.

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. 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.

Exemption for Building Materials for Local Government and Certain Nonprofit Organization Facilities (**Wisconsin Only**). A sales and use tax exemption is created for the sale of building materials sold to a construction contractor who, in fulfillment of a real property construction activity, transfers the building materials to exempt entities described below, if the building materials become part of a facility in Wisconsin, owned by the exempt entity. For purposes of this exemption, a qualifying exempt entity is:

1. Any county, city, village, town, or school district in this state

2. A county-city hospital established under sec. 66.0927, Wis.Stats.

3. A sewerage commission organized under sec. 281-43 (4), Wis. Stats., or a metropolitan sewerage district organized under secs. 200.01 to 200.15 or 200.21 to 200.65, Wis. Stats.

4. Any joint local water authority created under sec. 66.0823, Wis. Stats.

5. Any corporation community chest fund, foundation or association organized and operated exclusively for religious, charitable, scientific, or educational purposes, or for the prevention of cruelty to children or animals, except hospital service insurance corporations under sec. 613.80 (2), Wis. Stats., no part of the net income of which inures to the benefit of any private stockholder, shareholder, member, or corporation.

Caution: This exemption does not apply to all exempt organization facilities. It applies to building materials for facilities construction for **only** the exempt entities listed above. For example it **does not** apply to facilities constructed for state or federal governmental entities.

"Facility" is defined as any building, shelter, parking lot, parking garage, athletic park, storm sewer, water supply system, or sewerage and wastewater treatment facility, but does not include a highway, street, or road.

Contractors who make qualifying purchases must provide a fully completed exemption certificate to the seller. The Contractor should check "other purchases exempted by law" on the certificate and enter "exempt under sec. 77.54(9m). Wis. Stats."

7.11 LAWS AND REGULATIONS. 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.

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.

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. Contractor shall maintain in a safe place at the Site one record hard 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;

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 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. 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.

7.15 EMERGENCIES. 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 an electronic copy or the number of hard copies required in the Specifications.

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.

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.

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. 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, 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.

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;

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.

7.20 SUPERVISION OF ERECTION FOR ALL EQUIPMENT. All items of mechanical or electrical equipment whose cost delivered to the Owner exceeds $7,500.00 shall have included in the price bid the services of a qualified representative of the manufacturer for 1/2 day to inspect equipment in operation and train the operator. For items where cost exceeds $25,000.00, the bid price shall include not less than 1/2 day during erection and not less than 1/2 day of operation inspection. Over $50,000.00 the bid price shall include not less than one day during erection and one day operation inspection. After each trip, the manufacturer or supplier is to submit a report to the Engineer covering the findings made during the inspection including changes and/or repairs, if any. Lesser time than specified may be needed. In this case, the Owner reserves the right to call for "make up" trips during the 12 months following acceptance until the time specified has been utilized. Unused time will lapse after the 12-month period. Trips made for the purpose of correcting defective materials or workmanship are to be made without charge and are not to be credited to the required number.

7.21 OPERATION AND MAINTENANCE MANUALS. The manufacturer shall prepare and supply Operation and Maintenance Manuals for each item of equipment. The manuals shall be customized for the specific size and type of equipment being furnished. The cost of the manuals shall be included in the base price quoted to the Contractor. Furnish one (1) hard copy and one (1) electronic portable document format (PDF) of each manual. The manuals shall be delivered to the Engineer before the Work is 75% complete. Failure to deliver the manuals on time shall be cause for withholding payment from the Contractor.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 OTHER WORK. 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.

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.

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.

The 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.

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.

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, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 COORDINATION. When there are multiple prime contractors, the General Contractor shall have the sole authority and responsibility for coordination of the activities among the other prime contractors and subcontractors on the Site to ensure a safe, efficient working environment. This authority covers scheduling delivery of materials, storage of materials, sequencing of construction involving different crafts, resolving interface issues between crafts, scheduling testing, and all other aspects of the Work that do not impact the design or function of the Work.

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.

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. Except as otherwise provided in these General Conditions, Owner shall issue all communications to Contractor through Engineer.

9.02 REPLACEMENT OF ENGINEER. 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. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 PAY WHEN DUE. Owner shall make payments to Contractor when they are due as provided in the Agreement.

9.05 LANDS AND EASEMENTS; REPORTS, TESTS, AND DRAWINGS. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.

Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.

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.

9.06 INSURANCE. 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. Owner's responsibilities with respect to Change Orders are set forth in Article 11.

9.08 INSPECTIONS, TESTS, AND APPROVALS. 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. 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. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.

9.11 EVIDENCE OF FINANCIAL ARRANGEMENTS. 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. 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.

Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 OWNER'S REPRESENTATIVE. 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. 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 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.

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 10.03 C and 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 Specifications.

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 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.

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.

5. 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.

10.04 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. 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. 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.

10.07 LIMITATIONS ON ENGINEER'S AUTHORITY AND RESPONSIBILITIES. 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.

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.

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.

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.

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. 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. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.

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.

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.

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. 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 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.

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. 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.

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.

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. 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).

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 20 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. 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.

Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

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.

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. 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.

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 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 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 PSA Schedule of Rates for Building Works. 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.

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. 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 $1,000.

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 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 costs (including mobilization), overhead and profit for each separately identified item. No adjustment in unit price will be made for additions to the project where conditions are similar and work is performed within the Contract time period. No additional payments will be made for remobilization within the Contract time period.

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, 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. 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.

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 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. 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.

14.06 OWNER MAY STOP THE WORK. 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. 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.

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.

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.

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. Not more often than once a month, Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents. The first Application for Payment will not be accepted until the Work physically commences at the project site.

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.

No payments will be made that would deplete the retainage, place in escrow any funds that are required for retainage or invest the retainage for the benefit of the Contractor. The amount of retainage with respect to progress payments will be determined as follows: 95% of Work completed (with the balance of 5% 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, Owner, on recommendation of Engineer, may determine that as long as the character and progress of the Work remain satisfactory to them, there will be no retainage on account of Work subsequently completed, in which case the remaining progress payments prior to Substantial Completion will be in an amount equal to 100% of the Work completed less the aggregate of payments previously made; and

b. 95% of cost of materials and equipment not incorporated in the Work (with the balance of 5% being retainage).

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, 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.

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, or interference with other work at or adjacent to the Site;

c. Contractor has failed to provide or 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.

15.02 ASSIGNMENT OF PAYMENT. The Owner reserves the right to make direct payment to Subcontractors or Suppliers or to pay the Contractor with checks made payable to the Contractor and one or more Subcontractors or Suppliers. Such payments shall be considered equivalent to payments to Contractor and will be credited to the Contract Price.

15.03 PROMPT PAYMENT OF SUBCONTRACTORS. Contractor shall pay Subcontractors within 10 days of receiving payment from the Owner. Late payments shall include ½% per month interest.

15.04 CONTRACTOR'S WARRANTY OF TITLE. 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.

15.05 SUBSTANTIAL COMPLETION. When Contractor considers the entire Work fully completed and 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.

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.

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.

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.

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.

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.

15.06 PARTIAL USE OR OCCUPANCY

A. Prior to Substantial Completion of all the Work, Owner may use or occupy part of the Work 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 that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be ready to use.

2. 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.

15.07 FINAL INSPECTION. 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.

15.08 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.

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 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.

15.09 WAIVER OF CLAIMS. 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.

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.

15.10 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 Specifications 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 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. 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 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.

16.04 CONTRACTOR MAY STOP WORK OR TERMINATE. 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.

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. agree with the other party to submit the dispute to mediation (12.01 D) or an alternative dispute resolution process; or

2. give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

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. 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. The duties and obligations imposed by these General Conditions and the rights or 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. 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 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. 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. This Contract is to be governed by the law of the state in which the Project is located.

18.08 ASSIGNMENT OF CONTRACT. 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 prior 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. 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. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

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SECTION II
GENERAL REQUIREMENTS

Note: These General Requirements amend or supplement the standard Section I and Section IA General Conditions. All provisions that are not so amended or supplemented remain in full force and effect. This standard specification is supplemented and superseded by the Special Provisions that apply to this project only.

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GENERAL REQUIREMENTS

SECTION 2.1.0 – GENERAL

2.1.1 NOISE CONTROL. Construction vehicle and activity noise shall be limited in residential areas. If noise complaints are received, construction may be limited to daylight hours only. Noise control techniques which may be required are as follows: exhaust mufflers, intake silencers, engine enclosures, use of low noise emission equipment, scheduling operations to keep average noise levels low, setting speed limits and keeping noisy equipment operations as far as possible from site boundaries.

2.1.2 DUST CONTROL. When dry conditions create unacceptable amounts of dust, in the opinion of the Owner or Engineer, the Contractor shall periodically apply water or other dust control measures to the trench, roadway or other areas affected by the Work. The frequency must be adjusted to be effective and include weekend or other after hours work.

2.1.3 UNANTICIPATED DISCOVERY-ARCHAEOLOGICAL RESOURCES: “Archaeological resources” are defined as intact subsurface artifacts, features, and structural remains 50 years old or older. If archaeological resources are identified during construction for this project by the Contractor:

A. All activity will immediately cease in the vicinity of the discovery, and measures will be taken to project the discovery (by flagging or fencing off a buffer that is at least 50 feet around the area to signify it as a protected zone), but in a way that will not cause additional harm to the area.

B. The Owner will retain a qualified archaeologist to evaluate the discovery. If the archaeologist determines that the discovery is less than 50 years old, they will notify the Engineer that the construction may continue.

C. If the Archaeologist determines that the discovery is 50 years or older, they will notify the Engineer and conduct a more detailed examination of the discovery. If it is determined that the discovery lacks significance or integrity, the archaeologist will notify the Engineer that the construction may continue and will submit a letter report documenting the discovery to the State Historic Preservation Office (SHPO).

D. If the Archaeologist finds that the discovery appears to retain integrity and is potentially significant:

1. The Archaeologist will notify SHPO and the Engineer. The Archaeologist will consult with the Engineer on an avoidance plan.

2. If the continued construction activities will not avoid impacting the discovery, the Archaeologist will consult with the SHPO and the Engineer to obtain recommendations for the appropriate treatment of the discovery. These may include:

    a. Phase II testing and NRHP eligibility evaluation.

    b. Preparation and implementation of a data recovery plan (such as mitigation efforts)

    c. Completion of a report that documents the findings and recommendations.

        1. When the treatment measures are completed, the archaeologist will consult with the SHPO and Engineer to determine a need for further treatment measures, or if none are required, to obtain approval for the continuation of construction.

2.1.4 BURIAL/HUMAN REMAINS DISCOVERY PLAN: For discovery of suspected human remains, funerary objects, sacred objects, or other objects of cultural patrimony during construction. If the Contractor observes suspected human remains during the fieldwork:

A. All activity will immediately cease in the vicinity of the discovery, and measures will be taken to project the discovery (by flagging or fencing off a buffer that is at least 50 feet around the area to signify it as a protected zone), but in a way that will not cause additional harm to the area

B. If the human remains appear modern, the appropriate municipal law enforcement agency will immediately be contacted. If the human remains appear to be from precontact times, the Owner will retain an archaeologist to evaluate the discovery. The archaeologist conducting the evaluation will be qualified to work within burial sites and exhume remains. If there is a question as to whether the remains are human, a human osteologist will be consulted. If the remains are likely human, the contractor will immediately stop all project activities within an appropriate radius of the discovery and take appropriate measures to protect the discovery in place from construction impacts, looting, and vandalism.

C. Upon discovery of suspected human remains the archaeologist will notify SHPO.

D. If the archaeologist determines the remains are Native American, they will work with SHPO to determine how to proceed.

E. Suspected human remains will not be further disturbed or removed until disposition has been determined by the SHPO.

F. At all times, the remains will be treated with the utmost dignity and respect.

During evaluation of archaeological resources or human remains. construction must be shifted to another portion of the project. If work cannot be shifted and the delay exceeds 2 working days, the Contractor will be compensated as per requirements for extra work for delays over 2 working days.

2.1.5 CONTAMINATED SOIL. In the event excavation reveals soils contaminated by petroleum products or organic solvents, work shall be suspended and the Owner and Engineer notified. During evaluation, construction shall be shifted to another portion of the project. If work cannot be shifted and the delay exceeds 2 working days, the Contractor shall be compensated as per requirements for extra work for delays over 2 working days. Under no circumstances shall standard PVC pipe or standard rubber gaskets be used in areas of contamination.

2.1.6 ASBESTOS/ASBESTOS-CEMENT PIPE. If the Contractor during the course of work observes the existence of asbestos (other than asbestos-cement pipe) in the work area, Contractor shall promptly notify the Owner and Engineer. Owner shall then consult with Engineer regarding removal or encapsulation of the asbestos material. Contractor shall not perform any work pertinent to the asbestos material prior to receipt of special instructions from the Owner. Asbestos-cement pipe requires special handling, including PPE and manual, wet cutting with continuous spray-misting Asbestos-cement pipe to be removed shall be hauled to an approved landfill by the Contractor.

2.1.7 PRIMARY LINE AND GRADE. Primary line and grade will be furnished by the Owner and will be established by the Engineer. All work under this Contract shall be built in accordance with the lines and grades shown on the plans and as established by the Engineer.

The Contractor shall provide grade stakes and all other staking materials satisfactory to the Engineer for use on the project. The Contractor shall provide competent assistance as may be required for the setting and preserving line and grade. This generally will require that the Contractor supply one person to assist the Engineer during all project staking. This labor cost is an incidental cost. The Contractor shall accurately preserve all lines and grades of the work so staked until authorized to remove them. Additional staking by the Contractor may be necessary.

Figured dimensions on the plans shall be taken as correct but shall be checked by the Contractor before starting construction. Any errors, omissions or discrepancies shall be brought to the attention of the Engineer, whose decision thereon shall be final. All notes on the plans shall be followed. The Contractor shall check the accuracy of line and grade stakes by means of visual and taping checks.

The Contractor shall give at least forty-eight (48) hours notice in advance of the need for line and/or grade.

The Contractor shall pay the cost of restaking required due to the Contractor’s negligence.

2.1.8 CONSTRUCTION LINE AND GRADE. The Contractor must bear sole responsibility for the correct transfer of all construction lines and grades from the primary line and grade points, and for the correct alignment and grade of the finished structure, based upon the primary line and grade established by the Engineer.

2.1.9 LOCATION WITH RESPECT TO SEWER OR WATER. A minimum horizontal distance of ten (10) feet (8 ft. in Wisconsin) and a minimum vertical separation of 18" (6" if above water main in Wisconsin) shall be maintained between sanitary/storm sewer and water main lines and hydrants. The Contractor shall notify the Engineer of any variation before proceeding with construction.

2.1.10 HOUSING FOR ENGINEER. The General Contractor shall provide and maintain throughout the contract the following facilities for the use of the Engineer's representative on all construction contracts more than $750,000.00.

A. A temporary, clean, safely constructed, weather-tight office (which may be a shanty or one end of a shanty blocked off for the exclusive use of the Engineer) with a separate outside entrance. The housing shall have approximately 65 square feet of floor area and headroom of 7.5 feet minimum, suitable windows, a plan table, two chairs or a bench, air conditioning and controlled heating facilities with outside vent. Adequate lights shall be provided.

B. Such office shall be located at the site of the work and maintained at a mutually agreed upon work location. Upon completion of the work, it shall be removed from the work site.

2.1.11 COMPLIANCE WITH CODES AND PERMITS. All work shall be installed in accordance with the applicable State and local codes and regulations and the Permits that have been issued for the work.

2.1.12 SALVAGED CULVERTS. Existing culverts that are deemed salvageable by the Engineer shall be removed and reinstalled by the Contractor using reasonable care. Culverts deemed not salvageable shall be disposed of at the Contractor's expense. The Owner will furnish replacement culverts to be installed by the Contractor where culverts are not salvageable. Removal/Replacement or replacement of culverts within the work zone is an incidental expense.

2.1.13 SURVEY MONUMENTS. No stone monuments, iron pipe property corners, benchmarks, or other survey marker shall be removed or disturbed unless in the presence of the Engineer and with permission. If monuments are disturbed without permission, the Contractor shall be responsible for retaining a Registered Land Surveyor for replacement.

2.1.14 ELECTRIC POWER. The Contractor shall arrange and pay for all temporary electric power required for construction purposes, including all necessary wiring, fixtures and utility fees.

If a permanent power supply is required, the Owner will provide power to the site and pay all utility fees to the utility termination point. The Contractor shall furnish and install all service entrance equipment, conduit and wiring as required by the electric utility.

2.1.15 HIGHWAY OR RAILROAD REQUIREMENTS. The Contractor shall conform to all provisions of any highway or railroad permits issued to the Owner. The cost of conforming to the permits shall be included in the prices bid for other work unless a specific bid item is provided.

2.1.16 TRACER WIRE**.** All non-metallic pipes shall be marked with Tracer Wire. Conductivity shall be tested prior to acceptance.

2.1.17 PROJECT SIGNS. Only the specified Project Sign may be used on the site. No other signs or banners are permitted.

SECTION 2.2.0 - EXCAVATION

2.2.1 NOTIFY UTILITIES. The Contractor shall provide timely advance notice to all utilities located within the work area.

Iowa	Iowa One Call	(800) 292-8989	www.iowaonecall.com
Illinois	Julie	(800) 892-0123	www.illinois1call.com
Minnesota	Gopher State One Call	(800) 252-1166	www.gopherstateonecall.org
Michigan	MISS DIG	(800) 482-7171	wwwa.missdig.org/MissDig
Wisconsin	Diggers Hotline	(800) 242-8511	www.diggershotline.com

2.2.2 LENGTH OF OPEN TRENCH. Not more than 100 feet of trench shall be open at any one time in a developed area and not more than 250 feet of trench shall be open in an undeveloped area. Not more than one street crossing may be obstructed by the same trench at any one time.

2.2.3 USE OF DROP WEIGHT. A drop weight or other type of machinery for breaking pavement may be used when such usage does not become a nuisance or a source of damage to underground or adjacent structures. Before employing a drop weight, the Contractor shall make sure that there is no nearby underground structure that would be injured by its use. The Contractor shall be solely responsible for any damage caused thereby.

2.2.4 BLASTING. All applicable codes on explosives and all local ordinances regulating blasting shall be adhered towhen blasting is to be done. No blasting shall begin until blasting insurance is obtained. The local police department shall be notified of the proposed blasting at least 2 hours in advance. The Contractor will be solely responsible for any damage caused by the blasting operation.

2.2.5 SAWING OR CUTTING PAVEMENT. When specified, adjacent bituminous or concrete pavements to remain in place shall be sawcut to a minimum depth of 3" or ½ the depth of the pavement, whichever is greater, before being removed to create a straight, uniform edge for matching the new pavement. If sawcutting is not specified for bituminous pavement, the edge shall be "straight-lined" by other means to avoid a ragged, uneven edge.

2.2.6 POTHOLING. Potholing shall be utilized during construction activities to prevent excavation damage to existing underground utilities for all open-cut excavations and trenchless installation methods. Potholing is the practice of digging a test hole to expose underground utilities to determine the horizontal and vertical location of the facility.

The following alternative methods shall be utilized for potholing.

A. Hand Digging. Hand digging is the method of excavating a pothole by manual means with hand-held, non-mechanical equipment such as a shovel.

B. Vacuum Excavation. Vacuum excavation shall consist of air or water pressure to break up the soil and a vacuum device to collect the spoil. The Contractor shall determine if air or water vacuum excavation shall be used dependent upon specific site and environmental characteristics. Soil types such as heavy clay may require water vacuum excavation. Air vacuum excavators shall be utilized if mud from water vacuum excavators cannot be disposed of properly. Air vacuum excavators shall be used if damage to utilities, such as cutting through cables, will occur with the use of water vacuum excavators.

Air vacuum excavators shall utilize a high velocity air stream to penetrate, expand, and break-up the soil. The loosened particles of soil and rock shall be removed from the excavation through the use of a vacuum.

Water vacuum excavation systems shall excavate the pothole using high-pressure water to reduce and loosen the soil. The wet soil and mud slurry shall be removed to a spoil tank using a vacuum.

Maximum pothole size shall be 12 inches in diameter or 12-inch x 12-inch square.

Construction drawings indicating the proposed construction and existing utilities shall be present and utilized during potholing activities. The construction drawings shall be compared to locate paint marks to determine if all existing utilities shown on the drawings have been identified in the field. If the drawings and locate paint marks do not match, additional potholing shall be completed to determine accurate locations.

If locate paint marks have improperly designated the location of a facility, and the facility is exposed during potholing, the facility owner and the utility marking service shall be notified. The entity that exposed the facility shall document the horizontal and vertical location of the facility and communicate the information to the facility owner. If a utility cannot be located through potholing used in conjunction with construction drawings and locate marks, the facility owner and the utility marking service shall be contacted.

Potholing shall be performed for the following conditions:

A. Open-Cut Excavations. Potholing shall be completed to expose existing utilities, including mains and service lines, when open cut excavations are within the tolerance zone of the marked utility. The tolerance zone, also known as the “approximate location”, is a strip of land equal to the width of the underground utility plus two feet on each side.

B. Trenchless Installation Methods. For trenchless operations with a bore path that parallels a utility (mains and service lines) within 3 feet, potholing shall be completed at the beginning and end of the bore and every 50 feet along the route. For trenchless operations with a bore path that parallels a utility (mains and service lines) within 5 feet, potholing is required at the beginning and end of the bore and every 200 feet along the route. Potholing shall be completed for all utilities (mains and service lines) crossing the path of trenchless operations.

C. Congested Utilities. In congested areas having several facilities in close proximity and/or crisscrossing each other, locates have greater potential to be less accurate. Potholing shall be utilized for excavations near congested utility areas.Facilities exposed during potholing shall be protected throughout the project. Utilities that are rendered unsupported due to potholing shall be temporarily supported by shoring or other means. The utility shall be protected from heavy and sharp items falling into the excavation that could damage or cut the facility.

Potholes shall be restored within 24 hours after the utility has been located or as otherwise directed by the Owner. Backfilling and restoration of the pavement shall be in accordance with these specifications.

Potholing is an incidental cost and shall be included in other bid items.

2.2.7 INTERFERENCE OF UNDERGROUND STRUCTURES. When an underground structure interferes with the work to such an extent that an alteration of the plan is required, and the alteration results in a change in the cost to the Contractor, the Engineer will issue a written order for such altered work, specifying the basis of payment or credit for such altered work.

No pipe, conduit or other underground structure shall be allowed to remain in, penetrate, reduce the cross-sectional area or abridge the use of any sewer or appurtenance.

Where an unknown underground structure is encountered in the excavation for the proposed work, and because of interference, part of the structure requires relocation or chipping away, the Contractor shall immediately give notice of such interference to the Engineer and the owner of such underground structures.

Where the line or grade of the proposed work conflicts with an existing water main and alteration is not otherwise specified, the Owner will alter the water main at no cost to the Contractor or negotiate with the Contractor to perform such required alteration as an extra, unless otherwise specified. If unit prices for water main and fittings are included in the contract, they will be used to determine payment. The Contractor shall in either case excavate the area around the water main to allow sufficient room to alter the main.

No extra compensation will be paid for unavoidable delays caused by the interference of existing underground structures or pipelines.

In the event that relocation is for the convenience of the Contractor rather than actual interference, the Contractor shall first notify the Engineer and the owner of the underground structure and receive permission to temporarily relocate such structure or to discontinue service. Replacement to the original position and condition shall be made at no cost to the Owner. The owner of the structure shall have the right to do all the work in connection with said relocation, discontinuance and replacement, billing the Contractor for all costs of same, or, with the approval of the owner, the relocation, discontinuance or replacement may be made by or arranged for, by Contractor at Contractor's expense.

Where the excavation extends under or approaches an underground structure in a manner to endanger it, the Contractor shall be responsible for the protection of such structure and shall brace, support, and otherwise protect it.

2.2.8 PROTECTION OF EXISTING STRUCTURES AND UTILITIES. All surface structures and features, including buildings, pavements, sidewalks, curb and gutter, trees and shrubs, adjacent to the construction easement or right of way, and those within the construction easement, or right of way, which are to be saved shall be properly protected against all damage.

All existing gas pipes, water pipes, steam pipes, electric and telephone conduits, sewers, drains, culverts, buried tanks, hydrants, and other surface or subsurface structures, either of a private or of public ownership, except railway or railroad tracks, shall be carefully supported and protected from injury by the Contractor. In some cases, this protection may require the furnishing and driving of tight sheathing and such other means as may be necessary to properly support and maintain the structure involved. All such work must be done by and at the expense of the Contractor and according to their own plans. The fact that the Owner may be under no legal obligation to provide for doing such work will be no excuse for the Contractor neglecting or refusing to perform the same, such being specifically required. In the event of damage or injury to any of these surface or sub-surface structures, the Contractor will be required to make replacements or repairs to the satisfaction of the Engineer at no additional cost to the Owner.

Support and protection of railroad tracks shall be at the direction of the railroad owner.

2.2.9 REMOVAL OF OBSTRUCTIONS. The Contractor shall remove all obstructions such as mounds of dirt, stone or debris located within the working limits without additional payment. Obstructions such as street signs, culverts and end walls, advertising signs and guard posts located in construction easements or right of ways, may be removed providing they are promptly replaced to their original condition unless otherwise specified. No trees or shrubs located in private property or easement shall be removed or trimmed without permission of the property owner. In street rights-of-way, the Contractor may remove or trim only those trees or shrubs located within the trench limits. No other trees or shrubs shall be removed, cut down or trimmed unless specifically allowed in the contract documents or by the Owner. The Contractor shall take all precautions necessary to protect such trees from any damage due to the execution of the work or to the movement of equipment. The Contractor shall dispose of brush and wood within 5 days after being removed. Stumps shall be excavated and removed or chipped until removed. Trees to be saved in the construction zone shall be protected by wrapping the trunks or fencing them off. All interfering tree roots or branches one inch (1") or greater in diameter shall be neatly cut perpendicular to the direction of the growth on the tree side of the trench.

2.2.10 ROCK EXCAVATION. Rock excavation shall consist of boulders exceeding one cubic yard (1 cu. yd.) in volume, which are removed from the trench. Rock excavation shall also include solid ledge rock that, in the opinion of the Engineer, requires extraordinary procedures for its removal. No soft shell or disintegrated rock which can be removed with a pick; no loose, shaken or previously blasted rock; no broken stone, and no rock which may fall into the work from outside the limits of excavation will be included. Shales and hardpan shall not be classified as rock. When rock is encountered, the Contractor will be required to use the track mounted backhoe being used for excavation (rated at not less than 170 HP and developing 40,000 lbs. break-out force (ISO 7131) to remove as much rock as possible before payment for rock excavation is made. When solid rock is encountered, it shall be stripped of earth and shale and the Engineer notified and given proper time to measure the same before removal. The Contractor will be responsible for having an Engineer's representative present when rock measurements are made. No rock removed that has not been measured by the Engineer will be paid as rock excavation. In lieu of stripping the earth overburden prior to blasting, the Engineer and Contractor may mutually agree on a method to define the vertical limits of the rock. Deleting advance stripping will result in a reduction in the bid unit price for rock removal.

For the purpose of determining payment, the depth of rock excavation shall be measured from the top of the rock to eight inches (8") below the outside wall of the pipe (excluding bells). The width shall be measured as the outside diameter of the pipe plus eighteen inches (18") with a minimum pay width of thirty-six inches (36"). For manholes, rock excavation shall be measured from the top of the rock to a point twelve inches (12") below the invert and the nominal diameter of the manhole plus twenty-four inches (24"). Payment for rock excavation shall be the price bid per cubic yard. This payment is in addition to the price per lineal foot of the pipe installed. Bid price for rock removal is to include furnishing foundation and bedding material beneath the pipe/manhole of a type satisfactory to the Engineer. Class I Crushed Rock and Class II Clean Coarse-Grained sand are considered suitable. Backfill material to a point twenty-four inches (24") above the crown of pipe shall be Class I or II free of rock larger than one inch (1"). Rock over eight inches (8") diameter shall be hauled at the Contractor's expense to locations designated by Owner and replaced with sand or suitable excess material. Rock under eight-inch (8") diameter may be used in the Final Backfill above the pipe but no closer than twenty-four inches (24").

Where unit prices for rock excavation are not provided, the extra cost shall be negotiated prior to the removal of any rock, otherwise no extra payment will be made.

Where hard material is encountered that has physical characteristics lying between solid rock and earth excavation, the Engineer may allow a payment based on a percentage of the bid unit price for rock excavation. Generally, the full rock excavation price will be paid for material removed by blasting. A percentage of the full bid price will be paid for rock removed by use of specialized equipment such as ripping, drilling, impact hammers or rock buckets. No rock payment will be made for material removed with conventional equipment.

In all cases where rock is encountered in the excavation, whether payable as Rock Excavation or not, the foundation and bedding to eight inches (8") below the pipe and twenty-four inches (24") above the pipe shall be Class I or II backfill free of rock greater than one inch (1").

No additional payment will be made for rock excavation within the limits of jacking/boring, directional drilling, lift station, wastewater treatment facility, pump house, water treatment plant or reservoir contracts. All rock excavation on such projects is incidental.

2.2.11 EXCAVATED MATERIAL. All street surfacing and base material within the area of the excavation including pavements, paving gravel, crushed rock, breaker rock, sand lift, etc., shall be removed for a suitable distance in advance of the deeper excavation, and kept separate, to be again used in repaving or resurfacing the street, road or ground. This requirement will not apply with streets having less than 3" of combined gravel and asphalt surfacing.

The excavated material to be used for backfilling must be stored so that it will cause a minimum of inconvenience to public travel, adjacent owners or tenants and other contractors or Subcontractors. Stockpiles shall be protected as specified in Section 2.8.4.

No claim for extra payment will be allowed because of the presence of water, quicksand or other materials tending to increase the excavating costs, unless specifically provided for in the contract documents.**2.2.12** UNSTABLE FOUNDATION. If the bottom of the excavation is of undesirable material, such as rock, Class IV or Class V material, or the presence of ground water causes a condition which cannot adequately support the work, an additional four inches (4") of foundation shall be excavated and backfilled with compacted Class I or II and included as part of the standard sections at no additional payment. In the event that it becomes necessary to extend the foundation to a greater depth, such additional amount of removal and replacement will be paid for as Unsatisfactory Subgrade.

2.2.13 UNSATISFACTORY SUBGRADE. Where in the opinion of the Engineer native material is unsatisfactory for backfill, it shall be removed and replaced with material satisfactory to the Engineer, such as Class I, II or III. No payment for material hauled away will be made, but replacement material will be paid for at the unit price bid. Cubic yards are to be loose box measurement. If a unit price for unsatisfactory subgrade is not provided, the price shall be negotiated before any material is placed. Material will not be considered unsatisfactory solely because it is wet. If the native material would be suitable dry and the wet condition is the result of construction activities, the Contractor shall remove and replace or stabilize at no cost to the Owner. No additional payment shall be made for embedment replacement except as specified. Embedment replacement is included in the pipe installation price.

2.2.14 STORAGE OF MATERIALS IN STREETS. A reasonable amount of structural and other material to be used in constructing the Work may be stored in the streets or highways by or adjacent to the work but only to an extent that is absolutely necessary to avoid delay in construction. Such materials will not be allowed to accumulate but shall be replenished from day to day as they may be required. In any case, materials may be stored only with permission of the street authority and the Owner, which permission shall be revocable at any time. The Contractor, if so ordered, shall immediately remove such materials.

2.2.15 SURPLUS EXCAVATED MATERIAL. The excavated material that is not to be used for backfilling shall be removed immediately from the site of work. The Contractor shall dispose of surplus excavated material at sites designated by the Owner within two miles of the project site or within the corporate limits, whichever is greater. If the Owner does not designate a location, the Contractor shall be allowed to utilize the material and select the disposal site.

The Contractor shall obtain all permits necessary for use of the disposal site(s). If the area involved will be one acre or larger, a Construction Site Erosion Control and Storm Water Discharge Permit shall be obtained in advance. Before delivering material to the disposal location, the Contractor shall erect erosion control devices. The material shall be graded to drain with no side slopes steeper than 2:1. All areas disturbed shall be stabilized with topsoil, seed and mulch or erosion mat, as appropriate. The Contractor shall maintain the site until final cover is established. No material shall be placed in a floodway, waterway or wetland without prior written approval from the regulatory agency. If the disposal site is not under the Owner's control, the Contractor shall obtain written permission from the property owner.

2.2.16 DRAINAGE OF EXCAVATION. The Contractor shall keep all finished excavations free of water or sewage during the preparation of the sub-grade and until completion of the work. Trenches shall be protected to minimize entrance of runoff.

No ground or surface water shall be allowed to drain into any existing sanitary sewer. Water or sewage may be allowed to flow through completed sewers and sewer structures, but only after all mortar and concrete have set up to a degree that will insure them against damage. No units of work shall be constructed under sewage or under water except when done in accordance with accepted construction procedure. The cost of bypassing, bailing, or pumping of storm waters, ground water or sewage shall be included in the price bid for other items of work. All water pumped or bailed from the trench shall be conveyed to a suitable point of discharge. Sewage shall be discharged only to a sanitary sewer tributary to a treatment facility except when temporarily stored in a suitable holding tank.

2.2.17 DEWATERING SUMPS AND PUMP WELLS. The cost for making all extra excavations necessary to prevent the water from interfering with the proper construction of the work, and for forming all dams, and furnishing and laying of underdrains, digging of sumps or wells, bailing and pumping, most be borne by the Contractor, and included in the price bid for other items of work. No additional payment will be made for any dewatering unless a specific bid item is provided. The Contractor is solely responsible for investigating the site prior to bidding to determine the need for dewatering. Dewatering sumps and pump wells are to be strongly sheathed and braced while in use and, when abandoned, shall be backfilled in the manner described for wells.

State permits are required for most dewatering wells. Control measures to eliminate siltation of surface waters are required. The Contractor shall apply for, pay permit fees, obtain and comply with all conditions of the permit including proper abandonment.

2.2.18 THAWING OF FROZEN GROUND. The Contractor shall obtain a permit from the proper authority before building a fire to thaw frozen ground and shall comply with all conditions of said permit. Thawing shall be accomplished by a method that does not emit excessive smoke or flame, or otherwise inconvenience the public. The Owner reserves the right to prohibit burning whenever it is deemed undesirable.

2.2.19 – INSULATING PIPELINES

2.2.19.1 GENERAL. Pipelines shall be insulated where noted on the plans and wherever the depth of cover is less than 6 feet for water or forcemains or less than 4 feet for gravity sewer pipelines.

2.2.19.2 TYPE OF INSULATION. The insulation shall be either polystyrene boards or insulating concrete.

A. **Polystyrene Boards**. Polystyrene boards shall be closed-cell extruded polystyrene (blueboard) (2" thick) and shall be installed as follows:

1. Prior to placement of the polystyrene boards, bedding material shall be placed to a height of 6 inches over the top of the pipe, leveled and compacted.

2. The insulating boards shall be placed on the cover material with the long side parallel to the centerline of the water main for a minimum width of O.D. + 24". The boards shall be placed in a staggered arrangement so as to eliminate continuous transverse joints. If two or more layers of insulation board are used, each layer should be placed so as to cover the joints of the layer immediately below.

3. The first lift of backfill material shall consist of 6 inches of bedding material which shall be end or side dumped onto the insulation board and spread in such a manner that construction equipment does not operate directly on the insulation. This layer shall be compacted with equipment that exerts a contact stress of 70 to 80 psi. Once this layer has been compacted to the specified density, the remaining layers of backfill may be constructed utilizing conventional procedures.

B. Insulating Concrete. Insulating concrete shall consist of 1 part Portland cement and 8 parts perlite aggregate by volume. Do not use asbestos products. Clean water shall be added and mixed until mass is workable and homogeneous. The insulating concrete shall be placed around the entire main above the bedding material to a minimum thickness of 6 inches.

SECTION 2.3.0 – SHEATHING AND BRACING

2.3.1 EXCAVATION TO BE SHEATHED AND BRACED. Open-cut excavations shall be sheathed and braced as required by the applicable Federal and State code, and as may be necessary to protect life, property, or the work. When tight sheathing is used, it shall be driven so as to prevent soil from entering the excavation either below or through such sheathing. The shoring and bracing of tunnel excavation shall conform to the requirements of the applicable Federal and State codes.

Tight sheathing may be set in place rather than be driven, providing that ground condition are suitable and the excavation is properly spot braced prior to the placing of sheathing. Any voids behind the sheathing shall be immediately filled with gravel backfill.

Where conditions warrant extreme care in supporting the sides of the excavation, the Contractor shall furnish and drive steel sheathing or piling of the interlocking type or other approved material at no additional expense to the Owner. Care shall be taken to prevent voids outside of the sheathing, but if voids are formed, they shall be immediately filled with granular backfill.

2.3.2 LOWER LIMITS OF SHEATHING. Sheathing shall be driven to the full depth of the excavation or to such additional depths as may be required for the protection of the work. Where the soil in the lower limits of excavation has the necessary stability, the Contractor may stop the driving of sheathing above the excavation bottom.

2.3.3 REMOVAL OF SHEATHING AND BRACING. Sheathing and bracing, including sections which have been ordered left in place, shall be removed to a depth of 3 feet below the established street grade or the existing surface grade, whichever is lower.

Sheathing and bracing shall be removed only when and in such manner as will insure adequate protection of the completed structures and adjacent ground. Trench bracing, except that which must be left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheathing, except that which must be left in place, shall be removed after the backfilling has been completed or has been brought up to such elevation as to permit its safe removal.

2.3.4 COST OF SHEATHING AND BRACING. The cost of furnishing, placing, and removing of sheathing and bracing and the leaving in place of sheathing and bracing indicated in the Contract Documents, shall be included in other unit prices unless a specific bid item is available. Additional sheathing and bracing may be ordered left in place as an extra, by written order of the Engineer.

2.3.5 ENGINEER'S FAILURE TO ORDER SHEATHING AND BRACING LEFT IN PLACE. The right of the Engineer to order sheathing and bracing left in place shall not be construed as creating any obligation to issue such order. The failure to exercise this right shall not relieve the Contractor of any liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or sub- surface structures.

2.3.6 PORTABLE TRENCH BOX OR SLIDING TRENCH SHIELD. Portable trench boxes or sliding trench shields approved by appropriate Federal and State agencies may be used. Use of the shield shall not relieve the Contractor of any liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place in the trench sufficient sheathing and bracing to prevent the caving or moving of the ground, or disturbance of the completed work or any of the surface or subsurface structures.

Care shall be taken when a trench box or shield is moved ahead so as not to pull the already jointed pipe apart or leave voids around the pipe wall.

The Contractor shall provide an acceptable method of rechecking line, grade, and horizontal location of the pipe after the shield has been moved ahead. If the pipe has moved, it shall be reset to the proper line and grade.

The width of the trench shield or box shall be such that a minimum of six (6) inch horizontal clearance is maintained between the pipe and shield at all times.

Any voids occurring between the trench box or shield and the undisturbed trench wall within the pipe zone (bottom of trench to top of cover material) shall be filled with crushed rock or granular backfill, immediately after the box or shield is positioned.

SECTION 2.4.0 – BACKFILLING

2.4.1 EXCAVATED MATERIAL USED AS BACKFILL. Unless otherwise specified, excavated material shall be used for backfill provided that such material consists of clay, sand or other materials that are suitable for backfilling. Unsuitable backfill materials include vegetable or other organic matter, all types of refuse, large pieces or fragments or inorganic material and such other material as, in the judgment of the Engineer, are unsuitable for backfilling. Suitable excavated material shall be used for backfill. Lumps shall be broken up. Stones, lumps, or clods greater than 2 inches shall not be placed within 2 feet of the pipeline or structure. Rock larger than 6" shall not be used as backfill. Where backfill material is not suitable, in the opinion of the Engineer, the Engineer may request removal and replacement as Unsatisfactory Subgrade per Section 2.2.13.

Material will not be considered unsatisfactory solely because it is wet. If the native material would be suitable dry and the wet condition is the result of construction activities, the Contractor shall remove and replace or stabilize at no cost to the Owner.

Adjust the soil moisture content as required plus or minus 2% of optimum. Adding water or drying fill material to achieve suitable moisture content is incidental to the Project.

Where excavated material is not suitable for backfill or pipe bedding and granular material is used, the trench can become a conduit for water. Clay or bentonite barriers shall be provided at approximately 100 ft. intervals to prevent movement of water.

2.4.2 PLACING OF BACKFILL. All pipe or manholes with a rubber gasket or resilient type joint shall be backfilled within 24 hours after installation. Pipe sewers or manholes with cement mortar joints shall not be backfilled until initial set hasoccurred. Concrete shall not be backfilled until it has been determined that the concrete has reached a compressive strength of 2,500 psi.

Large stones (6" in longest dimension) or hard or frozen lumps of material will not be allowed in the backfill. Material that has frozen in the stockpile shall be replaced with acceptable backfill at the Contractor's expense.

After the cover material has been placed, the backfill shall be deposited and consolidated in accordance with the requirements of Chapter 2.4.4. The Contractor will be held responsible for any damage to underground structures and any settlement of the trench.

2.4.3 UPPER LEVEL OF BACKFILL. In existing pavement and roadways, the trench shall be backfilled to the existing surface, subject to pavement replacements as required in the Contract Documents. In streets under construction, in open areas and in easements, the excavation shall be backfilled to the existing ground surface or as specified.

2.4.4 COMPACTION. Backfill shall be compacted to preclude settlement, in accordance with the following:

A. Special Compaction. Unless otherwise specified, all backfill in areas to be used for structures or driving surfaces (streets, highway shoulders, parking lots, driveways, etc.) shall receive Special Compaction. This requires mechanical compaction by specialized equipment in lifts not exceeding twelve inches (12"). The equipment and procedures shall be appropriate for the type of material. Mechanical compaction shall not begin until the embedment material has been placed to the specified depth above any pipelines. Compaction procedures shall be performed to provide a minimum 90% Modified Proctor Density from the bottom of the excavation or top of bedding to 6 feet deep and 95% Modified Proctor Density for the top six feet (6'). The Engineer reserves the right to order compaction tests at the Contractor's expense if compaction efforts do not appear to be adequate.

B. Standard Compaction. Backfill in open fields shall receive Standard Compaction. Backfill shall be placed in 12" to 18" lifts and tamped or bulldozer compacted to a minimum 90% Modified Proctor Density. Each layer shall be compacted until no further appreciable consolidation takes place.

2.4.5 MINIMUM BACKFILL AND/OR COVER FOR PIPELINES. The minimum depth of backfill and/or cover shall be 4 feet above the outside top of sewer pipe and 7 feet for water pipe, unless specifically required by the Engineer or shown on the plans.

2.4.6 BACKFILL AT CROSSINGS OF STREETS, ALLEYS, DRIVEWAYS, PARKING AREAS OR TRAVELED ROADWAYS. Where an open-cut trench crosses a street, alley, driveway, parking area or traveled roadway, such crossing shall be compacted to prevent settlement and shall receive Special Compaction to a minimum of 95% Modified Proctor Density for the full depth of the trench. Where excavated material is not suitable as backfill, the Engineer may request removal and replacement as Unsatisfactory Subgrade per Section 2.2.13.

The top eight (8) inches of backfill shall be compacted crushed rock.

Where an open trench is cut in a traveled roadway or shoulder of a street and pavement replacement is not specified, the trench shall be surfaced with twelve (12) inches compacted depth of crushed rock.

SECTION 2.5.0 – SURFACE REPLACEMENT AND SITE RESTORATION

2.5.1 REPLACEMENT OF PAVEMENTS. All street surfacing and base material within the area of the excavation including pavements, paving gravel, crushed rock, breaker rock, sand lift, etc., shall be removed for a suitable distance in advance of the deeper excavation, and kept separate, to be again used in repaving or resurfacing the street, road, or ground. This requirement will not apply with streets having less than 3" of combined gravel and asphalt surfacing.

Unless otherwise specified, all streets are to have a total thickness of compacted base course equal to that originally existing. This depth shall consist of approved salvaged material (see above), or crushed rock furnished and placed by the Contractor. When the Owner requests a greater thickness than existing, the extra crushed rock shall come from the Owner's stockpile.

The surface of the ground in the streets and elsewhere shall in all cases be left in as good of condition as it was prior to the commencement of the work; and when of gravel or crushed rock it shall be bladed and compacted in accordance with standard road construction practices. Filling and resurfacing shall be done in a manner to prevent as far as possible after settlement .All culverts, sidewalks, curb and gutter sections, driveways, etc., are to be protected and not removed unless specifically directed by the Engineer. Asphaltic or concrete street surfacing material shall not be replaced unless specified.

2.5.2 REPLACEMENT PAID BY CONTRACTOR. Wherever any sidewalk, driveway, curb, gutter, culvert, or pavement has been damaged or removed by the Contractor, whether deliberately or through failure to carry out the requirements of the appropriate codes, the Contract Documents or the specific direction of the Engineer relative to their protection, or through failure to employ usual or reasonable safeguards, such existing improvements shall be replaced or repaired at the Contractor's expense. The Engineer shall have the option of ordering the Contractor to make the necessary repair or replacement at Contractor's expense or to have such repair or replacement done by the Owner and the cost deducted from the monies due the Contractor.

2.5.3 MAINTENANCE OF SURFACE. The Contractor shall be responsible for placing the specified surfacing and for its maintenance and safety to travel for the duration of the contract and for 30 days following final acceptance. The Owner shall maintain the surface after the 30-day period, although the Contractor shall correct deficiencies for the full one-year warrantee period. Temporary surfacing material such as breaker rock or crushed rock necessary to access the work area or maintain traffic shall be furnished and installed at the Contractor's expense.

In the event that it becomes necessary for the Owner to provide emergency maintenance of the Contractor's trenches, the cost of such work shall be deducted from the monies due the Contractor.

The Owner will provide crushed rock to be used for maintenance of streets only where subgrade or pavement replacement by the Contractor is not specified.

2.5.4 REPLACEMENT OF LAWNS. Where a project is constructed in an established lawn area the Contractor shall restore the damaged area with Type "C" lawn replacement, unless otherwise specified in the Contract Documents.

The following shall be standard types of lawn replacement:

TYPE "A" LAWN REPLACEMENT. Replace lawn with top grade nursery sod laid over three inches (3") of fertilized, screened topsoil spread evenly over the entire area.

TYPE "B" LAWN REPLACEMENT. Replace lawn with a good grade of weed-treated field sod laid over the disturbed area.

TYPE "C" LAWN REPLACEMENT. Replace lawn by means of placing four inches (4") of fertilized, screened topsoil spread evenly, seeding with an approved grass seed at the recommended rate and mulching.

TYPE "D" LAWN REPLACEMENT. Carefully salvage all topsoil in advance of excavation. Scarify the construction area and replace topsoil. Seeding and maintenance will be done by others.

All lawns shall be rolled, fertilized, and watered by the Contractor as necessary until sustained growth is assured. If salvaged topsoil is insufficient, the Contractor shall supply suitable material from offsite to meet the minimum thickness specified. In all cases the lawn area shall be landscaped to be suitable for maintenance and mowing by the type of equipment expected to be used for the area. For example, residential lawns shall be smooth enough for mowing by normal home mowing equipment and rural ditches shall be suitable for mowing by normal highway equipment.

The cost of such lawn replacement shall be included in the unit price bid for other items of work unless a specific bid item is listed. When a Contractor damages an existing lawn area and it is not repaired, the Owner will deduct the cost from the monies due the Contractor. Refer to Chapter 2.8.0 - Erosion and Sedimentation Control for further requirements.

SECTION 2.6.0 – JACKING, BORING OR HDD DRILLING

2.6.1 GENERAL REQUIREMENTS. When jacking, drilling, or boring operations are required or permitted, the Contractor shall submit details giving the limits of the proposed jacking, drilling or boring, the method and equipment to be used, and the location of the shaft, pit or approach tunnel. This shaft, pit or approach tunnel shall be at a location that will not unduly interfere with traffic or with the use of adjacent property.

Upon completion of the operations, all voids around the outside face of the pipe shall be filled.

2.6.2 CASING PIPE. A casing pipe is a pipe into which another pipe, the carrier pipe, conveying the flow is inserted. The pipe shall meet the minimum requirements of the applicable highway or railroad permit. The casing pipe shall be the type specified and comply with the following:

A. Types

1. STEEL PIPE. The steel pipe shall be new, welded, or seamless pipe, minimum Schedule 30 with minimum yield strength of 35,000 psi and meeting ASTM A139 – Grade B, ASTM A232 – Grade 2 or ASTM A53 – Grade B. The joints of sections of casing pipe to be jacked shall be welded with a continuous circumferential weld. It shall be the Contractor's responsibility to provide stress transfer across the joints that is capable of resisting the jacking forces involved.

The thicknesses of casing shown below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on an evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to the Owner.

Pipe Diameter	Casing Diameter	Wall Thickness
Inches	Inches	Inches
6	14	0.250
8	18	0.375
10	20	0.375
12	22	0.375
14	24	0.375

Comply with American Welding Society Code D1.1. Weld all joints with full penetrating weld. Welders must be certified in the State of Wisconsin per SPS 305.34.

2. REINFORCED CONCRETE PIPE. When reinforced concrete pipe is used, it shall be Class IV, Wall B, meet the requirements of Section III and have two circular rings of reinforcement extending into both the tongue and groove of the pipe. The use of quadrant reinforcement or elliptical reinforcement, as an alternate to full inner and outer circular cages, will not be permitted in pipe intended for jacking. The barrel and joints of all jacked pipe shall be protected from crushing, or other damage, by placing cushioning material on the outside shoulder of the spigot end of each section of pipe prior to jacking out of the shaft. Jacking pressures used shall be such that crushing or other damage to the barrel or joints of the pipe will not occur. After the pipe is in final position, the joints shall be pointed with a non-shrink cement mortar. This pointing is not required when rubber type gasket joints are used.

B. Seal Ends. End Seal shall be a minimum 1/8-inch-thick manufactured synthetic rubber casing with stainless steel bands and fasteners by APS or equal.

C. Casing Spacers. APS polyethylene casing spacers or equal shall be furnished and installed at 6 ft. intervals. Provide field-adjustable runners for gravity flow carrier pipes.

1. Manufactured by APS or equal.

2. HDPE Band/Panel and Riser: ASTM D 638.

3. Stainless Steel or Carbon Steel Band/Panel and Riser: Type 304 stainless steel according to ASTM 240 or carbon steel according to ASTM A 36.

    a. Liner: Elastomeric PVC per ASTM D 149.

    b. Spacer Skid/Runner: Abrasion resistant polymer with a low coefficient of friction.

    c. Fasteners: Type 304 (18-8) stainless steel per ASTM A 193.

2.6.3 JACK & BORE CASING

A. Equipment.

1. A cutting head shall be attached to a continuous auger mounted inside the casing pipe.

2. The installation equipment shall include a steering head and a grade indicator.

3. The steering head shall be controlled manually from the bore pit. The grade indicator shall consist of a water level attached to the casing that will indicate the elevation of the front end of the casing or some other means for grade indication approved by the Engineer.

2.6.4 EXECUTION

A. Investigating the site and determination of the soil conditions prior to bidding is the sole responsibility of the Contractor. Any subsurface investigation performed by the Bidder or Contractor must be approved by the Owner having jurisdiction over the site. Rock and/or water, if encountered shall not entitle the Contractor to additional compensation.

B. Casing construction shall be performed so as not to interfere with, interrupt or endanger railroad or roadway surface and activity thereon, and minimize subsidence of the surface, structures, and utilities above and in the vicinity of the casing. Support the ground continuously in a manner that will prevent loss of ground and keep the perimeters and face of the casing, passages, and shafts stable. The Contractor shall be responsible for all settlement resulting from casing operations and shall repair and restore damaged property to its original or better condition at no cost to the Owner.

C. Face Protection: The face of the excavation shall be protected from the collapse of the soil into the casing.

D. Design of the bore pit and required bearing to resist jacking forces are the responsibility of the Contractor. The excavation method selected shall be compatible with expected ground conditions. The lengths of the casing shown on the Drawings are the minimum lengths required. The length of the casing may be extended for the convenience of the Contractor, at no additional cost to the Owner. Due to restrictive right-of-way and construction easements, boring and jacking casing lengths less than the nominal 20-foot length may be necessary.

2.6.5 GROUNDWATER CONTROL

A. The Contractor shall control the groundwater throughout the construction of the casing.

B. Methods of dewatering shall be at the option and responsibility of the Contractor. Maintain close observation to detect the settlement or displacement of surface facilities due to dewatering. Should settlement or displacement be detected, notify the Engineer immediately and take such action as necessary to maintain safe conditions and prevent damage.

C. When water is encountered, provide, and maintain a dewatering system of sufficient capacity to remove water on a 24-hour basis keeping excavations free of water until the backfill operation is in progress. Dewatering shall be performed in such a manner that removal of soil particles is held to a minimum. Dewater into a sediment trap and comply with DNR requirements.

2.6.5 JACKING & BORING

A. Shaft

1. Conduct jacking and boring operations from a shaft excavated at one end of the section to be bored. Where conditions and accessibility are suitable, place the shaft on the downstream end of the bore.

2. The shaft shall be rectangular and excavated to a width and length required for ample working space. If necessary, sheet and shore shaft properly on all sides. Shaft sheeting shall be timber or steel piling of ample strength to safely withstand all structural loadings of whatever nature due to soil and site conditions. Keep preparations dry during all operations. Perform pumping operations as necessary.

3. The bottom of the shaft shall be firm an unyielding to form an adequate foundation upon which to work. In the event the shaft bottom is not stable, excavate to such additional depth as required and place a gravel sub-base or a concrete sub-base if directed by the Engineer due to soil conditions.

B. Jacking Rails & Frame

1. Set jacking rails to proper line and grade within the shaft. Secure rails in place to prevent settlement or movement during operations. The jacking rails shall cradle and hold the casing pipe on true line and grade during the progress of installing the casing.

2. Place backing between the heels of jacking rails and the rear of the shaft. The backing shall be adequate to withstand all jacking forces and loads.

3. The jacking frame shall be of adequate design for the magnitude of the job. Apply thrust to the end of the pipe in such a manner to impart a uniformly balanced load to the pipe barrel without damaging the joint ends of the pipe.

C. Jacking and boring of casing pipes shall be accomplished by the auger boring method without jetting, sluicing or wet boring.

D. Auger the hole and jack the casing through the soil simultaneously.

E. Bored installations shall have a bored-hole diameter essentially the same as the outside diameter of the casing pipe installed.

F. Execute boring ahead of the casing pipe with extreme care, commensurate with the rate of casing pipe penetration. Boring may proceed slightly in advance of the penetrating pipe and shall be made in such a manner to prevent any voids in the earth around the outside perimeter of the pipe. Make all investigations and determine if the soil conditions are such to require the use of a shield.

G. As the casing is installed, check the horizontal and vertical alignment frequently. Make corrections prior to continuing operation. For casing pipe installations over 100 feet in length, the auger shall be removed, and the alignment and grade checked at minimum intervals of 60 feet.

H. Any casing pipe damaged in jacking operations shall be repaired, if approved by the Engineer, or removed and replaced at Contractor's own expense.

I. Lengths of casing pipe, as long as practical, shall be used except as restricted otherwise. Joints between casing pipe sections shall be butt joints with complete joint penetration, single groove welds, for the entire circumference, in accordance with AWS recommended procedures. Prior to welding the joints, the Contractor shall ensure that both ends of the casing sections being welded are square.

J. The Contractor shall prepare a contingency plan which will allow the use of a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

K. Once the jacking procedure has begun, it should be continued without stopping until completed, subject to weather and conditions beyond the control of the Contractor.

L. Care shall be taken to ensure that casing pipe installed by the boring and jacking method will be at the proper alignment and grade.

M. The Contractor shall maintain and operate pumps and other necessary drainage system equipment to keep work dewatered at all times.

N. Adequate sheeting, shoring, and bracing for embankments, operating pits and other appurtenances shall be placed and maintained to ensure that work proceeds safely and expeditiously. Upon completion of the required work, the sheeting, shoring, and bracing shall be left in place, cut, or removed, as designated by the Engineer.

O. Trench excavation, all classes and type of excavation, the removal of rock, muck, debris, the excavation of all working pits and backfill requirements are included in Section 2.2.0 of General Requirements.

P. All surplus material shall be removed from the right-of-way and the excavation finished flush with the surrounding ground.

Q. Grout backfill shall be used for unused holes or abandoned pipes.

2.6.6 VENTILATION AND AIR QUALITY

A. Provide, operate, and maintain for the duration of casing project a ventilation system to meet safety and OSHA requirements.

B.

2.6.7 INSTALLATION OF CARRIER PIPE

A. After construction of the casing is complete, and has been accepted by the Engineer, install the pipeline in accordance with the Drawings and Specifications.

B. Check the alignment and grade of the casing and prepare a plan to set the pipe at proper alignment, grade and elevation, without any sags or high spots.

C. The carrier pipe shall be held in the casing pipe by the following method:

1. The pipe shall be supported within the casing by use of casing spacers sized to limit radial movement to a maximum of 1-inch. Provide a minimum of two casing spacers per nominal length of pipe with an interval no greater than seven linear feet between spacers. Casing spacers shall be attached to the pipe per the manufacturer's instructions.

2. The carrier pipe shall be restrained for the entire length of the casing. Piping shall, at a minimum, be restrained to 1 joint outside of casing. If a fitting is present at the joint, restraint requirements shall conform to table presented in Drawings.

D. Close the ends of the casing with specified end seals.

2.6.8 SHEETING REMOVAL

A. Remove sheeting used for shoring from the shaft and off the job site. The removal of sheeting, shoring and bracing shall be done in such a meaner as not to endanger or damage either new or existing structures, private or public properties and also to avoid cave-ins or sliding in the banks.

2.6.9 HORIZONTAL DIRECTIONAL DRILLING

A. **Qualifications**. The work shall be completed by an experienced contractor who can demonstrate expertise in trenchless methods and provide a list of five utility references for directional drilling for pipe sizes ranging from 4" to 24" performed in the last two years.

B. **Obstructions**. If an unknown obstruction is encountered, the Contractor shall promptly implement measures to adjust the borehole alignment as necessary to bypass/avoid the obstruction. Adjustments to the borehole alignment to bypass the obstruction shall be gradual and shall not impose abrupt changes in the alignment that will impose additional stresses and deformations on the pipe. The reasonable additional costs for alignment adjustment measures due to unknown obstruction shall be reimbursed only if a price is established in advance of the work.

C. **Instrumentation**. The Contractor shall provide and maintain instrumentation or other controls which will accurately locate the pilot hole, measure drill string axial and tensional loads, and measure drilling fluid discharge rate and pressure. The Engineer shall be allowed to have access to these instruments and their readings at all times.

D. **Record Information**. Following the completion of pilot hole drilling, the Contractor shall provide a tabulation of three-dimensional coordinates referenced to the drilled entry point which accurately described the location of the pilot hole at intervals of 25 feet along the length of the pilot hole alignment.

E. **Borehole Abandonment**. Boreholes installed and/or partially installed pipe that fails to meet specifications shall be abandoned ad backfilled with grout. Rejection criteria includes failure to drill the boreholes to within the required tolerances, failure to install the pipe properly without damage, collapse or parting the joints. Abandoned boreholes and pipe shall be completely grouted with a sand-cement grout mix as approved by the Engineer.

Ream and Pull Back. Prereaming operations shall be conducted at the discretion of the Contractor. The Contractor shall insure that a hole sufficient to accommodate the pull section has been produced. Any damage to the pipe resulting from inadequate prereaming shall be the responsibility of the Contractor. All provisions of this Specification relating to simultaneous reaming and pulling back operations shall also pertain to prereaming operations. The pull section shall be installed in the reamed hole in such a manner that external pressures are minimized and an appropriate counterbalancing internal pressure is maintained. Any damage to the pipe resulting from external pressure during installation shall be the responsibility of the Contractor. Buoyancy modification shall be used at the discretion of the Contractor. Any buoyancy modification procedure proposed for use shall be submitted for approval. The Contractor shall be responsible for any damage to the pull section resulting from buoyancy modifications.

F. Drilling Fluids. Drilling fluids shall be non-hazardous materials which comply with, state and federal regulations and permit requirements. use only products included in the Wisconsin DNR Approved Drilling and Filling Sealing Products List (including Heat Exchange Drillhole 1072-TS-3 WDNR October 2022 Products) (https://dnr.wisconsin.gov/sites/default/files/topic/Wells/DrillAbandonProducts.pdf), the NSF/ANSI/CAN 60: Drinking Water Treatment Chemicals – Health Effects program (https://info.nsf.org/Certified/PwsChemicals/), or the Wisconsin DNR Approved HDD Drilling Fluid Products (https://dnr.wisconsin.gov/sites/default/files/topic/Stormwater/PreviouslyReviewedHorizontalDirectionalDrillingAdditives.pdf). The Contractor shall be responsible for obtaining, transporting, and storing any water required for drilling fluids. The recirculation of drilling fluid surface returns shall be maximized. The Contractor shall provide solids control and fluid cleaning equipment of a configuration and capacity that can process surface returns and produce drilling fluid suitable for reuse. Disposal of drilling fluids and drill cutting shall be the responsibility of the Contractor. Excess drilling fluids and drill cuttings shall be disposed of in approved off-site locations in accordance with local, state, federal laws and regulations, right-of-way and workspace agreements, and permit requirements. No additives which would prevent off-site/non-hazardous disposal of drilling mud will be allowed. The Contractor shall employ his best efforts to maintain full annular circulation of drilling fluids. Drilling fluid returns or breakouts at locations other than the entry and exit points shall be minimized. In the event that annular circulation is lost, the Contractor shall take steps to restore circulation. If inadvertent surface returns or breakouts of drilling fluids occur, they shall be immediately contained with hand placed barriers (i.e. hay bales, sand bags, silt fences, etc.) and collected using pumps. If the amount of the breakout is not great enough to allow practical collection, the affected area shall be diluted with fresh water and the fluid will be allowed to dry and dissipate naturally. If the amount of the breakout exceeds that which can be contained with hand placed barriers, small collection sumps (less than 5 cubic yards) may be used. If the amount of the breakout exceeds that which can be contained and collected using small sumps, drilling operations shall be suspended until breakout volumes can be brought under control. The Contractor shall take all necessary steps to avoid any drilling fluid-induced blow out or any drilling fluid leak. Any damage resulting from such blow outs and leaks shall be the Contractor's responsibility.

H. Pipe Installation. The entry and exit angles shall be kept to a minimum to reduce the pull back forces required. The maximum entry angle shall be 15° from horizontal and the maximum exit angle shall be 8°. The Contractor shall provide the calculated as-built location coordinates at 30 ft. intervals. Each pipe shall have a firm bearing along its entire length. At all times when pipe installation is not in progress, the open ends of the pipe shall be closed with temporary watertight plugs or by other suitable means. If water accumulates in the entry and exit work shafts during stoppages when work is resumed, the plug shall not be removed until all conditions are suitable to prevent water, earth, slurry, or other material from entering the pipe. At all times, including when pipe installation is not in progress, the drilling slurry for support of the pipe excavation and hole must be maintained in a condition that provides borehole stability. If unstable ground sections or pervious zones are encountered in the ground sections or pervious zones are encountered in the ground, the Contractor shall implement appropriate measures, such as installation of temporary casings, grouting or other adjustments, to avoid borehole collapse.

I. Pipe Pulling. The maximum lengths of pipe assembled above ground and pulled at any one time shall not exceed the length recommended by the pipe manufacturer. The maximum allowable tensile load imposed on the pull section shall be equal to 90% of the product of the specified minimum yield strength of the pipe and the area of the pipe section. If more than one value is involved for a given pull section, the lesser shall govern. The Contractor shall provide a suitable pulling force measuring device connected to the drilling string or pulling mechanism. A swivel shall be used to connect the pull section to the reaming assembly to minimize torsional stress imposed on the section. The pull section shall be supported as it proceeds during pullback so that it moves freely and the pipe and corrosion coating are not damaged.

J. Tracer Wire. A Tracer Wire shall be installed for all non-metallic pipe. The tracer wire shall be pre-installed in conduits or interduct or as an integral part of the pipe installation.

Special Requirements for Wetlands or Stream HDD Crossings. Drill paths that cross a mapped wetland or stream must fully comply with the Wisconsin DNR HDD Technical Standard 1072. Prior to the Preconstruction Conference, the drilling contractor must prepare and submit a *HDD Summary, Spill Plan* and *Inadvertent Release (IR) Plan* as described in TS1072. The drilling contractor must also provide the Engineer with details on adjustments to the planned profile, the project timing, entry/exit point placement and containment pit placement. The drilling contractor must attend the Preconstruction Conference. Before starting work, the drilling contractor and Engineer must walk the drill path to identify potential obstacles and note the location of site-specific risk factors, environmental conditions and water resources. Monitor the returns continuously during drilling operations. Inspect the drill path immediately upon noted loss of drilling fluid. Document any substantial fluid loss or gain. Maintain documentation that monitoring and inspections are completed as specified. Include the name of the inspector, the date, the time, the stage of installation (pilot hole reaming, or pullback), and any observations that were made along with the location of the observation. For all HDD projects, report IRs, spills, and project modifications as required by applicable permits and federal, tribal, state, and local regulations. At a minimum, notify the WDNR Spills Hotline (1-800-943-0003) within 24 hours if drilling fluid enters a wetland or waterway or a substantial loss or gain has occurred. If a spill or IR enters a separate storm sewer inlet or drainage conveyance system, promptly notify the system owner that the discharge occurred, and include the estimated quantity of material discharged.

SECTION 2.7.0 – PROTECTION OF THE WORK, PUBLIC AND PRIVATE PROPERTY AND THE PUBLIC

2.7.1 PROTECTION OF WORK. During performance and up to the date of final acceptance, the Contractor shall be under an absolute obligation to protect finished and unfinished work against any damage, loss, or injury. This includes concrete sidewalk and curb and gutter. In the event of such damage, loss or injury, the Contractor shall promptly replace or repair such work, whichever the Engineer shall determine to be preferable.

The Contractor shall provide guards, if necessary, and take such other precautions as are required both by day and by night to protect life and property.

2.7.2 PROTECTING OPENINGS. Adequate protection shall be provided around all openings wherever required to safeguard the work or the public. All openings and surface obstructions shall be protected with barricades, signs and suitable warning devices.

2.7.3 STREET BARRICADES, SIGNS AND WARNING DEVICES. The Contractor shall be responsible for the erection and maintenance of all barricades, lights, and signs necessary for public safety and convenience. In general, all hazards within the limits of the work or on detour around the work must be marked with well-painted, well-maintained barricades, reflectors, electric lights, flashers and warning and directional signs in sufficient quantity and size adequate to protect life and property. These safeguards shall be moved, changed, increased or removed as required during the progress of the work to meet changing conditions.

When a street is closed to through traffic, barricades shall be placed at the adjacent intersections as well as at the location of the obstruction. Detour signs shall be attached to the barricades at the adjacent intersections. Detour signs shall be adequately illuminated and/or reflectorized so as to be clearly visible at all times.

Barrier fence may be required to be installed at locations where street or alleys are closed for the full width of the roadway.

All warning devices shall be kept clean and in good repair so as to be readily discernible at all times. The signing shall be done in accordance with the latest revision of the Manual on Uniform Traffic Control Devices (MUTCD) (http://mutcd.fhwa.dot.gov/) unless the Owner approves deviations in writing.

The Owner shall have full authority to suspend or limit the Contractor's operations, without additional compensation, if signing or barricading practices are inadequate. Failure to implement or maintain proper signing practices shall be justification for withholding or reducing payments to the Contractor.

2.7.4 FLAGGERS REQUIRED. Whenever the Contractor's operations obstruct or endanger a used traffic lane, and no marked detour has been provided, flaggers shall be furnished to direct traffic through or around the congested area.

2.7.5 REMOVAL OF SNOW. The Contractor shall be responsible for immediate removal of snow from those sections of streets that are obstructed by construction activities.

2.7.6 ACCESS TO PROPERTIES. The Contractor shall neither shut off nor unnecessarily interfere with either pedestrian or vehicular access to property without the consent of the Engineer or Owner.

2.7.7 PROTECTING PRIVATE PROPERTIES. All private property shall be fully protected by the Contractor. All trees, bushes, shrubs, sod, etc. on private property damaged by the Contractor shall be repaired or replaced by the Contractor at no cost to the Owner, and to the satisfaction of the Engineer.

Prior to commencing an excavation or tunnel in the immediate vicinity of any building or other structure, the safety of which may be endangered thereby; the Contractor shall serve notice upon the Owner of such building or structure, giving the date of beginning of such work. During the course of the work adjacent to such property, the Contractor shall at all times exercise due caution and care and furnish and place such extra timbering, bracing and sheathing as may be necessary to insure against loss of ground adjacent to the excavation or tunnel.

2.7.8 DRAINAGE. Storm water drainage must not be obstructed at any time. When necessary, a continuous pipe, of ample capacity, shall be laid to carry off the storm water. Such pipe or drain shall be kept open and free of obstructions. Proper precautions shall be taken to prevent excessive silt, sand or clay from entering sewers or drainage ways.

2.7.9 ACCESS TO WATER HYDRANTS. The Contractor shall maintain access to hydrants at all times. Before any hydrants are removed from service temporarily, the Contractor shall notify the Fire Department.

2.7.10 TRAFFIC. The Contractor shall maintain vehicular traffic as directed in the Contract Documents or by the local, State or County Highway authority. Generally, one lane traffic shall be maintained unless a detour is provided.

2.7.11 WORK IN PRIVATE RIGHT-OF-WAY. Whenever the work is to be prosecuted through private property for which the Owner has obtained a license or an easement, the Contractor must abide fully with the terms of the license or the easement, a copy of which is on file with the Owner.

2.7.12 APPROVAL OF EASEMENT RESTORATION. Prior to final payment, the Contractor shall send a notice to all easement grantors by certified mail, return receipt requested, a copy of which shall be filed with the Owner, said notice to be similar to the following:

"The undersigned Contractor has completed the restoration of the construction site on which you have granted an easement for installation of certain utilities and improvements. If the site restoration is not complete to your satisfaction, please contact Davy Engineering Co., 115 S. 6th St., La Crosse, WI 54601 in writing and arrangements will be made immediately to view the site and restore the site in conformance with our contract.
If Davy Engineering Company does not hear from you in writing within ten days from the above date, site restoration of your property will be deemed complete and approved by you."

(Name of Contractor)
(Address of Contractor)

The Owner shall furnish the Contractor with names and addresses of easement grantors.

Upon receipt of a notice of deficiency, the Owner will examine the site and direct the Contractor to complete all work that may be necessary to satisfy the terms of the Contract. If the Contractor refuses to comply, the Owner reserves the right to have the work done by others and to deduct the cost thereof from the monies due the Contractor. Should conditions exist which preclude the Contractor from completing satisfactory restoration, the Owner may require the Contractor to furnish a bond in a sum sufficient to cover any legal claims for damages.

If the Owner is satisfied that the work has been completed in agreement with the Contract Documents and the terms of the license or easement, the requirement to obtain the statement may be waived.

2.7.13 SANITARY PROVISIONS. The Contractor shall provide and maintain properly sheltered sanitary conveniences for workers, and their use must be strictly enforced.

2.7.14 EMERGENCY MAINTENANCE AND PROTECTION. In the event it becomes necessary for the Owner to perform emergency maintenance and protection, which is the responsibility of the Contractor under the Contract Documents, the cost of such work shall be billed to the Contractor and deducted from his final payment if not paid.

SECTION 2.8.0 – EROSION AND SEDIMENTATION CONTROL

2.8.1 GENERAL. The Contractor shall take positive action to adequately control erosion and sedimentation as a result of construction activities associated with this project. Unless bid items are provided in the proposal form, costs associated with erosion and sedimentation control shall be incidental to the project and included in the total bid price.

Erosion and sediment controls shall be installed, inspected and approved prior to beginning any construction activities. In general, the Contractor shall practice the following control measures.

Minimize size of disturbed areas.
Stabilize disturbed areas.
Keep runoff velocity slow.
Protect disturbed areas from runoff.
Retain sediment on site.
Maintain control measures and conduct frequent follow-up inspections.
Maintain log of inspections.

As used in this specification, "site" shall mean the entire area on which land disturbing or land development activities associated with this contract occur. Any eroded material leaving the site shall be removed and the affected area fully restored.

Erosion control practices shall comply with all permits issued for the Project.

2.8.2 IMPLEMENTATION OF EROSION CONTROL METHODS

A. Wisconsin

1. Technical Standards. All Contractors shall comply with NR 151.105 and NR 151.11 of the Wisconsin Administrative Code unless an alternate is specifically approved by the Engineer. Technical standards to comply with these requirements can be found at:
http://dnr.wi.gov/topic/stormwater/standards/index.html

2. Comply with Requirements. All erosion and sediment control measures shall be constructed and maintained in accordance with the Erosion Control Plan, the plans, the specifications and Stormwater Technical Standards at:
http://dnr.wi.gov/topic/stormwater/standards/const_standards.html.

B. Minnesota

1. Stormwater Permit for Construction Activity. If an NPDES Permit is required for Construction, the Contractor shall work with the Owner to coordinate submittal. Information on submittal can be located at:
http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/index.html

2. Stormwater Pollution Prevention Plan. The Contractor shall work with the site owner to create a stormwater pollution prevention plan (SWPPP) prior to beginning construction on the site.

3. Construction activity requirements. Construction activities shall meet Article IV of the General Permit to Discharge Stormwater Associated with Construction Activity, Permit Number: MN R1000001. The stormwater program for construction activity steps for construction are listed at
http://www.pca.state.mn.us/index.php/water/water-types-and-programs/stormwater/construction-stormwater/stormwater-steps-to-construction.html

C. Maintenance. Periodic inspection and maintenance of all sediment control structures shall be provided to ensure the intended purpose is accomplished. Sediment control measures shall be in working condition at the end of each working day. After any significant rainfall, sediment control structures shall be inspected for integrity. Any damaged structures shall be corrected. Sediment control measures shall not be removed until the areas served have established vegetative cover.

D. Waste and Material Disposal. All waste and unused building materials (including garbage, debris, cleaning wastes, wastewater, toxic materials or hazardous materials) shall be properly disposed and not allowed to be carried by runoff into a receiving channel or storm sewer system.

E. Tracking. Each site shall have graveled roads, access drives and parking areas of sufficient width and length 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.

F. **Drain Inlet Protection**. All storm drain inlets that can potentially receive water originating from or passing through the site shall be protected with a straw bale, filter fabric or equivalent barrier as specified or approved by the Engineer.

G. **Pipeline Construction**. Sediment control for pipeline construction shall also include the following:

1. Excavated trench material shall be placed on the high side of the trench.

2. Immediately following pipe installation, the trench shall be backfilled, compacted and stabilized at the end of each working day.

2.8.3 SITE EROSION CONTROL. The following criteria apply only to land development or land disturbing activities that result in runoff leaving the site:

A. Channeled runoff passing through the site from adjacent areas shall be diverted around disturbed areas, if practical. Otherwise, the channel shall be protected as described below. Sheetflow runoff from adjacent areas greater than 10,000 square feet in area shall also be diverted around disturbed areas. Diverted runoff shall be conveyed in a manner that will not erode the conveyance and receiving channels. (Note: Soil Conservation Service guidelines for allowable velocities in different types of channels should be followed.)

B. All activities on the site shall be conducted in a logical sequence to minimize the area of bare soil exposed at any one time.

C. Runoff from the entire disturbed area on the site shall be controlled by the following:

1. All disturbed ground left inactive for 7 or more days shall be stabilized by seeding or sodding (only available prior to September 15th) or by mulching or covering, or other equivalent control measure as approved by the Engineer.

2. For sites with more than 10 acres disturbed at one time, or if a channel originates in the disturbed area, one or more sedimentation basins shall be constructed. Each sedimentation basin shall have a surface area of at least 1% of the area draining to the basin, be at least 3 feet deep and be constructed in accordance with accepted design specifications. Sediment shall be removed as necessary to maintain basin depth of 3 feet. The basin discharge rate shall also be sufficiently low as to not cause erosion along the discharge channel or the receiving water.

3. For sites with less than 10 acres disturbed at one time, silt fences, straw bales or equivalent control measures shall be placed along all sideslopes and downslope sides of the site. If a channel or area of concentrated runoff passes through the site, silt fences shall be placed along the channel edges to reduce sediment reaching the channel.

2.8.4 PROTECTION FOR STORAGE PILES. 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 7 days, they shall be stabilized by mulching, vegetative cover, tarps or other means approved by the Engineer. Erosion from piles that will be in existence for less than 7 days shall be controlled by placing straw bales or filter fence barriers around the pile. In-street dirt storage piles located closer than 25 feet of a roadway or drainage channel must be covered with tarps or suitable alternative control, if exposed for more than 7 days. The storm drain inlets as defined above shall be protected with straw bales or other appropriate filtering barriers as approved by the Engineer.

2.8.5 CONTROL BY OWNER. The Owner shall have full authority to suspend or limit the Contractor's operations, without additional compensation, if erosion control practices are inadequate. Failure to implement or maintain erosion control practices shall be justification for withholding or reducing payments to the Contractor.

SECTION 2.9.0 – PAY MEASUREMENT

2.9.1 PAY MEASUREMENTS BY CONTRACTOR. The Contractor shall measure all quantities necessary for unit price payments and provide the quantities and supporting data to the Engineer

2.9.2 PAY MEASUREMENT FOR NEW SEWERS AND DRAINS. Sewers shall be paid for at the unit price bid per lineal foot measured horizontally. Pay measurement for sewers eight inches (8") through forty-eight (48") inches in diameter,…….usive, shall extend from centerline of manhole to centerline of manhole, or from centerline of manhole to the end of a portion not starting or terminating in a manhole.

Pay measurements for sewer greater than in diameter shall extend from the inside face of manhole or chamber to inside face of manhole or chamber.

Pay measurements for storm water drains shall extend from centerline of catch basin or storm water inlet to the centerline of manhole or sewer forty-eight (48") inches wide or less, or from centerline of catch basin or storm water inlet to the inside of sewers of structures wider than forty-eight (48") inches.

2.9.3 PAY MEASUREMENT FOR NEW BUILDING SEWERS. Pay measurements for new building sewers shall extend from the centerline of the main sewer to the end of the pipe laid. New building sewers shall be paid for at the unit price bid per lineal foot measured horizontally, and shall include the cost of all necessary bends and plugs.

2.9.4 PAY MEASUREMENT FOR RELAID BUILDING SEWERS AND DRAINS. Pay measurement for relaid building sewers and drains shall extend from the centerline of the main sewer to the end of the pipe laid. This measurement shall be made along the centerline of the relaid pipe. Relaid building sewers and drains will be paid for at the unit price bid per lineal foot.

2.9.5 PAY MEASUREMENT FOR WYES. Payment for wyes shall be made at the unit price bid. This price is to be in addition to the price per lineal foot of sewer and shall include the bend and plug.

2.9.6 PAY MEASUREMENT FOR RISERS. Pay measurement for risers shall extend from the flow line of the main sewer to the flow line of the connection pipe. Risers will be paid for at the unit price bid per vertical foot unless a lump sum bid is requested in the proposal.

2.9.7 PAY MEASUREMENT FOR MANHOLES. Manholes shall be paid for at the lump sum bid.

2.9.8 PAY MEASUREMENT FOR WATER MAIN AND FORCE MAIN. Pay measurement for water main and force main shall extend from the centerline of fitting to centerline of fitting. Water main and force main shall be paid for at the unit price bid per lineal foot of pipe installed.

2.9.9 PAY MEASUREMENT FOR HYDRANT LEAD. Pay measurement for hydrant lead shall extend from the centerline of the water main to the centerline of the hydrant. Hydrant lead shall be paid for at the unit price bid per lineal foot of pipe installed.

2.9.10 PAY MEASUREMENT FOR HYDRANTS. Hydrants shall be paid for per unit installed. This shall be a lump sum bid and include the cost of the hydrant, blocking and gravel backfill.

2.9.11 PAY MEASUREMENT FOR VALVES. Valves shall be paid for per unit installed. This shall be a lump sum bid and include the furnishing and setting of the valve box.

2.9.12 PAY MEASUREMENT FOR FITTINGS. Fittings for watermain shall be paid per pound for each fitting installed. The weight shall be based on the tables in ANSI/AWWA C153 *Ductile-Iron Compact Fittings for Water Service*. Joint accessories, including restraints, are incidental. Unless otherwise specified, the cost of fittings for forcemain shall be included in the price bid per foot of pipe.

2.9.13 PAY MEASUREMENT FOR CORPORATION STOPS. Corporation stops shall be paid for per unit installed and shall include the 1/8 bend coupling and saddle.

2.9.14 PAY MEASUREMENT FOR WATER SERVICES. Pay measurement for water services shall extend from the centerline of the main to the end of the pipe laid. This measurement shall be made horizontally. Water services shall be paid for at the unit price bid per lineal foot.

2.9.15 PAY MEASUREMENT FOR CURB STOPS. Curb stops shall be paid for per unit installed and shall include the furnishing and installing of the box.

2.9.16 PAY MEASUREMENT FOR WATER SERVICE ALTERATIONS. Water service alterations shall be paid for per unit altered. This shall be a lump sum bid.

2.9.17 PAY MEASUREMENT FOR WATER CURB STOP RELOCATIONS. Water curb stop relocations shall be paid for per unit relocated. This shall be a lump sum bid and include the stop and furnishing and setting the new service box.**2.9.18** PAY MEASUREMENT FOR CATCH BASINS AND STORM WATER INLETS. Catch basins and storm water inlets shall be paid for per unit constructed. This shall be a lump sum bid and include the furnishing and installing of all castings.

2.9.19 PAY MEASUREMENT FOR MOBILIZATION. Mobilization consists of preparatory work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the site; for the establishment of all offices, buildings, and other facilities necessary for the Work; for bonds and insurance; and for all other work and operations which must be performed, or for costs incurred, prior to beginning the Work. When the Contract does not include a separate pay item for mobilization, full compensation for mobilization is included in the Contract lump sum price or in the prices paid for the various items of work in a unit price contract and no additional compensation will be paid. When the Contract or proposed Schedule of Values includes a separate item for mobilization, payment for the mobilization item will include full compensation. No more than 5% of the Total Contract Price may be allocated to Mobilization. When the first Pay Application exceeds 10% of the Total Contract Price, payment for 50% of the Mobilization item may be requested. The balance of the Mobilization item may be included in the first Pay Application exceeding 50% of the Total Contract Price.

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SECTION III
MATERIAL SPECIFICATIONS

Note: This standard specification includes general requirements for materials and is supplemented and superseded by the following sections and the Special Provisions that apply to this project only.

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MATERIAL SPECIFICATIONS

SECTION 3.1.0 - GENERAL

3.1.1 SAMPLES. Samples of the materials proposed or furnished for the work may be taken by the Engineer at any time, at the point of manufacture, point of delivery or site of work. They will be selected, as far as practicable, in accordance with standard methods for sampling materials as specified in the standards of the American Society of Testing and Materials.

3.1.2 STANDARDS. The use of an ASTM, ANSI, AASHTO, or AWWA designation in these specifications refers to the latest revision of that particular standard or tentative standard of that organization.

3.1.3 COST OF TESTS. The specified tests and samples shall be furnished at no cost to the Owner unless otherwise specified. The manufacturer or seller shall furnish the required samples and the Contractor shall pay for the specified tests.

3.1.4 DELIVERY OF SAMPLES. The Contractor or supplier will be responsible for delivery of all test specimens to the laboratory of the designated testing agency without cost to the Owner.

3.1.5 TESTING LABORATORIES. Laboratories engaged to conduct the tests shall be approved by the Engineer and must be independent of the supplier or Contractor. The specified tests and samples shall be furnished by the supplier or Contractor at no cost to the Owner. The results shall be certified and submitted to the Engineer within 3 days of completion. The tests conducted by the Engineer and independent laboratories shall be the basis for requiring the replacement of substandard material. All test lab results shall be certified by a Professional Engineer licensed in the state where the project is located.

SECTION 3.2.0 - GENERAL REQUIREMENTS FOR ALL PIPE

3.2.1 INSPECTION. Each length of pipe shall be subject to inspection at the factory, point of delivery and site of work. Samples of pipe shall be selected at random and shall be delivered to a testing laboratory approved by the Engineer.

3.2.2 ACCEPTANCE OR REJECTION. When the specimens tested conform to specifications, then all pipe represented by such specimens shall be considered acceptable. Copies of test reports shall be submitted to the Engineer before the pipe is installed in the project.

If any of the test specimens fail to meet these requirements, all pipe represented by such tests shall be subject to rejection. The Contractor, however, has the right to furnish and test additional specimens from the same shipment or delivery, at no cost to the Owner. The pipe will be considered acceptable if all of these specimens meet the requirements.

3.2.3 REJECTED PIPE. Pipe which has been rejected by the Engineer shall be marked and removed from the site of the work by the Contractor and replaced with pipe which meets the requirements without cost to the Owner.

3.2.4 STRAIGHTNESS. Pipe shall not deviate from straight.

3.2.5 MARKING. Each length of pipe shall bear the name or trademark of the manufacturer, the location of the plant and the date of manufacture. Each length shall likewise be marked to designate the class or strength of the pipe. The markings shall be plainly visible. Pipe with either elliptical or quadrant reinforcing shall have the word Top or Bottom clearly stenciled on the inside of the pipe at the correct place to indicate the proper position when laid.

3.2.6 FITTINGS. Fittings such as wyes, tees and bends shall be made in such a manner as will provide strength and water tightness at least equal to the class of the adjacent main line pipe to which they are joined and shall conform to all other requirements specified for pipe of corresponding class and internal diameter.

Fabricated branches for wyes and tees shall be securely attached to the wall of the pipe in a watertight manner and shall be flush with the inside surface of the pipe. Tee branches shall have their axes perpendicular to the longitudinal axis of the pipe. Wye branches shall have their axes approximately 60 degrees from the longitudinal axis of the pipe, measured from the bell end. Pipe reinforcement shall not be interrupted beyond a radial distance of 3 inches outside of the fitting.

3.2.7 PIPE REJECTION. Pipe shall be subject to rejection for failure to conform to any requirement of the specifications or for any of the following reasons:

A. Concrete Pipe Only

1. Fractures or cracks passing through the pipe wall or socket, except that a single crack not exceeding 2 inches in length at either end of the pipe or a single fracture in the socket not exceeding 3 inches in width nor 2 inches in length shall not be considered cause for rejection unless these defects exist in more than 5% of the entire shipment or delivery.

2. Chips or fractures on the interior of the pipe exceeding 2 inches in length, 1 inch in width and of a depth more than 1/4 the barrel thickness.

B. All Pipe

1. Cracks, sufficient to impair the strength, durability, or serviceability of the pipe.

2. Defects that indicate improper proportioning, mixing, and molding.

3. Variations of more than 1/8 inch per linear foot in alignment of a pipe intended to be straight.

4. Insecure attachment of spurs.

5. Damaged ends, where such damage would prevent making a satisfactory joint.

3.2.8 FOUNDATION, BEDDING AND EMBANKMENT. The requirements for the pipe foundation, bedding and embankment are the same for all pipe materials, classes, and sizes. Refer to the Construction Specifications.

SECTION 3.3.0 - REINFORCED CONCRETE PIPE (12" OR LARGER)

3.3.1 REQUIREMENTS. Pipe furnished under this classification shall meet the requirements set forth in ASTM C-76, Class III, Wall B and ASTM C-655 for elliptical pipe. The maximum allowable depth of bury shall be 13 feet unless greater depths are approved in writing by the Engineer.

3.3.2 JOINTS. Joints shall be rubber gasket Type 1-MS as made by Press-Seal Gasket Corporation, Type CP as made by the Hamilton Kent Manufacturing Company or equal Gaskets shall comply with ASTM C443. All pipe grooves or bells shall have a concrete shoulder to help confine the gaskets. The gaskets shall be stored in as cool, clean, and shaded a place as practicable, preferably at 70 degrees F or less.

3.3.3 HANDLING HOLES. Pipe lifting holes are permitted only on reinforced concrete storm sewer pipe 24 inches or larger in diameter that is not being installed below expected high water. One preformed handling hole is permitted on straight lengths of pipe, less than 48" in diameter, and two on pipe 48" and larger in diameter. After the pipe has been laid, the handling holes shall be promptly plugged with non-shrink epoxy grout applied to the interior and exterior to provide a water-tight seal. The Owner reserves the right to prohibit handling holes.

3.3.4 TRACER WIRE. All non-metallic pipe shall be marked with Tracer Wire.

SECTION 3.4.0 - POLYVINYL CHLORIDE (PVC) SEWER PIPE AND FITTINGS

3.4.1 REQUIREMENTS. Pipe and fittings furnished under this classification shall meet the requirements of ASTM D3034 and F679 (12454C). Type ASTM D3034 SDR 35 only will be accepted for sewer mains, 8" through 18". Building sewers (laterals) shall be ASTM D3034 SDR 26. Installation is to be in accordance with ASTM D2321. The maximum allowable depth of bury shall be 20 feet unless greater depths are approved in writing by the Engineer.

3.4.2 DIMENSIONS. The dimensions of the pipe shall be in accordance with the following table for SDR 35.

The wall thickness shall not be less than 97% of that specified in the following table:

PVC PIPE DIMENSIONS			
Outside Diameter (inches)			
Nominal Size	**Average**	**Tolerance on Average**	**Minimum Wall Thickness (inches)**
8"	8.400	+/- 0.012	0.240
10"	10.500	+/-0.015	0.300
12"	12.500	+/-0.018	0.360
15"	15.300	+/-0.023	0.437
18"	18.701	+/-0.028	0.536

3.4.3 MARKING. Each length of pipe shall be clearly marked as follows in intervals of 10 feet or less and each fitting shall be marled as follows:

1. Manufacturer's name or trademark
2. Nominal pipe size
3. ASTM Designation D3034 or F679
4. The legend, "Type PSM SDR 35 PVC Sewer Pipe"

3.4.4 TRACER WIRE. All non-metallic pipe shall be marked with Tracer Wire.

3.4.5 FITTINGS. Fittings such as saddles, elbows, tees, wyes and others shall be of material, construction and joint design corresponding to the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe.

3.4.6 JOINTS. Only State approved rubber gaskets joints complying with ASTM F477 shall be used. Assembled joints shall pass the performance tests specified in ASTM D3212.

3.4.7 MANHOLE ENTRIES. Flexible, watertight, pipe-to-manhole seals shall be furnished and installed at all manholes. The cost shall be included in the unit price per foot of pipe.

3.4.8 DEFORMATION REQUIREMENTS. PVC pipe deforms rather than breaks. The Contractor will be required to pull an approved go-no-go device through the pipe. Testing shall be completed before placing finished surface.

If testing occurs within 30 days of backfill, maximum deflection shall not exceed 5 percent. When testing occurs more than 30 days after backfilling, maximum deflection shall not exceed 7.5 percent. The testing device dimensions shall be as follows:

TESTING DEVICE DIMENSIONS FOR PVC PIPE			
Nominal Size (inches)	**Base ID**	**Minimum Diameter (inches)**	
		5% Deflection	**7.5% Deflection**
8	7.67	7.28	7.09
10	9.56	9.08	8.85
12	11.36	10.79	10.51
15	13.90	13.20	12.85
18	16.98	16.13	15.70

The device must pass through the entire section in one pass when pulled by hand without the use of excessive force. In case of failure to meet the test requirement, the faulty section must be repaired.

SECTION 3.5.0 – HIGH DENSITY POLYETHYLENE (HDPE) STORM SEWER PIPE AND FITTINGS

3.5.1 PIPE REQUIREMENTS: Pipe shall have smooth interior and annular exterior corrugations. Pipe and fittings shall meet the requirements of AASHTO M-252 (4”-10”) and 12- through 60-inch shall meet AASHTO M294, Type S or SP ASTM F2306. Manning's "n" value for use in design shall be 0.012. Pipe shall be ADS N-12 or approved equal as manufactured by Advanced Drainage System, Inc.

3.5.2 MATERIAL PROPERTIES: Pipe and fittings shall be made of virgin polyethylene compounds that comply with the cell classification 424420C for 4- through 10-inch diameters, or 435400C for 12- through 60-inch diameters, as defined and described in ASTM D3350, except that carbon black content should not exceed 4%. The 12- through 60-inch virgin pipe material shall comply with the notched constant ligament-stress (NCLS) test as specified in Section 9.5 and 5.1 of AASHTO M294 and ASTM F2306 respectfully.

3.5.3 DIMENSIONS. The dimensions of the pipe shall be in accordance with the following table:

NOMINAL DIAMETER, IN													
Pipe I.D., in	4	6	8	10	12	15	18	24	30	36	42	48	60
Pipe O.D., in	4.8	6.9	9.1	11.4	14.5	18	21	28	36	42	48	54	67

*Pipe O.D. values are provided for reference purposes only, values stated for 12- through 60-inch are ± 1 inch

3.5.4 MARKING. Each length of pipe and or fitting shall be clearly marked as follows in intervals of 10 feet or less and each fitting shall be marled as follows:

1. Manufacturer’s name or trademark
2. Nominal pipe size
3. ASTM Designation AASHTO M 252, AASHTO M 294, or ASTM F2306
4. Plant designation code
5. Date of Manufacture or an appropriate code

3.5.5 TRACER WIRE. All non-metallic pipe shall be marked with Tracer Wire.

3.5.6 FITTINGS. Fittings shall conform to AASHTO M294 or ASTM F2306. Fabricated fittings shall be welded at all accessible interior and exterior junctions. Fittings such as saddles, elbows, tees, wyes, and others shall be of material, construction and joint design corresponding to the adjacent pipe. Approved adapters shall be provided for transitions to other types of pipe.

3.5.7 JOINTS. Pipe shall be joined with a watertight joint meeting the requirements of AASHTO M 252, AASHTO M294 or ASTM F2306. The 4- through 60-inch pipe shall be watertight and pass performance tests according to the requirements of ASTM D3212. Gaskets shall meet the requirements of ASTM F477. Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly. Only State approved “O-Ring” rubber gaskets joints complying with ASTM F477 shall be used.

3.5.8 MANHOLE ENTRIES. Flexible, watertight, pipe-to-manhole seals shall be furnished and installed at all manholes. The cost shall be included in the unit price per foot of pipe.

3.5.9 INSTALLATION: Installation shall be in accordance with ASTM D2321 and manufacturer’s installation guidelines.

SECTION 3.6.0 - DUCTILE IRON PIPE

3.6.1 REQUIREMENTS. All pipe furnished under these specifications shall conform to AWWA C-151 or ANSI A21.51 for ductile iron pipe and be Pressure Class 350 unless otherwise specified. Joints shall meet the requirements of AWWA C-111.

3.6.2 DESCRIPTION. Pipe and fittings shall be made with bell and spigot ends adaptable for use of a rubber gasket slip joint. They shall be straight and of true circular section with their inner and outer surface concentric.

3.6.3 COATING. The pipe shall have a cement mortar lining per AWWA C104 and internal and external asphaltic coating per AWWA C-151, Section 51.8. The thickness of the standard cement lining shall be 1/16” for sizes 3” to 12” in diameter, inclusive, and 3/32" for sizes 14” through 24”.

The asphaltic coating shall be applied over the cement lining on the inside of the pipe and an asphaltic seal coat shall be applied on the exterior of all pipe and fittings. The coating shall be smooth, tough and tenacious, and impervious to water without any tendency to scale off and shall not be brittle.

3.6.4 MARKINGS. Each pipe shall have the weight and class designation or thickness conspicuously painted on it. In addition, the manufacturer’s mark and year in which the pipe was cast and the letters “DI” or the word “Ductile” shall be distinctly cast or stamped on the face or interior of the bell.

3.6.5 PUSH-ON JOINTS. All rubber gaskets shall be Tyton, Fastite or approved equal and conform to AWWA C-111 or ANSI 21.11 for Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.

Gaskets shall be furnished in sufficient number for all joints. Sufficient joint lubricant shall be furnished by the manufacturer with the gaskets. Mechanical joints shall be provided where specified.

3.6.6 INSTALLATION PROCEDURES

A. Rubber Gasket Joints

1. The main shall be joined by means of a compression type push-on rubber gasket unless otherwise specified.

2. The bell and spigot of each pipe shall be wiped clean and dry. The gasket shall be inserted, large round end first, into the gasket seat inside of the bell.

3. A thin film of non-toxic lubricant shall be applied to the inside surface of that portion of the gasket which comes in contact with the entering pipe and the spigot up to the insertion line. The only type of lubricant to be used shall be that recommended by the pipe manufacturer.

4. Extreme care shall be exercised when lowering the pipe into place to avoid foreign material from adhering to the spigot, bell or gasket. The entering pipe shall be placed in approximate alignment with the receiving bell and inserted until it just makes contact wish the gasket. Sufficient pressure shall be applied on the entering pipe until the spigot end sockets in the bell. This can be accomplished by one of the following methods:

   a. A leverage bar or other approved method shall be used on pipe 12 inches in diameter or smaller.

   b. A jack and two choker-slings, or other approved method, may be used on pipe larger than 12 inches in diameter.

5. Whenever it is necessary to deflect pipe from a straight line, either in the vertical or horizontal plane, the amount of deflection shall not exceed the following:

MAXIMUM PERMISSIBLE DEFLECTION IN LAYING PUSH-ON JOINT PIPE						
Size of Pipe (inches)	Maximum Permissible Deflection Per Length (inches)			Approximate Radius of Curve Produced by Succession of Joints (feet)		
	LENGTH					
	16-Foot	18-Foot	20-Foot	16-Foot	18-Foot	20-Foot
3	17	19	21	185	205	230
4	17	19	21	185	205	230
6	17	19	21	185	205	230
8	17	19	21	185	205	230
10	17	19	21	185	205	230
12	17	19	21	185	205	230
14	10	11	12	300	340	380
16	10	11	12	300	340	380
18	10	11	12	300	340	380

B. Mechanical Joints

1. Where specified, the water main shall be jointed by means of a mechanical joint assembly.

2. The last 8 inches of the outside of the spigot and inside of the bell shall be thoroughly cleaned of all foreign matter and painted with a soap solution. The ductile iron gland shall then be slipped on the spigot end with the lip extension toward the socket or bell end. The rubber gasket shall be painted with the soap solution and placed on the spigot end with the thick edge toward the gland.

3. Nuts and bolts used in the joint assembly shall be made of high-strength, low-alloy, corrosion resistant steel having the characteristics specified in AWWA C-111 Section 11.6.5.

4. The entire section of the pipe shall be pushed forward to seat the spigot end in the bell. Care shall be taken to locate the gasket evenly around the entire joint. All nuts may be tightened with a suitable torque-limiting wrench. The torque for various sizes of bolts shall be as follows:

Bolt Size (inches)	Range of Torque (ft.-lbs.)
5/8	45-60
3/4	75-90
1	100-120
1-1/4	120-150

Nuts shall be tightened alternately in order to produce an equal pressure on all parts of the gland. After a joint is assembled and securely tightened, the entire joint shall be double wrapped in polyethylene encasement per AWWA C105, loosely held in place with tape.

3.6.7 CERTIFICATION BY MANUFACTURER. At the Engineer's request, the manufacturer shall furnish certification data representing each class of pipe furnished. The certification report shall clearly state that all pipe furnished meets the appropriate AWWA and ANSI specification.

SECTION 3.7.0 - POLYETHYLENE WRAP

3.7.1 REQUIREMENTS. Unless otherwise specified, all ductile iron pipe shall be enclosed in a polyethylene film. Polyethylene Wrap shall conform to AWWA C-105 or ANSI A21-5. Film shall be Class "C" – Black, with a minimum nominal thickness of 0.008 inches (8 mils). Tape for securing the film shall be a thermoplastic material with a pressure sensitive adhesive face capable of bonding to metal, asphaltic coating, and polyethylene. Tape shall have a minimum thickness of 8 mils and a minimum width of one inch.

3.7.2 DESCRIPTION. The polyethylene wrap shall be free as is commercially possible of gels, streaks, pinholes, particles, of foreign matter and undispersed raw materials. There shall be no other visible defect such as holes, tears blisters or thinning out at folds.

3.7.3 CERTIFICATION BY MANUFACTURER. When requested, manufacturers shall furnish certification detailing the conformance of the material to the requirements of AWWA C-105/ANSI A21.5.

3.7.4 INSTALLATION. The polyethylene wrap shall be cut approximately 2 feet longer than the length of the pipe section. After assembling the pipe joint, the polyethylene shall be overlapped approximately 1 ft. and at all joints sealed with approved adhesive tape. Additional taping shall be used at 3 ft. intervals along the pipe. Any rips, punctures, or other damage to the polyethylene shall be prepared immediately with adhesive tape. All copper service connections shall be wrapped for a distance of 3 feet from the centerline of the main. Before installing the polyethylene wrap the exterior of the pipe shall be free of foreign material.

3.7.5 WRAPPING OF SPECIAL FITTINGS AND VALVES. When valves, tees, crosses, etc. cannot be wrapped practically in a tube, a double wrap of flat sheet or split tube shall be used. The wrap shall extend approximately 18 inches beyond all joints. All seams shall be taped securely.

3.7.6 BACKFILL AROUND POLYETHYLENE WRAPPED PIPES. The bedding and cover material shall be placed with care so as to prevent damage to the polyethylene wrap. Any rips or punctures in the wrap shall be repaired immediately.

SECTION 3.8.0 - POLYVINYL CHLORIDE (PVC) PRESSURE MAIN

3.8.1 GENERAL. PVC pressure main shall meet the requirements of AWWA C900. Forcemain pipe shall meet the requirements of AWWA C900 or ASTM D2241. Watermain pipe shall be AWWA C900 SDR 18.

3.8.2 PRODUCT. Pipe shall be suitable for use at hydrostatic working pressures of 150 psi and sustained pressures of 500 psi at 73 degrees F. All pressure pipe must meet requirements as set forth in NSF Standard 61 and bear the NSF seal for potable water pipe. Provisions must be made for contraction and expansion at each joint with a rubber ring and integral thickened bell as part of each joint. Pipe and fitting must be assembled with a non-toxic, approved lubricant. No solvent weld or fusion joints are permitted. Laying length shall be 20 feet. The outside diameter shall be equal to cast iron pipe (CIOD).

3.8.3 MARKINGS. Markings on the pipe shall include the following: Nominal pipe size, type of plastic pipe material, SDR number, AWWA Designation with which the pipe complies, and the manufacturer's name.

3.8.4 TRACER WIRE. All non-metallic pipe shall be marked with Tracer Wire.

3.8.5 LAYING OF PVC PIPE. The laying of PVC pipe shall be as specified with the additional following requirements.

A. Pipe Surfaces. The inside and outside surface of each length of pipe shall be free from nicks, scratches, and other surface defects and blemishes. The pipe shall be homogeneous throughout and free of any bubbles, voids, or inclusions.

B. Jointing Areas. The jointing areas of the barrel of each length of pipe shall be free from dents or gouges.

C. Gaskets. The rubber gasket shall be supplied by the manufacturer and conform to the requirements of ASTM F477.

D. Lubricant. Sufficient pipe lubricant shall be supplied by the manufacturer for use with each joint. A light film of lubricant shall be applied to each pipe spigot before insertion into bell.

E. Jointing Pipe. The bell end of the pipe shall be free of dirt or other foreign matter. The gasket shall be inserted with the painted edge facing toward the end of the bell. After lubricating the spigot end, each length of pipe shall be pushed home individually. The use of the backhoe bucket bearing directly against the pipe to force the spigot is not allowed. The pipe shall be positioned so that the reference mark on the spigot end is in line with the bed end.

F. Cutting Pipe. PVC pipe shall be cut at right angles to the centerline of the pipe with an approved saw or mechanical cutter. A course hand file or an approved machining tool shall be used for beveling the end similar to the factory beveled edge as supplied by the manufacturer. A reference mark equal to that as shown on the pipe of similar size supplied by the manufacturer shall be made at the proper distance from the cut end.

G. Deflection. Maximum deflection shall not exceed that recommended by the manufacturer. Bell design will not allow deflection at the joint.

H. Storage. The pipe shall be stored on the job site protected from direct sunlight and excessive heat. Stored pipe shall be covered with tarps.

3.8.6 USE FOR HYDRANT LEAD. PVC pipe is not to be allowed for hydrant leads. All hydrant leads shall be ductile iron pipe Pressure CI 350.

3.8.7 CERTIFICATION BY MANUFACTURER. At the Engineer's request, the manufacturer shall furnish certification data representing each SDR of pipe furnished. The certification report shall clearly state that all pipe furnished meets the appropriate AWWA or ASTM Specification.

SECTION 3.9.0 – HIGH DENSITY POLYETHYLENE (HDPE) PRESSURE MAIN

3.9.1 PIPE AND FITTINGS The pipe supplied under this specification shall be high performance, high molecular weight, high density polyethylene pipe as manufactured by Phillips Driscopipe, Inc. (Driscopipe 1000), Flying "W" Plastics, Inc. or equal and shall conform to the Plastic Pipe Institution Standards, AWWA C906 and ASTM D3350 (cell classification of PE 345434C).

Dimensions and workmanship shall conform to ASTM F714. The fittings supplied under this specification shall be molded from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe or shall be manufactured using a polyethylene compound having a cell classification equal to or exceeding the cell classification of the pipe supplied under this specification. To ensure compatibility of polyethylene resins, all fittings supplied under this specification shall be of the same manufacture as the pipe being supplied.

3.9.2 PHYSICAL PROPERTIES OF PIPE COMPOUND

A. Density - The density shall be no less than 0.904 gms/cm^3 as referenced in ASTM D1505.

B. Melt Flow - Melt flow shall be no greater than 0.15 gms/10 minutes when tested in accordance with ASTM D1238 - Condition E. (Melt flow shall be no greater than 4.0 gms/10 minutes when tested in accordance with ASTM D1238 - Condition F.)[1]

C. Flex Modulus - Flexural Modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D3350.

D. Tensile Strength at Yield - Tensile strength shall be 3,200 to less than 3,500 psi as referenced in ASTM D638.

E. ESCR - Environmental Stress Crack Resistance shall be in excess of 1,500 hours (5,000 hours) with zero failures when tested in accordance with ASTM D1693 - Condition C.

F. Hydrostatic Design Basis shall be 1,600 psi at 23^o C when tested in accordance with ASTM D2837.

3.9.3 CERTIFICATION. The pipe supplier shall furnish certification stating that the pipe furnished meets the above requirements.

3.9.4 REJECTION. Polyethylene pipe and fittings shall be rejected for failure to meet any of the requirements of this specification.

3.9.5 PIPE DIMENSIONS. Pipe supplied under this specification shall have a nominal DIPS (ductile iron pipe size) OD unless otherwise specified. **The pipe shall be Dimension Ratio 11 (DR 11)** unless otherwise specified by the Engineer.

3.9.6 CONSTRUCTION PRACTICES

3.9.6.1 HANDLING OF PIPE. Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking should be done in accordance with the pipe manufacturer's recommendations. The handling of the pipe should be done in such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.

3.9.6.2 REPAIR OF DAMAGED SECTIONS. Segments of pipe having cuts or gouges in excess of 10% of the wall thickness of the pipe should be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion joining method.

3.9.6.3 PIPE JOINING. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements, alignment and fusion pressures.

3.9.6.4 HANDLING OF FUSED PIPE. Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable type chokers should be avoided. Nylon slings are preferred. Spreader bars should be used when lifting long fused sections. Care should be exercised to avoid cutting or gouging the pipe.

SECTION 3.10.0 – HDPE WATER SERVICES

3.10.1 REQUIREMENTS. All High Density Polyethylene (HDPE) pipe furnished under these specifications shall be ¾" through 2" and conform to AWWA C901, ASTM D2737 and NSF 14 & 61. The pipe shall be blue with a clear core, SDR 9, CTS, 200 psi and produced with PE 3408 resin. HDPE water tubing shall only be used in outdoor, buried applications.

3.10.2 MARKINGS. The pipe shall be labeled with the ASTM standard, NSF certification logo, SDR and pressure rating.

3.10.3 STORAGE AND HANDLING. Pipe shall be stored so as to prevent damage by crushing or piercing and UV exposure. Do not expose pipe to excessive heat. Do not drag across rough ground and avoid hitting or placement on sharp objects when storing or placing in service. Before pipe is installed each length should be inspected for transport damage, cuts, punctures or excessive abrasion. Damage from shipping or handling may have occurred. Flush the pipe before final connections.

3.10.4 JOINING PIPE. Join pipe with external compression fittings that seal via internal gaskets and external clamping. Heat fusion is also acceptable for joining HDPE to HDPE. The compression fittings shall be specifically designed for heavy wall HDPE CTS pipe. HDPE pipe is chemically inert and there are no known glues that can be used to create effective joints that will stand up over long periods of time. DO NOT LUBRICATE THE PIPE. Lubrication other than water shall not be used. Use of any lubricants, sealing compounds or pipe dope voids all pipe producers' warranties and may cause damage to the pipe.

3.10.5 TRACER WIRE. Furnish, install and test tracer wire per 3.11.0. Pipe with an integral tracer wire may be substituted for the external tracer wire.

3.10.6 COLD WEATHER. HDPE pipe may develop some ovality from storage and in cold weather it may be necessary to warm the pipe to enable the assembly of a compression fitting. To warm HDPE DO NOT USE A TORCH TO HEAT THE PIPE and never heat the plastic above 200 degrees F. The recommended method for warming the pipe is immersion in hot water or warming with a hair dryer. Use care to warm the inside of the pipe was well as the outside and never heat the outside of the pipe only. HDPE does not become brittle when subjected to extremely low temperatures, but does become much stiffer. The workability of HDPE increases with higher temperatures. The heavier the wall thickness of the pipe being used the more stiffness will be encountered in cold weather. It is recommended that the pipe be kept in a warm environment prior to installation in the winter months to keep it as flexible as possible.

3.10.7 CONSTRUCTION PRACTICES

3.10.7.1 TRENCH PREPARATION. Install per ASTM D2774, F645-95 and ASTM D2321. Pipe shall be surrounded with a bed of sand or other backfill material that is 1/2" or less in diameter and is free from rocks, sharp objects and debris that might puncture the pipe. The base of the trench must be lined first with sand and the pipe uniformly and continuously supported for its entire length. Pipe should be placed with at least 7 foot cover. Trenches may be curved to avoid obstacles with the minimum trench radius being 24 inches. HDPE's natural flexibility allows it to be routed around objects to eliminate fittings.

3.10.7.2 THERMAL EXPANSION AND CONTRACTION. HDPE is stable in its cross section dimensions, but can expand and contract longitudinally with changing temperatures. Allowing HDPE pipe to naturally "snake" in a trench will provide adequate slack to compensate for this expansion and contraction. A minimum 12 inches of slack per 100 feet of pipe shall be provided to compensate for thermal changes.

3.10.7.3 INSTALLATION IN CONTAMINATED SOILS. Hydrocarbon fuels, certain organic solvents and a few other chemical compounds can have a serious negative effect on HDPE if present in sufficient quantity. Water is vulnerable to contamination by absorption of chemicals through the walls or joints. HDPE pipe shall not be installed in areas when chemical contamination is present or suspected or if chemical spills are likely to occur.

3.10.7.4 PRESSURE TESTING. All HDPE water service pipe shall be pressure tested with water before backfilling. All joints and connections shall be inspected for leaks. After backfilling, the water service lines shall be pressure tested with the mains per Section 8.10.0.

3.10.7.5 DIRECTIONAL DRILLING. The boring tool should create a hole that is 25% larger than the outside diameter of the pipe to allow the pipe to pass through the soil without being abraded or subjected to excessive tension. All bends and changes in elevation should be within the guidelines established for HDPE pipe and tubing. Pipe installed with directional boring equipment shall not be subjected to tensions greater than the tensile strength of the product being used. Excessive tension can cause damage to polyethylene pipe. The nominal tensile strength of ¾" pipe is 877 psi and 1" pipe 1,463 psi. In some soils it may be necessary to grout the bore hole to prevent collapse prior to installation of the pipe. Grouting will maintain the hole and reduce friction that could damage the pipe. It is essential to maintain an open hole during pipe installation and avoid sharp rocks or debris that cut or scrape the pipe causing damage that may reduce the wall thickness.

NOTE: Pipe laying in sunlight can increase significantly in temperature often to temperatures as high as 140° F. If pipe is bored at elevated temperatures, it is possible that the pipe will stretch or elongate. If the pipe stretches greater than 5% the pipe is damaged and is not capable of carrying its rated pressure. Pipe that has been stretched greater than 5% shall be removed and replaced.

SECTION 3.11.0 – TRACER WIRE

3.11.1 GENERAL. To assist in locating buried pipe, a tracer wire shall be laid for all non-metallic pipe.

3.11.2 TYPE OF WIRE.

3.11.2.1 GENERAL. Tracer wire shall be #12 AWG, annealed copper-clad high carbon steel. Copper shall conform to ASTM B170, oxygen free electrolytic copper. The HDPE coating shall be solid blue (potable water), purple (non-potable water), green (sanitary sewer) or brown (storm sewer). The wire shall be rated for 30 volts. Wire surface shall be free of any defects. Tracer wire shall be as manufactured by Copperhead Industries, LLC; Pro-line Safety Products; or equal.

3.11.2.2 OPEN TRENCH. Tracer wire for open trench shall be high strength tracer wire with a minimum breaking load of 450 pounds, with 30 mil thick HDPE insulation. Copper clad wire shall conform to ASTM B910 / B910M.

3.11.2.3 HORIZONTAL DIRECTIONAL DRILLING / BORING Tracer wire for directional drilling / boring shall be extra high strength tracer wire with a minimum breaking load of 1,150 pounds, with 45 mil thick HDPE insulation. Copper clad wire shall conform to ASTM B869.

3.11.2.4 PIPE BURSTING/SLIP LINING. Tracer wire shall be 7 x 7 Stranded Copper Clad Steel, Extreme Strength with 4,700 lb. break load, with minimum 50 ml HDPE insulation thickness.

3.11.3 PLACEMENT OF WIRE. The wire shall be placed along the bottom half of the pipe and attached in 5 foot intervals with at least 3 overlapping wraps of standard PVC electrical tape or plastic ties.

3.11.4 WIRE TO SURFACE. Wire shall surface every 400 to 500 feet. Wire shall typically surface at hydrants, services or locator boxes.

3.11.5 WIRE TERMINATION/ACCESS. All trace wire termination points must utilize an approved tracer wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose. All grade level/in-ground access boxes shall be appropriately identified with “sewer” or “water” cast into the cap and be color coded. A minimum of 2 feet of excess/slack wire is required in all tracer wire access boxes after meeting final elevation. All tracer wire access boxes must include a manually interruptible conductive/connective link between the terminal(s) for the trace wire connection and the terminal for the grounding anode wire connection. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.

A. Sewer Serice Laterals on Public Property – Tracer wire must terminate at an approved grade level/in-ground trace wire access box, located at the edge of the road right-of-way, and out of the roadway.

B. Sewer Service Laterals on Private Property – Tracer wire must terminate at an approved above-ground tracer wire access box, affixed to the building exterior directly above where the utility enters the building, at an elevation not greater than 5 vertical feet above finished grade, or terminate at an approved grade level/in-ground trace wire access box, located within 2 linear feet of the building being served by the utility.

C. Hydrants – Tracer wire must terminate at an approved above-ground tracer wire access box, properly affixed to the hydrant grade flange with HDPE or stainless steel bracket, (affixing with tape or plastic ties is not acceptable).

D. Long-runs, in excess of 500 linear feet without service laterals or hydrants – Tracer wire access must be provided utilizing an approved grade level/in-ground trace wire access box, located at the edge of the road right-a-way, and out of the roadway. The grade level/in-ground tracer wire access box shall be delineated using a minimum 48” polyethylene marker post, color coded per APWA standard for the specific utility being marked.

3.11.6 CONNECTORS. Minimize splices. Tracer wire systems shall be installed as a single continuous wire except where using approved connectors. All tracer wire shall be joined using dielectric silicon filled connectors to seal out moisture and corrosion and to prevent any uninsulated tracer wire exposure. Connectors shall be as manufactured by **Copperhead Industries, LLC; Pro-line Safety Products; 3M DBR**; or equal. All mainline trace wires must be interconnected in intersections, at mainline tees and mainline crosses. At tees, the three wires shall be joined using a single 3-way lockable connector. At crosses, the four wires shall be joined using a 4-way connector. Use of two 3-way connectors with a short jumper wire between them is an acceptable alternative. Direct bury wire connectors shall include 3-way lockable connectors and mainline to lateral lug connectors specifically manufactured for use in underground trace wire installation. Connectors shall be dielectric silicon filled to seal out moisture and corrosion, and shall be installed in a manner so as to prevent any uninsulated wire exposure. Non locking friction fit, twist on or taped connectors are prohibited.

3.11.7 GROUNDING. Tracer wire must be properly grounded at all dead ends/stubs. Grounding of tracer wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20 feet of #14 red HDPE insulated copper clad steel wire connected to anode (minimum 0.5 lb.) specifically manufactured for this purpose, and buried at the same elevation as the utility. When grounding the tracer wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the tracer wire, at the maximum possible distance. When grounding the tracer wire in areas where the tracer wire is continuous and neither mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the tracer wire. Do not coil excess wire from grounding anode. In this installation method, the grounding anode wire shall be trimmed to an appropriate length before connecting to tracer wire with a mainline to lateral lug connector. Where the anode wire will be connected to a tracer wire access box, a minimum of 2 feet of excess/slack wire is required after meeting final elevation.

3.11.8 TESTING. All new tracer wire installations shall be located using typical low frequency (512Hz) line tracing equipment, witnessed by the contractor, Engineer and facility Owner as applicable, prior to acceptance. This verification shall be performed upon completion of rough grading and again prior to final acceptance of the project. Continuity testing in lieu of actual line tracing is not acceptable.

3.11.9 PAY ITEMS. Tracer wire, accessories and grounding anodes shall be included in the price per foot of pipe, hydrant or sewer or water service.

SECTION 3.12.0 - FITTINGS FOR PRESSURE PIPE

3.12.1 REQUIREMENTS. Fittings shall be compact ductile iron fittings and conform to AWWA C-110 or ANSI A-21.20. The entire fitting shall be double wrapped in polyethylene encasement per AWWA C105, loosely held in place with tape.

3.12.2 DESCRIPTION. Push-on joints and mechanical joints shall conform to AWWA C-111. Mechanical joint bolts and nuts shall be made of high-strength, low-alloy, corrosion resistant steel having the characteristics specified in Section 11.6.5 of AWWA C-111. Flange joints and bell-and-spigot joints shall conform to AWWA C-110. "Compact" fittings shall be cast from ductile iron grade 70-50-05 in accordance with AWWA/ANSI C-110/A21.10 and AWWA/ANSI C-153/A21.53 with exception of the manufacturer's proprietary design dimensions and weights. The working pressure rating shall be 350 psi.

3.12.3 COATING. Interior and exterior coatings shall conform to AWWA C-110. Ductile iron compact fittings which shall be cement lined per AWWA Cl53 and AWWA C104 or epoxy coated per AWWA C550 and C116.

3.12.4 MARKINGS. The manufacturer's mark, nominal diameters of openings and the number of degrees or fraction of the circle on all bends, shall be distinctly cast on the fittings. The pressure rating shall be distinctly marked on the fitting. Ductile iron fittings shall have the letters "DI"" or "DUCTILE" cast on them.

3.12.5 JOINT RESTRAINTS. Concrete blocking shall be used only where specifically approved by the Engineer in advance. Joint restraints shall be **EBBA Iron MegaLug Series 1100 (DI Mech Joint), Series 2000 (PVC Mech Joint), Series 1500 (PVC Slip Joint) or Series 1700 (DI Slip Joint); Uni-Flange Series 1300C (Mech Joint), Uni-Flange Series 1390C (Slip Joint); or equal.** Only qualified welders having adequate skill and experience in the practice of manual electric arc welding and cutting ferrous materials shall be allowed to field weld and field cut restrained joints for Ductile Iron pipe. Pipe manufacturers' recommended procedures shall be followed while exercising reasonable care.

3.12.6 PAY MEASUREMENT FOR SPECIAL FITTINGS. Fittings for watermain shall be paid per pound for each fitting installed. The weight shall be based on the tables in ANSI/AWWA C153 *Ductile-Iron Compact Fittings for Water Service*. Joint accessories, including restraints, are incidental. Unless otherwise specified, the cost of fittings for forcemain shall be included in the price bid per foot of pipe.

SECTION 3.13.0 - COPPER WATER TUBING

3.13.1 REQUIREMENTS. Tubing furnished shall be Type "K" soft annealed seamless copper tubing and shall conform to the specification of the ASTM Designation B-88. Water services shall be 1" unless otherwise specified.

3.13.2 MARKINGS. The name or trademark of the manufacturer, and a mark indicative of the type, shall be permanently and plainly marked on tubing at intervals not greater than 10 feet

3.13.3 FITTINGS. Fittings for copper tubing shall be of cast brass, "lead free", containing not more than 0.25 percent lead. Solder and flux shall be "lead free", containing not more than 0.2 percent lead. Fittings must be uniform in wall thickness and strength and free from any defect which may affect their serviceability. Each fitting shall be permanently and plainly marked with the name or trademark of the manufacturer. Fittings must be flared or compression-type only. Unions shall be extra heavy 3-part unions only.

SECTION 3.14.0 - SERVICE BOXES AND CURB STOPS

3.14.1 REQUIREMENTS. Curb boxes shall comply with AWWA C-800 and ASTM B-62 and match the Owner's standard. If the Owner does not have a written standard the service boxes shall be Minneapolis pattern, extension type with 1-1/4" upper section, stationary rods and lid **Mueller H-10300, A.Y. McDonald 5614** or equal with telescope movement 6" in excess of trench depth. Curb stops shall be **Mueller H-1504-2 (3/4"-1") or H-15209 (1-1/4", 1-1/2", and 2"), A Y. McDonald 610**4. The castings shall be free from blowholes, porosity, hard spots, shrinkage defects or cracks, or other injurious defects and shall have a normal smooth casting finish. The Contractor shall note that the stop must be installed in the proper direction. All curb boxes shall be suitable for the specified depth (7 0" minimum cover) without the use of an extension section.

3.14.2 SHUT-OFF RODS. Shut-off rods and pentagon keys are to be included at the rate of one each per 100 curb stops installed with a minimum of one each. Upper section is to be 1-1/4" minimum. Bottom section is to be threaded to fit the stop. A stationary rod is to be included with each box.

SECTION 3.15.0 - CORPORATION STOPS AND SADDLES

3.15.1 REQUIREMENTS-CORPORATION STOPS. Corporation stops must comply with AWWA C-800 and ASTM B-62 and match the Owner's standard. If the Owner does not have a written standard, the corporation stops must be **Mueller H-15008** or **H-15023, A.Y. McDonald 4701** or equal, complete with necessary couplings.

3.15.2 REQUIREMENTS-SADDLES. Saddles must comply with AWWA C-800 and ASTM B-62 and match the Owner's standard. If the Owner does not have a written standard the saddles must be **Smith Blair 372**, **JCM 502** or equal. Saddles must be used with all corporation stops on all types of pipe materials. Deleting saddles on DI pipe will be considered on a case-by-case basis and approval will require a reduction in the bid price.

SECTION 3.16.0 - VALVES AND BOXES

3.16.1 REQUIREMENTS. Valves shall meet AWWA C-509, be of uniform make and match the Owner's standard. If the Owner does not have a written standard the valves shall be full-opening, iron-body, non-rising stem, open to left, resilient seated wedge-type valves. All internal ferrous metal surfaces shall have an approved 6-mil, non-toxic, epoxy coating. Valves shall be **American Flow Control 2500, Mueller #A-2360-20, Clow F-6100 epoxy-lined**, or equal. End connections shall be mechanical joints..

3.16.2 BOXES. The adjustable cast iron valve box with removable cover shall be **Tyler Pipe 6860** or equal, screw-type, three (3) pieces consisting of a cover, a tube extension section, a bottom section, and a base. The base must completely overlap the valve box. The length shall be such that when extended to the specified depth of cover (7 ft. minimum), there shall be not less than 6” overlap remaining between the top section and the next section.

3.16.3 VALVE BOX ADAPTERS. Each valve box shall be provided with a valve box adapter to help support the box on top of the valve to eliminate shifting and settling. The adapter shall be as manufactured by **Adapter, Inc**. or equal and include the epoxy coated support and a rubber gasket between the valve body and adapter. The adapter shall fit the valve furnished.

3.16.4 TYPE. Detailed information with regard to construction and operation shall be furnished to the Engineer for approval before purchase by the Contractor. If the proposed valves do not meet the Engineer’s approval, the Contractor shall provide acceptable valves without additional cost to the Owner.

3.16.5 JOINTS. Valves and fittings shall be furnished with mechanical joints consisting of high quality cast iron glands, rubber gaskets, and corten alloy bolts.

3.16.6 WRENCHES. The Contractor shall furnish one extension wrench for each 100 valves installed, with a minimum of one. Each wrench shall be 18” longer than the depth of the trench. The wrenches shall fit the valves furnished.

SECTION 3.17.0 - FIRE HYDRANTS

3.17.1 REQUIREMENTS. All hydrants shall comply with AWWA C502 and match the Owner's standard. If the Owner does not have a written standard fire hydrants shall be 5” self-draining, dry-barrel type. Each hydrant shall have one (1) pumper connection to match local standards and two 2-1/2" nozzles with National Standard threads and National Standard operating nut (1” pentagon). Hydrants shall open to the left (counter-clockwise). All hydrants shall be designed for the specified depth of cover (7’0” minimum) and include a 16” traffic section so the pumper connection shall be 24” above grade. Hydrants shall be of uniform make. Hydrants and fittings shall be furnished with mechanical joints, consisting of high quality cast iron glands, rubber gaskets, and corrosion-resistant bolts.

All hydrants shall be painted solid red or match the local standard. Hydrants shall be the local standard, **Waterous Pace**r or equal.

Hydrants shall be equipped with a 16” traffic flange located approximately 2” above grade to permit a “break away” of the hydrant barrel and stem.

3.17.2 REPAIR KITS. On projects with over 25 hydrants, one (1) repair kit shall be furnished. Each repair kit shall contain at least 2 gaskets, 1 break off flange, 1 break off standpipe to match hydrants furnished, 1 sleeve coupling (2 halves), 1 stud coupling and 4 nut couplings.

3.17.3 CONNECTIONS. All hydrant connections shall consist of 6" Pressure Class 350 ductile iron pipe connecting the hydrant directly to the main line fitting. Whenever the main is 6" in diameter or over or a valve is provided on the lead, retainer glands or metal strapping shall be provided from the main line tee to the hydrant. Concrete blocking for the hydrant is required.

3.17.4 TYPE. The hydrants shall match the local standard and meet these specifications unless approved in writing. Detailed information with regard to construction and operation shall be furnished to the Engineer before purchase by the Contractor. If the hydrants do not meet the Engineer's approval, the Contractor shall provide acceptable hydrants without additional cost to the Owner.

3.17.5 WRENCHES. One standard wrench for operating the hydrants shall be furnished for each order of 25 or more hydrants.

SECTION 3.18.0 - PRECAST REINFORCED CONCRETE MANHOLES

3.18.1 REQUIREMENTS. Refer to Section 4.4.0 for additional storm and sanitary manhole requirements. Precast reinforced concrete manhole risers and tops shall meet the minimum requirements of ASTM Designation C-478. Precast manhole tops shall be the eccentric cone type except for water valve manholes where concentric cones shall be used. Flat top slabs may be used only with the permission of the Engineer. The cone section and barrel above a depth of 12'0" shall not be less than 5" thick with not less than 0.098 square inches per lineal foot of reinforcing. For manholes below this depth, barrel sections shall have not less than 0.32 square inches per lineal foot. Concrete strength shall be not less than 4,000 psi. Tongue and groove joint will be required.

All manholes are to be 48" I.D. crowned to a 24" opening as shown on the detailed sketches. The cone is to start 18" below finished grade.

Concrete is to be used for all manhole bases. All sanitary sewer pipe shall be connected to precast manholes by means of a flexible, watertight pipe-to-manhole seal except as provided in Section 4.4.6.

3.18.2 JOINTS. Manhole sections shall be jointed with a 1-inch butyl rubber gaskets or butyl rubber rope. A 1/2" rope shall be used between adjusting rings in the chimney. Where manhole sections are known to be below high groundwater, double 1" butyl rubber ropes shall be used. The rubber-type gaskets shall meet the requirements of ASTM C-443. Gasketed, flexible, water-tight connections shall be provided for all inlet and outlet pipes. Refer to Section 4.4.0.

3.18.3 STEPS. Manhole steps shall be steel-reinforced plastic installed by the manufacturer and shall be **Neenah R1981J, M.A. Industries PS 1** or equal. The steps shall meet the requirements of OSHA 1910.27 and ASTM 478. The spacing of the steps shall be 16" with an allowable tolerance of 1" plus or minus. Minimum embedment shall be 3".

3.18.4 CHIMNEY SEAL. All new sanitary manholes shall be provided with an external chimney seal, **Cretex X85, Adapter, Inc. Internal/External Adapter Seal** or equal. Provide an extension as necessary for complete chimney coverage. All new storm sewer manholes shall have the frame and chimney area wrapped with geotextile fabric.

3.18.5 REJECTION. Precast reinforced concrete manhole risers and tops shall be subject to rejection on account of failure to conform to any of the specification requirements. In addition, individual sections of manhole risers and tops may be rejected because of any of the following reasons:

A. Fractures or cracks passing through the shell, except for a single end crack that does not exceed the depth of the joint.

B. Defects that indicate imperfect proportioning, mixing, and molding.

C. Surface defects indicating honey-combed or open texture.

D. Damaged ends, where such damage would prevent making a satisfactory joint.

E. Manhole steps out of line, or not properly spaced.

F. Infiltration.

G. The internal diameter of the manhole section shall not vary more than 1% from the nominal diameter.

H. Any continuous crack having a surface width of 0.01 inch or more and extending 12 inches or more.

SECTION 3.19.0 - MANHOLE CASTINGS

3.19.1. REQUIREMENTS. All manhole castings shall conform to the requirements of ASTM A-48, Class 35B (Gray Iron) with tensile strengths of 35,000 psi. Castings shall be of uniform quality and free from blowholes, shrinkage, distortion, cracks or other defects. They shall be smooth and well cleaned by shot blasting.

All manhole castings shall have machined bearing surfaces, concealed pick holes and be self-sealing.

The manhole castings shall be **Neenah R1550 Type B, Campbell 1269 Heavy Duty** or equal. Where water-tight covers are specified, the castings shall be equal to **Neenah R1916-C with anchor bolts and bolt holes, Campbell Type A No. 1502 with gasket** or equal.

For any project including 25 or more manhole covers, one (1) “cover lift” to open the cover through the concealed pickhole is to be furnished by the Contractor.

SECTION 3.20.0 - GRASS SEED

3.20.1 REQUIREMENTS. Grass seed used shall conform to the following standards by weight and be uniformly distributed at a rate of 7#/1000 square feet.

Kentucky Blue Grass	33.5%	Minimum Germination 78%
Red Creeping Fescue	14.4%	Minimum Germination 90%
Perennial Rye	25.0%	Minimum Germination 90%
Annual Rye	24.6%	Minimum Germination 93%
Inert Material (Maximum)	7.0%	
Weeds (Maximum)	0.5%	
Crop Seeds (Maximum)	4.2%	

SECTION 3.21.0 - PORTLAND CEMENT

3.21.1 REQUIREMENTS. All cement shall be delivered to the mixing site in original packages bearing the type and name brand or stamp of the manufacturer. Bulk cement may be used at ready-mixed concrete plants only. Cement containing lumps or crusts shall not be used.

Cement shall conform to the *Standard Specifications for Portland Cement* (ASTM C-150 Type I, IL or IA) or *Standard Specifications for High Early Strength Portland Cement* (ASTM C-150 Type III). No flyash shall be used in any structure in contact with potable water.

3.21.2 MINIMUM CEMENT IN CONCRETE. Where using standard separated fine and course aggregates, and regardless of the design strength adopted and compressive strength test results actually obtained, the minimum amount of standard Portland cement per cubic yard of concrete in place shall be not less than 6 bags per cubic yard. This mix is expected to yield 28-day strengths in excess of 4,000 psi. If test results indicate 28-day strengths less than 4,000 psi, but greater than 3,000 psi, the Contractor will be required to verify the design mix. If test results indicate 28-day strengths less than 3,000 psi, the Contractor will be required to remove and replace the substandard concrete. The water/cement ratio shall be based on 6 bags cement per cubic yard and not more than 6.0 gallons water per bag of cement.

SECTION 3.22.0 - CONCRETE AGGREGATE

3.22.1 FINE AGGREGATE REQUIREMENTS. Fine aggregate shall conform to ASTM C33 and consist of sand having clean, hard, durable, uncoated grains free from deleterious substances and shall range in size from fine to coarse within the limits indicated below, percentage by weight:

Sieve (Specification E 11)	Percent Passing
3/8 inch (9.5mm)	100
No. 4 (4.75mm)	95 to 100
No. 8 (2.36 mm)	80 to 100
No. 16 (1.18mm)	50 to 85
No. 30 (600µm)	25 to 60
No. 50 (300µm)	5 to 30
No. 100 (150µm)	0 to 10

Not more than 45% shall pass a standard size sieve and be retained on the next smaller standard sieve.

The fineness modulus shall be between 2.3 and 3.1. Aggregates containing silt and clay particles in excess of 2% by weight shall not be used.

3.22.2 COARSE AGGREGATE REQUIREMENTS. Coarse aggregate shall conform to ASTM C33 and consist of gravel, crushed stone, crushed gravel or other approved inert materials with similar characteristics or combination thereof, having clean, hard, durable, uncoated particles free from deleterious matter. Recycled material shall not be used. ***The use of crushed limestone for coarse aggregate will not be permitted unless it meets the following specific conditions:***

TEST	Maximum %
Soundness (Magnesium Sulfate) – Loss at 5-cycles of any fraction of the coarse aggregate (ASTM C33)	5
Abrasion Loss (LAR), ASTM C131	40
Absorption (ASTM C127)	2.5
Freezing and Thawing Loss (16 cycles)	12
Deleterious Substances	
1. Clay Lumps & Friable Particles (ASTM C142)	0.3
2. Soft Particles (ASTM C235)	2.5
3. Total Spall Material	1.5
4. Total of 1, 2 & 3	3.0

Coarse aggregate shall range in size from fine to coarse within the following percentages by weight without exceeding the maximum size.

ASTM C33, TABLE 2, SIZE 467 FOR GREATER THAN 12" THICK		
Sieve		Percent Passing
Inches	Millimeters	
2	50.00	100
1-1/2	37.50	95-100
3/4	19.00	35-70
3/8	9.50	10-30
No. 4	4.75	0-5

ASTM C33, TABLE 2, SIZE 57 FOR 12" THICK OR LESS		
Sieve		Percent Passing
Inches	Millimeters	
1-1/2	37.50	100
1	25.00	95-100
1/2	12.50	25-60
No. 4	4.75	0-10
No. 8	2.36	0-5

The maximum size of the aggregate shall be adjusted to not larger than one-fifth of the narrowest dimension between sides of the member for which the concrete is to be used nor larger than three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. For unreinforced slabs, the maximum size or aggregate shall not be larger than one-third the slab thickness.

SECTION 3.23.0 - READY-MIXED CONCRETE (Refer to Section V for Detailed Concrete Specifications)

3.23.1 REQUIREMENTS. Ready-mixed concrete may be used if it complies with these specifications and ASTM C94. The Engineer shall have free access at all times to the batching and mixing plant for sampling of all materials and inspection of work performed for this project. Concrete shall be delivered in water-tight containers which will not permit segregation of the materials. When delivered, the concrete shall be uniform throughout the mass.

3.23.2 DELIVERY TIME. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours, or before the drum has been revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates or the introduction of the cement to the aggregates, unless a longer time is specifically authorized by the Engineer. In hot weather, or under conditions contributing to quick stiffening of the concrete, a time less than 1-1/2 hours may be specified by the Engineer. When a truck mixer is used for the complete mixing of the concrete, the mixing operation shall be within 30 minutes after the cement has been intermingled with the aggregates.

3.23.3 DELIVERY TICKET. With each load of concrete delivered to the job, there shall be furnished by the ready-mix plant a duplicate delivery ticket, one copy to be retained by the Contractor and the other given to the Engineer. The ticket shall indicate the mix and the time the mixing water was added to the cement and aggregates and the time the cement was added to the aggregates as outlined in ASTM C94, paragraph 16.

3.23.4 CONCRETE REQUIREMENTS AND TESTS.

Concrete Cylinders: During progress of the work for each concrete pour of 15 cubic yards or more, a set of 3 standard 6" concrete cylinders shall be made and one tested at 7 days and one tested at 28 days. Cylinders will also be collected and tested for each change of mix. The remaining cylinders may be tested if necessary to confirm results. These cylinders are to be moist closet cured at the designated laboratory per ASTM C31, Paragraph 9.2. Reports shall be sent to the Engineer.

Curing: When the Contractor requests early form stripping or backfilling, additional cylinders shall be field cured and tested at intervals to be determined by the Engineer. These cylinders shall be field cured under conditions equivalent to the concrete in the structure per ASTM C33, Paragraph 9.3. Results will be used to determine when the concrete has attained sufficient strength for form stripping and/or backfilling.

Required Strength: Where using standard separated fine and coarse aggregates, and regardless of the design strength adopted and compressive strength test results actually obtained, the minimum amount of standard Portland cement per cubic yard of concrete in place shall not be less than 6 bags per cubic yard. The specified 6 bag mix is expected to yield 28 day strengths in excess of 4,000 psi. If test results indicate 28 day strengths less than 3,000 psi, the Contractor will be required to remove and replace the substandard concrete. The Engineer may allow in-place field tests to measure compressive strength to assist in determining the extent of removal. These tests shall be conducted by an independent laboratory at the Contractor's expense.

Standard Slump Tests: A uniform consistency shall be continuously maintained in consecutive batches of concrete. Slump tests per ASTM C143 shall be conducted at the rate of one per 15 cubic yards poured. Slump shall be maintained between 1" and 4" (1/2" tolerance) or the batch shall be rejected. These slump numbers do not apply if an approved high-range water reducer is used.

Air Content Tests: Where more than 50 cubic yards of concrete are being used, air content shall be field tested by the air pressure method, ASTM C231. The Contractor shall secure an acceptable air content test apparatus for the use of the Engineer on the job site. Air content shall be 6.0 $\pm$ 1% by volume unless other content is determined by proportioning tests.

SECTION 3.24.0 – CRUSHED ROCK AND BEDDING SAND

3.24.1 GRADED CRUSHED ROCK. Crushed rock for bedding or unsatisfactory subgrade replacement shall be made from crushing sound limestone, dolomite ledge rock, or other rock materials of regional significance. The material shall be hard, tough, and durable. The crushing process shall produce material of which 85% to 100% of the particle shall have at least one machine fractured face. Crushed pea gravel will be acceptable if it meets these criteria.

GRADATION REQUIREMENTS FOR 3/8 INCH CRUSHED ROCK	
Sieve Sizes	**Percentage Passing by Weight**
1/2 inch	100
3/8 inch	90-100
No. 8	0-15
No. 30	0-3

GRADATION REQUIREMENTS FOR 3/8 INCH CRUSHED ROCK (ASTM C33 SIZE NO. 67)	
Sieve Sizes	**Percentage Passing by Weight**
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

When larger crushed rock is required to improve soil stability or drainage, it shall meet the following requirements:

2-1/2 AND 2 INCH CRUSHED ROCK	
Sieve Sizes	**Percentage Passing by Weight**
2-1/2 Inch Size (ASTM C33 Size No. 2)	
1 inch	100
2-1/2 inch	90-100
2 inch	35-70
1-1/2 inch	0-15
3/4 inch	0-5
2 Inch Size (ASTM C33 Size No. 2)	
2-1/2 inch	100
2 inch	90-100
1-1/2 inch	35-70
1 inch	0-15
1/2 inch	0-5

3.24.2 BEDDING SAND. Bedding sand shall consist of durable particles ranging in size from fine to coarse in a substantially uniform combination. Unwashed bank-run sand, rejected concrete sand, and crushed bank-run gravel will be considered generally acceptable under this specification. The presence of approximately 6% of fine clay or loam particles is desirable, but clay or loam lumps are not permitted. The maximum moisture content shall be 10%.

GRADATION REQUIREMENTS FOR BEDDING SAND	
Sieve Sizes	**Percentage Passing by Weight**
1 inch	100
No. 16	45-80
Material Finer than No. 200	2-10

SECTION 3.25.0 - SILT FENCE

3.25.1 REQUIREMENTS. Filter fabric silt fences shall be 24 inches to 36 inches high supported by 5 foot long, 4 inch diameter posts (or equivalent) and a wire fence 42 inches high. Posts shall be driven at least 6 inches into the ground at a maximum spacing of 10 feet. The wire fence shall be 14 gauge minimum with 6 inch maximum mesh spacing: The filter fabric and wire mesh shall be stapled or wired to the upstream side of the posts. The bottom of the filter fabric shall be anchored by extending 8 inch of fabric into a 4 inch x 4 inch trench on the upstream side and backfilled and compacted. The wire mesh shall extend at least 2 inches into the trench.

3.25.2 GEOTEXTILE FABRIC. The geotextile filter fabric shall be woven or non-woven polyester, polypropylene, stabilized nylon, polyethylene or polyvinyl chloride. For non-woven fabric the contractor may use needle punched, heat bonded, resin bonded, or combinations of all 3. Submit a certificate of compliance certifying that the geotextile conforms to the following:

Test Requirement	Method	Value
Minimum Grab Tensile Strength	ASTM D 4632	120 lb
Minimum Grab Tensile Strength	ASTM D 4632	100 lb
Maximum Apparent Opening Size	ASTM D 4571	No. 30 Sieve
Minimum Permittivity	ASTM D 4491	0.05 s^{-1}
Minimum Ultraviolet Stability (500 hours)	ASTM D 4355	70%

3.25.3 INSTALLATION, MAINTENANCE AND REMOVAL. The silt fence shall be erected prior to starting any construction operation which might cause any sedimentation or siltation at the site of the proposed silt fence

The silt fence shall, when possible, be constructed in an arc or horseshoe shape with its ends pointing up slope. Silt fences shall be removed, as determined by the Engineer, after the slopes and ditches have ban stabilized and turf developed to the extent that future erosion is unlikely. Materials remaining after removal shall become the property of the Contractor and shall be disposed of off the project site. Removal may require a special trip after the area is fully stabilized.

The Contractor shall inspect all silt fences immediately after each rainfall and at least daily during prolonged rainfall. Any deficiencies shall be immediately corrected by the Contractor. In addition, the Contractor shall make a daily review of the location for silt fences in areas where construction activities changes the earth contour and drainage runoff to ensure that the silt fences are properly located for effectiveness. Where deficiencies exist, additional silt fences shall be installed.

Sediment deposits shall be removed when the deposit reaches approximately one half of the volume capacity of the silt fence and disposed of as directed by the Engineer. Any sediment deposits remaining in place after the silt fence is no longer required shall be dressed to conform to the existing grade and the area topsoiled, fertilized and seeded as required. All sediment deposits shall be removed from wetlands.

SECTION 3.26.0 - CRUSHED AGGREGATE BASE COURSE

3.26.1 GENERAL REQUIREMENTS. No crushed concrete, reclaimed asphaltic material, reprocessed material or blended material shall be used unless approved in writing by the Engineer. Crushed aggregate base coarse shall consist of 85% or greater virgin aggregates meeting the requirements of Wisconsin DOT Section 301. Test results shall be furnished upon request.

3.26.2 GRADITION REQUIREMENTS. The crushed rock aggregate shall meet the Wisconsin DOT Section 305 Dense Graded Base requirements as follows:

PERCENT PASSING BY WEIGHT			
Sieve Size	**3-Inch**	**1-1/4 Inch**	**3/4 Inch**
3	90-100	-	-
1	60-85	-	-
1-1/4 inch	-	95-100	-
1 inch	-	-	100
3/4 inch	40-65	70-93	95-100
3/8 inch	-	42-80	50-90
No. 4	15-40	25-93	35-70
No. 10	10-30	16-48	15-55
No. 40	5-20	8-28	10-35

Unless the plans or Special Provisions specify otherwise, do the following:

1. Use 1¼-inch base in top 4 or more inches of base. Use 3-inch base or 1¼-inch base in the lower base layers.

2. Use ¾-inch base in the top 3 inches of the shoulder.

SECTION 3.27.0 – BREAKER ROCK

3.27.1 GENERAL REQUIREMENTS. Furnish crushed rock from an approved source substantially free of unconsolidated overburden materials, topsoil, organic materials, and other deleterious materials. An approved source is any source with acceptable DOT test results for wear and soundness on record. The Engineer may also approve other sources as follows:

A. Mined or quarried waste rock that, in the engineer's opinion, is hard, durable, and when processed through a primary crusher, will produce a material similar in size and texture to that produced from a quarry face.

B. Material from a new or untested quarry or pit that the engineer judges hard, durable, and comparable to that normally used to produce aggregate.

C. The engineer may reject material produced from concrete or from non-durable rock such as sandstone, shale, slate, disintegrated granite, or heavily weathered rock of any type.

3.27.2 GRADATION REQUIREMENTS. The crushed rock aggregate shall meet the Wisconsin DOT Section 312 Select Crushed Material requirements as follows:

Sieve Size	% Passing by Weight
5"	90-100
1.5"	20-50
No. 10	0-10

Furnish a material that has a minimum of 50 percent, by count, of the number of particles retained on the 1 1/2 inch (37.5 mm) sieve with at least 2 fractured faces. The engineer will assess select crushed material acceptability based primarily on visual inspection.

3.27.3 BASIS OF PAYMENT. Breaker Rock is paid by cubic yard or ton of rock, as specified. The pay item includes both the excavation and removal of existing material and the furnishing, placing and compaction of the replacement breaker rock.

SECTION IV
CONSTRUCTION – STORM AND SANITARY SEWERS

Note: This standard specification includes general requirements for construction of sewers and is supplemented and superseded by the Special Provisions that apply to this project only.

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SECTION 4.1.0 - LAYING OF PIPE SEWERS

4.1.1 LINE AND GRADE FOR OPEN-CUT CONSTRUCTION. The exact grade and line for the pipe will be staked by the Engineer with the assistance of the Contractor, and must be strictly followed.

A. Laser Beam. The Contractor may use the laser beam method of maintaining line and grade upon demonstrating to the Engineer that a qualified operator will handle the equipment during the course of the construction.

When “in the pipe” method is used, batter boards will be required to check the installation of the first 100 feet of pipe, and the Contractor shall check the line and grade at any additional points at which offset stakes have been placed or whenever so requested by the Engineer.

If bending of the beam due to air temperature variations becomes apparent with “in the pipe” units, a fan shall be provided to circulate the air. However, air velocity shall not be so excessive as to cause pulsating or vibrating on the beam. If, in the opinion of the Engineer, the beam cannot be accurately controlled, this method of setting line and grade shall be abandoned.

When the above-ground method is used, the setup shall be checked with the three batter boards including one set at the upstream manhole. If the laser has a gradient indicator, two boards may be used to check the setup. The batter board at the upstream manhole shall be retained to check into as pipe laying progresses.

The beam alignment shall be verified at least once during the first half of each day’s work shift and at least once more during the second half of each day’s work shift. More frequent checks of the beam will be provided when warranted by job conditions.

B. Grade Boards. The Contractor shall, at his own expense, furnish and set the line and grade boards. A substantial stake shall be driven on each side of the trench on a line at right angles to each stake of the primary line. A substantial straight and even-edged 2x6 inch board shall be nailed or clamped to the stakes in a level position and at some even foot height above the grade line of the proposed sewer. The centerline of the proposed sewer shall be located by measurement from the primary line stake and marked upon the board. Not less than three (3) such lines and grade boards shall be set and immediately checked visually for errors in line and grade. As each additional board is placed, it shall be checked visually for error in line and grade. At least three (3) boards shall be maintained at all times. During the laying of the pipe, a line shall be fastened to the boards at the center of alignment marks and pulled sufficiency tight to remove any noticeable or measurable sag. The alignment of each pipe shall be obtained by measuring down from the line by means of an approved type of grade pole. Methods other than that described above may be used only if approved by the Engineer.

4.1.2 POINT OF COMMENCEMENT AND DIRECTION OF LAYING. The point of commencement for laying of sewer pipe shall be the lowest point in the proposed sewer line. The pipe shall be laid with the bell end of bell and spigot pipe or with the receiving groove end of tongue and groove pipe pointing upgrade. Any other procedure shall be followed only with permission of the Engineer. When a new sewer is to be connected to an existing sewer not terminating in a manhole, the Contractor shall uncover the end of the existing sewer to allow any adjustments in line and grade to be made before any pipe is laid.

4.1.3 GENERAL REQUIREMENTS FOR LAYING PIPE. All pipe shall be laid uniformly to line and grade so that the finished sewer will present a uniform bore. Noticeable variations from true alignment and grade will be considered sufficient cause for rejection of the work. All pipe to be laid in open-cut trench shall have 6-inch minimum clearance between the outside face of the pipe-barrel and the face of the trench wall or sheathing.

4.1.4 JOINING DISSIMILAR MATERIALS. Maintenance couplings and adapters for sanitary sewer pipe shall be Fernco or equal. Adapters will be permitted for repair or rehabilitation work only.

If adapters are not available for the type or size of pipe involved, the joining method must be approved by the Engineer.

4.1.5 FITTINGS FOR BUILDING SEWER CONNECTIONS.

A. Fittings for building sanitary sewer connections shall be single branch wyes, unless otherwise specified. The diameter of the smallest branch of the wye shall be either 4” or 6” as determined by the Owner, and the other

wye shall be of the diameter of the sewer line in which it is laid. Except where necessary to maintain basement service, the wye branch is to be laid with the branch at an angle of 45 degrees with the horizontal.

B. Fittings for reconnections to re-laid sewers shall be as specified.

C. All connection fittings not to be extended shall be sealed with a water-tight stopper having the same joint as the spigot ends of pipe on the main sewer.

D. Building sewer connections at locations where wyes are not provided shall be made by a saddletee of a type approved by the Engineer. The connection shall be water-tight and not protrude into the sewer.

4.1.6 PLUGS. Before extending a sanitary sewer, the Contractor shall provide a plug in the existing sewer immediately downstream of the point of connection. This plug shall be left in place until the new sewer has been cleaned of accumulated water and debris and has been accepted.

All tees, wyes, sockets and bell and spigot pipe sewers 24 inches or smaller in diameter for future sewers shall be plugged with PVC plugs or a watertight stopper having the same joint as the spigot end of the pipe on the main sewer.

4.1.7 BEDDING CONDITIONS. The maximum width of trench excavation at the top of the pipe shall be the outside diameter of the pipe plus 24 inches. All pipe, regardless of the material, class, size, or use shall follow the same specifications. Refer to the Standard Details on the plans.

A. Soil Classifications. For purposes of pipe installations, the following Soil Classification Chart applies. The Engineer shall make the initial determination of soil classification for the native soils. If the Contractor contests the determination or the material is difficult to classify, the Contractor shall retain an Independent Laboratory to determine classifications. The Soil Classification of the native material is used to guide the pipe installation. In general, coarse grained soils like sands and gravels are suitable for most foundation, bedding, haunching and backfill purposes and fine-grained soils like clay may be suitable for foundation and backfill but not for bedding.

SOIL CLASSIFICATION CHART			
COARSE-GRAINED SOILS			
Gravels			
GW	Well-graded gravel	More than 50% of coarse fraction retained on #4 sieve	Clean gravels <5% fines
GP	Poorly graded gravel		
GM	Silty gravel		Gravel with fines >12% fines
GC	Clayey gravel		
Sands			
SW	Well-graded sand	50% or more of coarse fraction passes #4 sieve	Clean sands <5% fines
SP	Poorly graded sand		
SM	Silty sand		Sand with fines >12% fines
SC	Clayey sand		
FINE-GRAINED SOILS			
Silts and Clays			
CL	Lean clay	Liquid limit <50	Inorganic
ML	Silt		
OL	Organic clay/silt		Organic
CH	Fat clay	Liquid limit >50	Inorganic
MH	Elastic silt		
OH	Organic clay/silt		Organic
PT	Peat		Organic

B. Soil Classes For purposes of pipe installations, the following Soil Classes applies to the backfill material.

SOIL CLASSES			
Crushed rock			Class I
Clean coarse grained	SW, SP, GW, GP	<12% passing #200	Class II
Coarse grained with fines	GM, GC, SM, SC	>12% passing #200	Class III
Silty Clay	CL, ML	>30% retained #200	Class III
Fine grained	CL, ML	<30% retained #200	Class IV
	MH, CH, CL, CH, PT		Class V

C. Use of Soil Classes for Pipe Foundation, Embedment and Backfill

USE OF SOIL CLASSES FOR FOUNDATION, EMBEDMENT AND BACKFILL	
Foundation	4" minimum in rock excavation
Foundation - no water	Class I, II or III or subcut and use Class I or II
Foundation - with water	Class I or II or subcut and use Class I or II
Bedding	4" minimum Bedding Sand (3.24.2) or 3/8" Crushed Rock (3.24.1)
Embedment - no water	Class I, II or III or replace with Class I, II or III
Embedment - with water	Class I or II or replace with Class I or II
Foundation and embedment	No rock > 1", No Class IV or V
Final Backfill	No rock > 8"
Embedment includes Bedding, Haunching and Initial Backfill	

Compaction for Foundation, Embedment and Backfill	
Foundation	90% Modified Proctor
Bedding	90% Modified Proctor
Haunching	90% Modified Proctor
Initial Backfill	90% Modified Proctor
Final Backfill	90% - 95% Modified Proctor

D. Bedding and Backfill Description

Foundation. No subcutting is required where a stable foundation of suitable soil exists below the bedding. If the bottom of the excavation is of undesirable material, such as rock, Class IV or Class V material, or the presence of ground water causes a condition which cannot adequately support the work, an additional four inches (4") of foundation shall be excavated and backfilled with compacted Class I or II and included as part of the standard sections at no additional payment. In the event that it becomes necessary to extend the foundation to a greater depth, such additional amount of removal and replacement will be paid for as Unsatisfactory Subgrade.

Bedding. Place a minimum of 4" Bedding Sand or 3/8" Crushed rock below the invert of the pipe to provide a firm, stable, uniform bed.

Haunching. Work in and tamp the haunching material in the area between the bedding and the underside of the pipe before placing and compacting the rest of the haunching up to the springline. Use Class I, II or III material. If water is present, use Class I or II only.

Initial Backfill. Place and compact the initial backfill to 12" above the crown of the pipe. Increase initial backfill to 24" in rock excavation.

Embedment - Haunching and Initial Backfill. Use special care near the pipe and only select Class I, II or III material free of debris, frozen material or organic matter. If water is present, use Class I or II only. No rock greater than 1" shall be placed in the embedment. No Class IV or V material shall be placed in the embedment. Compact the embedment to 90% Modified Proctor using vibration or impact for Class I and II and impact for Class III. Use care to avoid damage to the pipe.

Final Backfill. Use native material with no rock greater than eight inch (8"). Compact in 12" lifts (Class I and II) or six inch (6") lifts (Class III or IV) to 90% Modified Proctor in open fields and to six feet (6') deep and 95% Modified Proctor from six feet (6') deep to the surface in streets.

The base bid for pipe installation shall include furnishing and installing appropriate material for the first four inches (4") of Foundation and Embankment (Bedding, Haunching and Initial Backfill). Where appropriate, suitable material may be salvaged from within the trench or from other areas of the job.

Minimum Cover. The minimum cover for sewer shall be four feet (4') and the minimum cover for water and forcemain shall be seven feet (7'). Provide the minimum unless otherwise indicated on the plans.

E. Water Checks. To prevent water from following the granular backfill, provide a clay or bentonite water check at 100 ft. intervals.

4.1.8 FILL SECTIONS. Where the sewer is to be laid above the existing ground surface, the topsoil and other organic material to a depth of 12 inches shall be removed from a strip of ground centered on the sewer line and of width equal to twice the amount of height of the sewer flow line above the ground surface. An embankment of approved excavated material shall be constructed to the elevation of the top of the pipe. The material shall be placed in 6-inch layers and compacted by approved mechanical means to 95% Standard Proctor Density. The pipe shall then be laid to line and grade and properly bedded and jointed. Three feet of earth backfill shall be placed over the pipe and embankment. The side slopes of the embankment material and of the earth cover shall be no less than 1.5 horizontal to 1 vertical.

4.1.9 PROTECTION OF OPEN PIPE. During all intermissions in construction of the sewer, the open face of the last pipe laid shall be covered or bulkheaded to prevent sand, water, earth or other materials from entering the pipe.

4.1.10 PROTECTION OF NEW MORTAR JOINT. Water shall not be allowed to rise in or around, or pass over any mortar joint before it has substantially set. After a joint has been made, no weight shall be placed on the pipe until after the hand backfilling has been completed.

4.1.11 LAYING OF PIPE IN COLD WEATHER. Pipe-laying shall be discontinued whenever there is danger of the quality of work being impaired because of cold weather. The Contractor shall be responsible for heating the pipe and jointing materials so as to prevent freezing of joints. No pipe shall be laid on frozen ground.

When pipes are to be laid with rubber gaskets or resilient-type joints in cold weather, the gasket or joint material shall be sufficiently warmed so as to facilitate making a proper joint.

When pipes are to be laid with a solvent cemented joint in cold weather, care shall be taken to insure the removal of all ice and snow from the jointed area prior to the application of the solvent cement. Temperatures shall be above the minimum specified by the manufacturer.

4.1.12 ABANDONED SEWERS, DRAINS AND SEWER STRUCTURES. Sanitary and storm sewer mains and structures which are to be abandoned and not removed shall be filled with sand unless otherwise indicated on the plans. Service shall be maintained in such sewers until the Engineer shall order plugs placed. All existing sewers, manholes, catch basins and catch basin leads that are no longer in use shall be plugged with concrete and abandoned. All castings on such abandoned structures are the property of the Owner and shall be salvaged by the Contractor and delivered as directed. All abandoned manholes and catch basins shall be removed to a depth of 3 feet below the proposed or established grade or existing street grade, whichever is lower. The cost of abandonment shall be included in the unit price bid for new sewers.

4.1.13 CONNECTIONS TO EXISTING MANHOLES OR EXISTING SEWERS. The Contractor shall cut a new connection into an existing manhole or sewer structure where there is no connection, or where the connection is not to line or grade, or where the connection stub is of a different type of material and/or different joint than on the sewer which is to be extended. When connecting to an existing sewer or manhole connection stub that is of a different type of material and/or has a different type of joint than that of the material and/or joint of the new sewer to be extended, the Contractor shall have the option of using an approved Fernco watertight adapter for the joint.

4.1.14 BACKFILLING. Refer to Section 2.4.0 for backfilling and compaction requirements.

4.1.15 TRACER WIRE. All pipe shall be marked with Tracer Wire. The Tracer Wire shall be furnished and installed per Section 3.11 and the standard details.

SECTION 4.2.0 - BUILDING SANITARY SEWERS

4.2.1 WIDTH OF TRENCH. The minimum width of trench shall equal the outside diameter of the pipe barrel plus a clear width of 6 inches on each side.

4.2.2 SIZE. Standard building sewers are to be not less than 4 inches in diameter. All building sewers shall be laid in standard size unless a larger size is specified or required by State or local codes.

4.2.3 CONNECTING BUILDING SEWERS. Standard curve fittings and curve specials shall be used to connect building sewers to the wye of the main sewers. Curves shall be limited to 45, 30 and 22-1/2 degree angles and shall be placed so as to provide a smooth transition from the building sewer to the main sewer in the street. In general, a 30 degree bend will be required.

4.2.4 ALIGNMENT AND GRADE. The alignment of a building sewer shall be straight extending from the connection to the main sewer in a direction at right angles to the main sewer or as specified.

The standard grade shall be 1/8” per foot so as to provide maximum fall from the basement to the main sewer. The Contractor shall lay all laterals at this grade unless the property owner desires a shallower lateral. The request must be written, signed by the property owner and approved by the Engineer. The installation must be in accordance with the applicable plumbing code. Between the lot line and the sewer main, or riser pipe there from, the sewer shall be laid at a uniform slope not exceeding 1/2 inch per foot. Between the lot line and the building the slope shall not exceed 1/2 inch per foot, except for a change in elevation, which shall be made by use of 45 degree fittings.

Risers shall be installed when the maximum slope of 1/2 inch per foot would be exceeded between the lot line and the sewer main.

4.2.5 POINT OF COMMENCEMENT AND DIRECTION OF LAYING. The point of commencement for laying of building sewer pipe shall be at the connection in the main sewer. Building sewer pipe shall be laid with the bell-end of the pipe pointing upgrade. Any other procedure shall be followed only with the permission of the Engineer.

4.2.6 CONNECTION OF BUILDING SEWERS TO A MANHOLE. The building sanitary sewer shall not be connected to a manhole at an elevation of more than 24 inches above the invert of the outgoing sewer.

Where the difference in elevations is greater than 24 inches, the connection shall be made with an outside drop connection.

4.2.7 GENERAL REQUIREMENTS FOR LAYING PIPE. All building sewer pipe shall be laid in accordance with Section 4.1.0 with the exception that lasers or line and grade boards do not have to be used except if ordered by the Engineer. If the Engineer so orders the use of lasers or line and grade boards, they shall be furnished and set by the Contractor at no additional cost to the Owner to insure the correct line and grade of the proposed installation. All building sewers shall be installed by open cut unless pavement crossings interfere. Where building sewers are jacked or bored under pavement, the end must be exposed and checked for proper depth.

4.2.8 PIPE SUPPORT ACROSS TRENCHES. Where a building sewer crosses an existing trench up to 36" wide, a plank support shall be used, except where use of such planking is deemed unnecessary and waived by the Engineer. A 2" x 12" plank long enough to extend 1-1/2 feet on each side of the trench shall be used. A 4" sand cushion shall be placed between the plank and the pipe. For trench widths over 36", a wall of backfill concrete shall be provided.

4.2.9 RISERS. Whenever the excavation exceeds twelve (12) feet or at such points as may be directed by the Engineer, the Contractor shall install CL52 ductile iron risers by one of the following methods:

A. Straight wall trenches. A tee shall be inserted in the main at 45 degrees to the horizontal. A 45 degree bend and vertical pipe riser shall be installed to a point 9 feet below the surface and plugged. The tee, bend and riser pipe shall be encased in a minimum 6" envelope of concrete to a point 6" above the top of the main line sewer.

B. Sloping wall trenches. A tee shall be inserted in the main line at 45 degrees to horizontal and a pipe installed on a 45 degree angle to a point 9 feet below grade and plugged. The tee and sloping riser shall be encased in a minimum 6" envelope of concrete to a point 6" above the main line sewer.

Refer to the standard sketch for construction details. Riser size shall match lateral size.

If a unit price for risers is not provided, the unit price for wyes plus 50% will be paid for riser tees. Unit price for laterals will be paid for riser installations including elbow. Concrete backings shall be included in other unit prices offered.

4.2.10 EXTENSIONS, RELOCATIONS, DISCONNECTIONS, AND RECONNECTIONS OF BUILDING SERVICES. The Contractor will be furnished with available recorded measurements for the location of existing building sewers and water services. Existing service stop boxes, indications of old trenches and any other pertinent evidence also shall be used in their location.

The Contractor shall commence excavation for the location of the existing building sewers and water services at such point as the weight of evidence demands. In case the initial excavation for the location of existing building sewers and water services fails to uncover same, the Contractor, at no cost to the Owner, shall explore a distance of 10 feet in each direction, or a total of 20 feet, immediately in back of and parallel to the curb, or along the main.

In case the existing building sewers or water services cannot be located in these limits, and additional trenching is required, the Contractor shall make application to the Engineer for a written order for extra work, covering such additional exploratory trenching.

4.2.11 MARKING OF BUILDING SEWER. Ends of all building sewers are to be checked for proper depth by the Owner's representative before backfilling. The Contractor is to install a 2" x 2" x 5'0" stake directly over the end of each building sewer and drive the stake to 2" above grade.

4.2.12 RECORDS REQUIRED. The Contractor shall be responsible for furnishing exact information on wye locations, building sewer locations and building sewer depths at the property line to the Engineer for preparation of final records. Ties shall be provided. These Record Drawings shall be provided before final payment is released.

4.2.13 TRACER WIRE. All building sewer shall be marked with Tracer Wire teed off the mainline Tracer Wire. Extend the wire to the locator box and coil 5 feet extra for extension.

4.2.14 SEPARATION OF WATER SERVICE AND BUILDING SEWERS. Except as permitted below, the underground water service pipe and building sewer shall not be less than 10 feet apart horizontally and shall be separated by undisturbed or compacted earth. The water service pipe may be placed in the same trench with the building sewer under the following conditions:

A. The water service is 2” or less and installed concurrently with the building sewer.

B. The bottom of the water service pipe at all points shall be at least 12 inches above the top of the sewer line.

C. The water service pipe shall be placed on the solid shelf excavated at one side of the common trench.

D. The number of joints in the water service pipe shall be kept to a minimum.

SECTION 4.3.0 - RECONNECTING BUILDING SEWERS, STORM WATER DRAINS, AND UTILITY DRAINS

4.3.1 RECONNECTING EXISTING SEWERS, BUILDING SEWERS, AND DRAINS. Where a main sewer is to be abandoned and replaced, each existing sewer, building sewer, storm water drain, utility or other drain which is connected to the existing main sewer, whether active or apparently inactive, shall be provided with an outlet to the new sewer or appurtenance thereof. Where a building sewer or drain has been identified as abandoned, the Contractor shall omit a new outlet for same.

Existing storm water and utility drains which are to enter new manholes shall be connected by extending them from the last undisturbed intact pipe to the inside face of the manhole using pipe of equal size and type, laid on the same grade as the existing drain. The manhole shall be shaped to conduct sewage from the building sewer to the invert where such drains are to enter the new sewer directly; they shall be connected as set forth for existing building sewer connections to the new sewer. Clear water drains shall not be reconnected to the sanitary sewer without specific authorization.

Existing sanitary building sewers which are to enter new manholes shall be connected as indicated above for storm and utility drains, provided the elevation of the building sewer at the manhole is not more than 24 inches above the invert of the sewer. Where a sanitary building sewer enters the manhole above this elevation, the connection shall be made with an outside ductile iron pipe drop connection.

Where the existing building sewer is to enter the new main sewer approximately at spring line, the connection shall be made by joining the last undisturbed intact pipe of the building sewer to the new sewer with pipe of equal size and type laid at standard grade. As the difference in elevation between the existing building sewer and the new main sewer increases, a 45 degree bend shall be used in making the connection. Where the difference in elevation becomes substantial, the connection shall be made by first joining a straight length of pipe to the new sewer at the middle of the upper quadrant, and extending such pipe upward on an angle of 45 degrees to the approximate elevation of the building sewer. At this elevation, a 45 degree bend shall be inserted and the connection made to the existing building sewer.

All building sewers shall be reconnected to new sewers or manholes and shall be supported by a wall made of concrete, extending from the main sewer to the outside limit of trench. The wyes and all bends used in reconnecting the building sewers shall be encased in concrete.

4.3.2 BRANCH FITTINGS, PIPE, AND JOINTS. Branch fittings to be used for reconnecting existing building sewers and drains to the new sewer shall be wye branches placed so that the spur of the branch fittings makes an angle of 45 degrees with the horizontal or a lesser angle when the gradient of the building sewer or drain so requites

4.3.3 BASIS OF PAYMENT. When existing building sewers, storm water or other drains are to be connected to the new sewer or to new manholes, payment will be made at the price bid. In the event that there is no bid price for reconnecting building sewer and drains, a change order will be negotiated before the work is done.

SECTION 4.4.0 - MANHOLES

4.4.1 DEFINITION. Where the term manhole is used in the specification, it shall mean a structure which is placed in the sewer line to permit entry, inspection, cleaning and repairing of the sewer, the entrance to which is enclosed with a manhole frame and cover, as hereinafter specified.

4.4.2 LOCATION. Manholes shall be constructed at the locations and grades indicated on the sewer plans or as staked in the field.

4.4.3 GENERAL REQUIREMENTS. The following requirements shall apply to all manholes, regardless of size, type, or shape. Refer to Section 3.15.0 for materials specifications.

A. Manhole Excavation. The excavation shall be limited to the size required for the manhole to be constructed and shall be sheathed and braced as necessary.

B. Preparation of Subgrade. All undesirable material, such as organic soils, which cannot adequately support the manhole shall be removed below the normal manhole bottom and replaced with 3/4" graded crushed rock. The first 6 inches of crushed rock below the normal manhole bottom shall be placed and included in the cost of the manhole. In the event that it becomes necessary to extend the rock fill to a greater depth, such additional amount of rock will be paid for as unsatisfactory subgrade at the bid or negotiated price.

C. Manhole Inverts. The invert of the manhole shall be the same diameter as the larger of the adjoining sewers. The pipe or approved lagging shall be laid through the manhole and, if the pipe is left in place, the upper half shall be removed after the manhole is built.

D. Walls, Corbel, and Chimney. The precast concrete manhole wall shall be constructed at the specified diameter up to the beginning of the corbel section. From this point the manhole shall be corbelled in at approximately 1/2 inch horizontal to one inch vertical (eccentric) to the diameter of the manhole frame. The face of the manhole in which the steps are installed shall be kept vertical. Flat top slabs may be used only where specified or by permission of the Engineer. The elevation of the manhole frame shall be determined in the field. A chimney having a minimum height of 6 inches and a maximum height of 12 inches (top 2 rings 2") constructed of 2" or 4" precast adjusting rings shall be built on top of the corbel section or flat slab up to the elevation at which the frame is set. The Engineer reserves the right to increase or decrease the height of the chimney as required.

E. Castings. Manhole frames and covers shall be furnished and installed by the Contractor. The castings shall conform to the requirements of Section 3.16.0. The manhole frame shall be centered on the chimney and brought to grade. The frame/chimney joint shall be constructed as specified below.

F. Joints. Sanitary manholes shall be constructed with a Type I joint. Storm manholes shall be constructed with a Type-II joint.

1. *Type I - Mortar and butyl rubber seal.* A 1-inch butyl rubber rope shall be installed between the manhole frame and the top of the chimney and in all joints in the cone and barrel section. A 1/2 inch butyl rubber rope shall be installed between adjusting rings in the chimney. Where manhole sections are known to be below high groundwater, double 1-inch butyl rubber ropes shall be used in each joint. The surfaces that the butyl rubber rope win adhere to shall be clean and dry before the butyl rubber rope is installed. The butyl rubber rope shall first be installed in the center of the joint and compressed by the weight of the frame or other means. All joints in the chimney and cone shall be pointed up with mortar on the interior and exterior of the manhole as necessary to make a smooth, uniform surface.

2. *Type II - Mortar Joint.* The manhole frame shall be set in a bed of fresh mortar extending the full width of and continuously around the top of the chimney. The inner and outer faces of the mortar joint shall be trowel finished.

G. Steps. Manhole steps conforming to the requirements of Section 3.15.3 shall be installed in all manholes in excess of 4 feet deep, and shall be aligned so as to form a continuous ladder with steps equally spaced vertically in the completed manhole at a design distance of 16 inches on center. The steps shall project a minimum clear distance of 4 inches from the wan of the riser or cone section measured from the point of embedment The steps shall be placed as required with an allowable tolerance of one inch plus or minus.

H. Chimney Seal. All new manholes shall be provided with an external chimney seal, Cretex or equal. Internal chimney seals may be used where approved by the Engineer.

I. Connection for Future Sewers. Unless waived by the Engineer, where the sewer terminates in a dead-end manhole or where indicated on the sewer plans, manholes shall include connection pipes or bulkheaded openings in the manhole wall for future sewers, building sewers or drains. For sanitary manholes, a cored opening through the manhole wall shall be provided and the opening shall be capped. For storm sewers, the connection pipe shall be of the same type as specified for the sewer through the manhole and shall terminate in a bell, grooved or other type end having the same type of joint as provided on the sewer being constructed. The connection pipe, which shall not extend more than one foot outside the manhole well, shall be carefully set to line and grade and connected to the manhole. If no elevation is shown for the connection pipe, it shall be set at the invert of the outlet sewer and channeled in the direction of the flow. Unused connection pipe shall be plugged.

4.4.4 MANHOLE BASES. Concrete manhole bases shall be as follows:

A. Field Poured Base for Precast Manhole. The precast manhole bottom barrel section shall be set on concrete brick or solid block so that the bottom of this section is below the spring line of the outlet pipe, set for proper location and plumbed. The manhole base shall then be poured.

B. Precast Manhole with Integral Base. The excavation shall be deep enough so that after the bottom manhole barrel section with integral base has been placed thereon, set to grade and plumbed, there remains a 4-inch minimum depth of 3/8" graded crushed rock bedding material below the bottom of the base. The annular space between the manhole excavation and outside wall of the manhole shall be backfilled with 3/8" graded crushed rock bedding material up to the spring line of the incoming pipe. The invert shall not be poured until the manhole is completely built and backfilled. The invert shall be the same diameter as the larger of the adjoining sewers.

4.4.5 MANHOLE TEES. Manhole tees shall be made up of Precast Manhole sections and Reinforced Concrete Pipe meeting the requirements of Section III with the same strength as the mainline pipe. Manhole tees may be used only where specified

These manhole tees shall either be poured monolithically or poured separately and joined together such that the completed unit has the same strength as that of the adjoining pipe barrel and the concrete used to complete the section shall not spill or separate. Sufficient additional reinforcement shall be added around the connections during the manufacture and fabrication to prevent shearing or separation after installation.

Manhole tees shall be one of the following types:

A. Manhole Larger Than Sewer. Where the diameter of the manhole is greater than the diameter of the outlet sewer which is connected to it, the connecting sewers shall be set in the manhole so there remains a minimum distance of 12 inches between the bottom of the manhole and invert of the outgoing pipe. When the manhole is poured as a single unit, the distance between the bottom of the manhole and the invert of the outgoing pipe may be reduced to a minimum of two times the pipe wall thickness or five inches, whichever is greater.

B. Manhole Smaller Than Sewer. Where the diameter of the manhole is equal to or less than the diameter of the outlet sewer to which it is connected, a saddle-type manhole may be used. The face of the manhole riser in which the steps are installed shall be kept even with one side of sewers larger than the manhole. Steps shall be drilled into the wall of the pipe below the spring line. These steps shall be placed on Winch centers with the first or bottom step located 10 to 22 inches above the flow line and the top steps located 8 inches below the top of the manhole tee.

4.4.6 PIPE TO MANHOLE CONNECTION. The manhole connection of pipe sewers shall be accomplished by one of the following methods:

A. Rigid Pipe. When rigid pipe is connected to either a concrete brick, block, or precast manhole within the manhole base, it shall be supported on brick or solid concrete block. Where the pipe enters the manhole above the manhole base, it shall be supported from the wall of the manhole back to the face of the first pipe joint bell with a wall of backfill concrete, brick, or solid concrete block columns. The connecting pipe shall then be neatly bricked or concreted into the manhole wall. The connection shall be watertight on sanitary manholes.

B. Plastic Pipe. All plastic sanitary sewer pipe shall be connected to precast manholes by means of an approved, flexible, and watertight pipe-to-manhole seal. This seal shall meet the physical requirements of ASTM C-443 and the performance requirements of both ASTM C425 and C443. Pipe entering a manhole through this seal shall not be rigidly supported. To maintain the seal flexibility, that portion of the annular space between the pipe and the manhole wall below the spring line of the pipe, shall be plugged with butyl rubber gasket material prior to the placing of concrete in the manhole.

4.4.7 OUTSIDE DROP MANHOLE. Where a sanitary sewer or building sewer enters a manhole 24 inches or more above the invert of the outgoing sewer, the incoming sewer shall be connected to the manhole by means of an outside drop connection. Refer to the standard detail

The drop pipe shall be the same diameter as the incoming sewer unless otherwise specified.

For 8" drops, a precast concrete horseshoe is to be utilized. The horseshoe units are to be 6" high with a 4" wall thickness laid up with mortar. The space between the sewer pipe and horseshoe is to be filled with concrete. A fibrous tube form may be used for larger diameter drops.

When an outside drop connection is to be made on an existing manhole, the footing of the drop shall be the same thickness as the manhole base and connected by means of a minimum four, 1/2-inch diameter reinforcing bars drilled into the existing manhole base. An additional four, 1/4-inch diameter reinforcing bars shall be placed as dowels into the new footing and extended into the vertical part of the drop constructed of monolithic concrete. In addition, the drop shall be tied to the existing manhole with 1/2-inch diameter reinforcing bars or steel strapping at a maximum spacing of 2 feet with a minimum of two ties to prevent any separation of the drop from the manhole wall. The entire drop connection shall be encased with a minimum 4-inch thick envelope of concrete.

4.4.8. LAYING OF BRICK AND CONCRETE BLOCK MANHOLE. Precast concrete manholes shall be provided unless brick or concrete block is specified. Brick shall be laid flat with the long dimension tangent to the manhole wall except for the fifth course laid as a header or binder course. The depressions in the brick shall be laid upward. Brick shall be laid with full, shoveled joints of standard cement mortar and the inside joints shall be brushed. Vertical joints shall be staggered. The outside face of the manhole shall be back-plastered with a smooth coat of mortar 1/2 inch thick, and covered with a bituminous waterproof coating. The inside face of the brickwork, manhole steps, benches, and the manhole inverts shall be cleaned of mortar. All debris shall be removed from the manhole and all debris, especially cement and mortar bags, shall be removed from the adjacent trench before backfilling.

When solid concrete blocks are substituted for bricks, the above requirements shall apply, except that blocks are laid edgewise, the wall consisting of one or more courses of block and without the header or binder courses. Concrete blocks or bricks shall be clean, dry, and free from frost when they are laid. Any block or brick unfit for use shall be rejecters.

4.4.9 GRADES FOR SETTING MANHOLE FRAMES. The manhole frame shall be at the elevation given on the sewer plan, or when no such elevation is given, they shall be set as follows: within a traveled roadway or on the shoulder of a highway, the top of the manhole frame shall be set flush with the existing ground or pavement surface. In other locations, the top of the frame shall be set at the proposed or established street grade, or at the existing surface grade as specified and/or shown on the plans. The frame shall be set upon adjusting rings.

4.4.10 BUILDING MANHOLES IN FREEZING TEMPERATURES. When manholes are built in temperatures below 35 degrees Fahrenheit, the ingredients of the mortar at the time of using shall have a temperature not less than 60 degrees and not more than 80 degrees F. The block and brick shall be warmed to the same temperature range. The manholes shall be enclosed and heat furnished inside so as to prevent freezing of the completed work for a minimum of 24 hours. Other precautions may also be necessary.

4.4.11 CATCH BASINS AND STORM SEWER WATER INLETS. Catch basins and storm sewer water inlets shall be constructed similar to manholes. Refer to the standard details.

SECTION 4.5.0 - TESTING OF SEWERS

4.5.1 GENERAL. All sewers, except relays with active connected building sewers, shall pass a leakage test before they are accepted by the Owner. The permitted leakage tests are the water infiltration test or the low-pressure air test The Contractor shall perform either one of these tests unless testing is waived by the Engineer.

The Contractor shall notify the Engineer not less than 48 hours in advance. Water infiltration and low-pressure air tests shall be performed by the Contractor under the observation of the Engineer.

Water infiltration or low-pressure air testing are not required on replacement sanitary sewers (relays) with active connected building sewers. The Engineer may waive testing of storm sewers.

The cost of the equipment, materials, and labor necessary to perform the leakage test shall be included in the prices bid for the sewer. The ends of branches, laterals, tees, wyes, and stubs to be included in the test should be plugged to prevent leakage. When the lateral is connected to a saddle fitting installed on the main line under the same contract, that section of the main sewer shall be included in the lateral test.

The Contractor is required to repair all visible defective joints or leaks in pipes, manholes or catch basins even though leakage test requirements are met.

4.5.2 WATER INFILTRATION TEST. The infiltration test shall not be considered a valid leakage test unless the top surface of the groundwater level is at least 2 feet above the pipe during the test measurement. The Contractor may simulate this condition, at no cost to the Owner, by flooding the trenches.

The ground water height above the installed pipe may be determined by attaching a transparent plastic tube to an opening in the manhole and using the plastic tube as a manometer.

The rate of infiltration of water into the sewer project, including appurtenances, shall not exceed 200 gallons per day, per inch diameter, per mile of sewer. The infiltration between any two adjacent manholes shall not be greater than 250% of the allowable infiltration rate.

No infiltration allowance will be allowed for manholes.

This maximum allowable infiltration, expressed in gallons per hour, is shown in the following table for various pipe sizes.

ALLOWABLE LIMITS OF INFILTRATION (Based on 200 gallons/inch diameter/mile)			
Diameter of Sewer, Inches	**Infiltration per foor per hour, gallons**	**Diameter of sewer, inches**	**Infiltration per foot per hour, gallons**
4	0.0063	21	0.0332
6	0.0095	24	0.0378
8	0.0126	27	0.0426
10	0.0158	30	0.0474
12	0.0190	36	0.0568
15	0.0237	42	0.0663
18	0.0284	48	0.0758

4.5.3 LOW PRESSURE AIR TEST. The procedure for setting up the apparatus for the low pressure air test shall be approved by the Engineer.

The pipe shall be tested between adjacent manholes. The test time for the air pressure to drop the specified one pound shall be in accordance with the following table. The test time shall be in accordance with the following formula which is based on the maximum air loss of 4.5 cubic feet per minute. In all cases, the length of laterals shall be ignored.

$$T = .00493D^2L$$

Where: T = Test Time, Seconds
D = Diameter, Inches
L = Length of Test Section, Feet

Only after the sanitary sewers, including appurtenances and sanitary laterals have been installed, backfilled and cleaned, shall the Contractor proceed with an air test on the installed facilities.

A. Low Pressure Air Test Procedure

1. The section of sewer line to be tested should be flushed and cleaned prior to conducting the low pressure air test. This serves to clean out any debris, wet the pipe, and produces more consistent results.

2. Isolate the section of the sewer line to be tested by means of inflatable stoppers or other suitable test plugs. One of the plugs should have an inlet tap or other provision for connecting a hose to a portable air control source.

3. If the test section is below the ground water level, determine the height of the groundwater above the spring line of the pipe at each end of the test section and compute the average. For every foot of groundwater above the pipe spring line, increase the gauge test pressures by 0.43 pounds per square inch.

4. Connect the air hose to the inlet tap and a portable air control source. The air equipment should consist of necessary valves and pressure gauges to control the rate at which air flows into the test section and to enable monitoring of the air pressure within the test section. Also, the testing apparatus should be equipped with a pressure relief device to prevent the possibility of loading the test section with the full capacity of the compressor.

5. Add air slowly to the test section until the pressure inside the pipe is raised to 4.0 psi greater than the average back pressure of the groundwater that may be over the pipe. Do not exceed 9 psi.

6. After a pressure of 4.0 psig is obtained, regulate the air supply so that the pressure is maintained between 3.5 and 4.0 psig (above the average ground water back pressure) for a period of two minutes. This allows the air temperature to stabilize in equilibrium with the temperature of the pipe walls. The pressure will normally drop slightly until temperature equilibrium is obtained. During this period, all plugs should be checked with a soap solution to detect any plug leakage.

7. Determine the rate of air loss by the time/pressure drop methods After the two-minute air stabilization period, the air supply is disconnected and the test pressure allowed to decrease to 3.6 psig. The time required for the test pressure to drop from 3.5 psig to 2.5 psig is determined by means of a stopwatch and this time interval is then compared to the specification time as calculated to determine if the rate of air loss is within the allowable time limit If the time is equal or greater than the times indicated in the tables, the pipe line shall be deemed acceptable.

8. Upon completion of the test, the bleeder valve is opened and all air is allowed to escape. Plugs should not be removed until all air pressure in the test section has been released. During this time, no one should be allowed in the trench or manhole while the pipe is being decompressed.

LOW PRESSURE AIR TEST TIME

Specification time (Min:Sec) required for loss of air pressure from 3.5 psig to 2.5 psig for size and length of pipe indicated. (Based on 0.003 cfm per sq.ft with a minimum loss of 2.0 cfm and a maximum of 4.5 cfm)

A Pipe Diameter (inches)	B Times per Foot up to Length in Column C (seconds)	C Test Length (feet)	D Test Time for Any Length Column C & (Min:Sec)	E Length at which Time in Column F Applies (feet)	F Time per Foot for Total Length (seconds)
4	0.18	636	1:54	1432	0.08
6	0.40	424	2:50	955	0.18
8	0.07	318	3:47	716	0.32
10	1.11	255	4:43	573	0.49
12	1.60	212	5:40	477	0.71
15	2.50	170	7:05	382	1.11
18	3.62	141	8:30	318	1.61
21	4.92	121	9:55	273	2.19
24	6.42	106	11:20	239	2.85

EXAMPLE: 15-inch diameter with lengths of 150, 250 and 500 feet.

For 150 feet T = 2.50 seconds (Col B.) x 150 feet = 375 sec = 6:15 min:sec

For 250 feet T = 7:05 (Col D) min:sec

For 500 feet T = 1.11 seconds (Col F) x 500 ft = 555 seconds = 9:15 min:sec

The Engineer may waive the low pressure air test on any section of sewer based on evaluation of the results of previous tests on the project. When tests are waived, a credit will be negotiated.

4.5.4 INSPECTION OF COMPLETED SEWER LINE. Sewer lines will be inspected after backfilling by use of mirrors or flashlights. Any sewer line that does not permit a thorough view of at least half the diameter between manholes shall be re-laid or additional manholes shall be installed by the Contractor without expense to the Owner. The decision as to what corrective measure will be taken shall be determined by the Engineer. The Contractor shall assist the Engineer in checking the sewer.

4.5.5 DEFLECTION TESTING. Deflection testing is required for some types of pipe. Refer to Section III.

4.5.6 TRACER WIRE TESTING. Test for locatable signal on all Tracer Wire per Section 3.11.

SECTION 4.6.0 - FORCEMAIN

4.6.1 GENERAL. Where forcemain is indicated on the plans, the Contractor shall furnish and install the specified pipe at the locations shown. Forcemain may be laid in the same trench with sanitary sewer where indicated on the plans. A minimum separation of 18” between the walls of the pipe shall be maintained. The forcemain shall be shelved to maintain a minimum of 12” between the bottom of the forcemain and the top of the sewer unless the minimum cover of 7’0” over the forcemain cannot be maintained. The top of the forcemain shall be a minimum of 12” below the bottom of the sewer, if necessary, to maintain the depth of cover.

4.6.2 LENGTH AND DEPTH OF TRENCH. No more than 450 feet of trench shall be open at any one time, except with special permission of the Engineer. In no case shall such excavation extend at the same time across any two parallel streets which intersect the street in which the work is being done. The depth of the trench is to be such that the top of the pipe is at least seven (7) feet below the surface of the existing or proposed ground, unless specified elsewhere. The width of the trench shall be adequate to insure good workmanship and proper inspection of joints.

4.6.3 WIDTH OF TRENCH FOR FORCEMAIN. The maximum width of the trench excavation at the top of the pipe shall be the outside diameter of the pipe used plus twenty-four (24) inches, except where sheathing or trench boxes are required

All pipe to be laid in open-cut trench shall have 6 inch minimum clearance between the outside face of the pipe barrel and the face of the sheathing.

4.6.4 LINE AND GRADE FOR OPEN-CUT CONSTRUCTION. If the Contractor is not able to maintain the depth of cover or grade by other means, the Engineer may require the use of line and grade boards. A substantial stake shall be driven on each side of the trench on a line at right angles to each stake of the primary line. A substantially straight 2 x 6 inch board shall be nailed or clamped to the stakes in a level position and at some even foot height above the grade line of the proposed water main. The elevation of each pipe shall be obtained by sighting across at least three batter boards to a mark on an approved type of grade pole. If, in the opinion of the Engineer, the accurate elevation of the pipe cannot be determined by sighting over the grade boards, the Contractor may be ordered to fasten a line to the boards at the center alignment marks and obtain the elevation by measuring down from the line by means of an approved type grade pole. The alignment of each pipe shall be obtained by plumbing down from the center marks or line, by means of a plumb bob. Methods other than described above may be used only if approved by the Engineer.

4.6.5 PREPARATION. The bottom of the trench will be excavated to the exact form and size of the lower portion of the pipe with additional excavation at the joints so that bearing will be continuous and the pressure equally distributed.

4.6.6 UNSTABLE FOUNDATION. If the bottom of the trench is of undesirable material, such as organic soil, or the presence of ground water causes a condition which cannot adequately support the main, an additional 3 inches shall be excavated and filled with 3/8" graded crushed stone and included as part of the standard sections at no additional payment In the event that it becomes necessary to extend the rock fill to a greater depth, such additional amount of rock will be paid for as unsatisfactory subgrade.

4.6.7 SUBGRADE REPLACEMENT. Where in the opinion of the Engineer more than 3" of subgrade beneath main is unsatisfactory, it shall be removed and replaced with material satisfactory to the Engineer, such as 3/8", 2" or 2 1/'2" graded crushed rock. No payment for material hauled away will be made, but replacement material will be paid for at the unit price bid. Cubic yards are to be loose box measurement. If a unit price for subgrade replacement is not provided, the price shall be negotiated before any material is placed.

4.6.8 WOOD BLOCKING PROHIBITED. Force mains shall be installed without the use of wood blocking. Special fittings shall be supported on solid concrete block and blocked with retainer gland type thrust restraint.

4.6.9 HANDLING OF PIPE, FITTINGS, ETC. The Contractor shall have sufficient and adequate equipment on the site of the work for unloading and lowering pipe and fittings into the trench. Extreme care shall be exercised by the Contractor in handling all pipe, fittings and special castings so as to prevent breakage and coating damage. Any damage to coating shall be repaired before installation. Under no circumstances shall pipe or fittings be dropped or so handled as to receive hard blows or jolts when being moved. All mud or dirt shall be removed prior to installation.

4.6.10 FIELD INSPECTION OF MATERIALS. All pipe or fittings shall be inspected for defects. All materials used in the work must pass field inspection.

4.6.11 DIRECTION OF LAYING. Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of laying. When the grade exceeds 10 feet of rise per 100 feet of trench, the bells shall face upgrade.

4.6.12 CUTTING OF CAST IRON PIPE. 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. 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.

4.6.13 OBSTRUCTIONS IN LINE OR GRADE. Whenever it becomes necessary to lay a main over, under or around a known obstruction, the Contractor will furnish and install the required fittings. Such fittings shall be included in the unit price bid. No additional compensation will be paid to the Contractor for any expenses incurred because of such obstruction. When an unknown underground structure interferes with the work to such an extent that an alteration of the plan is required, which alteration results in a change in the cost to the Contractor, the Engineer will issue a written change order, acceptable to the Owner, specifying the basis of payment or credit for such altered work.

4.6.14 PIPE INSTALLATION. Requirements for pipe installation are included in Section III under the type of material.

4.6.15 JOINT RESTRAINT. At all bends, elbows, tees, dead ends, valves and hydrants, installed approved joint restraints per Section 3.9.0. Joint restraints are also required on all joints within the "L", "Lr", or "b" dimensions from a fitting or deadend as shown on the standard details.

4.6.16 TESTS REQUIRED. All new mains shall be tested by the Contractor and shall successfully pass the pressure, and leakage tests described in the following sections. The Contractor shall notify the Engineer at least 48 hours before performing the tests. The tests must be witnessed by a representative of the Owner. Where a new main will be connected to an existing main, it may be necessary for the Contractor to install a temporary plug in the new main for testing purposes. After the specified pressure and leakage tests have been completed on the new main, actual connection to the existing main shall be made. The section of new connecting main between the removed test plug and the existing main shall be subject to line pressure prior to backfilling. Any visible defects observed in the connecting main shall immediately be repaired at the Contractor's expense, prior to backfilling.

In lieu of separate leakage and pressure tests, a combination leak/pressure test may be run at a pressure of 150 psi for a duration of two hours with the approval of the Engineer.

4.6.17 PRESSURE TEST. After the test connections are made and the main filled with water, the test section shall be subjected to 60 psi water pressure. After examination of exposed parts of the system, the test pressure will be increased to 150 pounds per square inch on the main at the lowest elevation. The main shall be examined and if any defects are found, the Contractor shall immediately make the necessary repairs at his own expense. The pressure test shall be repeated until no defects can be found. The duration of the final pressure test shall be one hour. The pressure shall be kept within 5 psi of the specified level.

4.6.18 LEAKAGE TEST. The leakage test shall be conducted after satisfactory completion of the pressure test. The test section shall be subjected to a minimum 100 pounds per square inch gauge pressure at the point of highest elevation of the main under test. The test pressure shall be 50 psi above normal operating pressure.

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain the specified leakage test pressure after the main has been filled with water and the air expelled.

Maximum allowable leakage rate according to AWWA C600: $L = \frac{(S)(D)(P)^{0.5}}{148{,}000}$

Where:
L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal pipe diameter, in inches
P = average test pressure, in pounds per square inch

ALLOWABLE LIMITS OF LEAKAGE GALLONS/HOUR/1000 FEET							
Nominal Pipe Diameter (Inches)							
		4	6	8	10	12	14
Average Test Pressure (psi)	225	0.41	0.61	0.81	1.01	1.22	1.42
	200	0.38	0.57	0.76	0.96	1.15	1.34
	175	0.36	0.54	0.72	0.89	1.07	1.25
	150	0.33	0.50	0.66	0.83	0.99	1.16
	125	0.30	0.45	0.60	0.76	0.91	1.06
	100	0.27	0.41	0.54	0.68	0.81	0.95

4.6.19 TEST LENGTH. Pipe lines shall be tested in lengths of not more than 800 feet unless approved by the Engineer.

4.6.20 REPAIRS AND RETESTING. All visible leaks at exposed joints, and all leaks evident on the surface where joints are covered shall be repaired and leakage minimized, regardless of the total leakage as shown by test.

All pipe, fittings, blocking and other materials found to be defective shall be removed and replaced at the Contractor's expense.

Lines which fail to meet the tests shall be repaired and retested as necessary, all at the Contractor's expense, until test requirements are complied with.

4.6.21 ELECTRICAL CONTINUITY. All metal pipe shall be tested for electrical continuity. Lead tipped gaskets will not be permitted. Copper jumpers or cable bond are to be utilized to secure electrical continuity on metallic pipe. Contractor is to check the line for electrical continuity or tracking signal after backfilling is completed. Sections shall be tested in

lengths of 1,000 feet or less. Where continuity or signal is not obtained, it must be established at the Contractor's expense. The Engineer or Owner shall witness each test.

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SECTION V
REINFORCED CONCRETE

Note: This section superseded the specifications for small quantities of reinforced concrete included in Standard Section III.

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REINFORCED CONCRETE

SECTION 5.1.0 – MATERIALS

5.1.1 CEMENT

A. Requirements. Cement shall conform to the "Standard Specifications for Portland Cement" (ASTM C150 Type I or IA) or "Standard Specifications for High Early Strength Portland Cement" (ASTM C150 Type III or IIIA).

B. Minimum Cement in Concrete. The minimum amount of standard Portland cement per cubic yard of concrete in-place shall be not less than 6 bags per cubic yard (564 lbs. per cubic yard). This mix is expected to yield 28-day strengths in excess of 4,000 psi. If test results indicate 28-day strengths less than 3,000 psi. the Contractor will be required to remove and replace the substandard concrete.

C. Minimum Air Content. Minimum air content shall be 6.0% by volume unless otherwise specified or determined by proportioning testing. Maximum variation is 1%.

D. Admixtures. Air entraining admixtures shall conform to ASTM C260. All retarding, accelerating and water-reducing admixtures to be used shall meet ASTM C494 or C1017 and shall be approved by the Engineer prior to their use. No calcium chloride or other admixtures containing chloride ions shall be used. Hydration-controlling admixtures (HCAs) may be used when necessary for long hauls. Admixtures used in the concrete shall remain the same as those used in the trial batches for the Advance Concrete Tests (5.3.5a). Where flyash is permitted by the Engineer, flyash shall meet ASTM C618, Type C or F. No flyash shall be used in any structure in contact with potable water.

E. **No Returned Concrete**. No returned fresh concrete added to a new batch is allowed.

5.1.2 AGGREGATE

A. Fine Aggregate Requirements. Fine aggregate shall conform to ASTM C33 and consist of sand having clean, hard, durable, uncoated grains free from deleterious substances and shall range in size from fine to coarse within the limits indicated below, percentage by weight:

Sieve (Specification E 11)	Percent Passing
3/8 inch (9.5mm)	100
No. 4 (4.75mm)	95 to 100
No. 8 (2.36 mm)	80 to 100
No. 16 (1.18mm)	50 to 85
No. 30 (600µm)	25 to 60
No. 50 (300µm)	5 to 30
No. 100 (150µm)	0 to 10

Not more than 45% shall pass a standard size sieve and be retained on the next smaller standard sieve.

The fineness modulus shall be between 2.3 and 3.1. Aggregates containing silt and clay particles in excess of 2% by weight shall not be used. Recycled material shall not be used.

B. Coarse Aggregate Requirements. Coarse aggregate shall conform to ASTM C33 and consist of gravel, crushed stone, crushed gravel or other approved inert materials with similar characteristics or combination thereof, having clean, hard, durable, uncoated particles free from deleterious matter. Recycled material shall not be used. ***The use of crushed limestone for coarse aggregate will not be permitted unless it meets the following specific conditions:***

Test	Maximum %
Soundness (Magnesium Sulfate) - Loss at 5 cycles of any fraction of the coarse aggregate (ASTM C33)	5
Abrasion Loss (LAR), ASTM C131	40
Absorption (ASTM C127)	2.5
Freezing and Thawing Loss (16 cycles)	12
DELETERIOUS SUBSTANCES	
1. Clay Lumps & Friable Particles (ASTM C142)	0.3
2. Soft Particles (ASTM C235)	2.5
3. Total Spall Material	1.5
4. Total of 1, 2, & 3	3.0

Coarse aggregate shall range in size from fine to coarse within the following percentages by weight without exceeding the maximum size.

ASTM C33, TABLE 2, SIZE 467 FOR GREATER THAN 12" THICK		
Sieve		Percent Passing
Inches	Millimeters	
2	50.00	100
1 1/2	37.50	95-100
3/4	19.00	35-70
3/8	9.50	10-30
No. 4	4.75	0-5

ASTM C33, TABLE 2, SIZE 57 FOR 12" THICK OR LESS		
Sieve		Percent Passing
Inches	Millimeters	
1 1/2	37.50	100
1	25.00	95-100
1/2	12.50	25-60
No. 4	4.75	0-10
No. 8	2.36	0-5

The maximum size of the aggregate shall be adjusted to not larger than one-fifth of the narrowest dimension between sides of the member for which the concrete is to be used nor larger than three-fourths of the minimum clear spacing between individual reinforcing bars or bundles of bars. For unreinforced slabs, the maximum size or aggregate shall not be larger than one-third the slab thickness.

5.1.3 WATER

A. General. Mixing water shall meet ASTM C94 and be clean and free from excessive amounts of oil, alkali, acid, organic matter, salts or other deleterious substances. Use of non-potable water requires the Engineer's approval.

5.1.4 REINFORCING STEEL

A. Requirements. Reinforcing bars shall be Grade 60 and meet ASTM A615. Welded wire fabric (WWF) shall meet ASTM A185.

B. General. Bars shall be free from defect and kinks or bends not shown on the plans. All bars shall be new stock, free from rust scale and grease.

C. Storage. All bars shall be stored off the ground and protected against rust.

D. Shop Drawings. Detailed reinforcing steel plans shall be prepared, reviewed and approved by the Contractor and then submitted to the Engineer for review and approval. Five copies shall be submitted, 3 copies will be returned. No bars may be set until and unless there is an approved set of detailed plans on the job.

SECTION 5.2.0 – PROPORTIONING

5.2.1 GENERAL. Fine and coarse aggregate shall be proportioned by direct weight upon suitable weighing devices approved by the Engineer. Portland cement in standard unopened cloth or paper sacks as packed by the manufacturer may be considered as weighing 94 pounds per sack.

5.2.2 MEASURING INGREDIENTS. All measurements of cement, fine and coarse aggregate shall be made separately. Measurements by weight shall be based on actual dry loose weight per cubic foot of fine and coarse aggregate used. Weighing equipment shall be arranged to permit making compensation for changes in the weight of moisture contained in the aggregates.

5.2.3 WATER/CEMENT RATIO. The proportioning of materials shall be based on the requirements for a plastic and workable mix with the use of not less than 6 sacks of cement (564 lbs.) per cubic yard and not more than 5.1 gallons of water per sack of cement including the surface water carried by the aggregate, expressed in terms of the quantity of cement (w/c ratio = 0.45). The water in the aggregate must be included in the mixture. It shall be measured by methods satisfactory to the Engineer, which will give results within one pound for each 100 pounds of aggregate. Moisture determinations shall be made on representative samples at least once each day and at other times as the appearance of the aggregate or the mixed concrete indicates a change in moisture content.

5.2.4 PROPORTIONING AND CONSISTENCY. The proportions of aggregate to cement shall be such as to produce concrete that can be thoroughly compacted. The slump shall not exceed 4”. A nominal one cubic yard of concrete shall contain 3,050 lbs total fine and coarse aggregate with the fine aggregate ranging from 30% - 45% of the total as necessary to secure suitable workability. This weight is based on oven-dry materials having a bulk specific gravity of 2.65 and shall be adjusted as required.

The combined aggregate shall be of such composition of sizes that when separated by the No. 4 standard sieves, the weight retained on the sieve shall not be less than one-half nor more than two-thirds of the total, based on dry materials.

5.2.5 TRIAL BATCHES. Full size trial batches shall be made in the mixer using the aggregate selected for the job to establish the correct proportions of the mix and to give proper workability without exceeding the water-cement ratio and slump specified. If the desired workability is not obtained with the first combination of aggregates, then the proportions of fine and coarse aggregate shall be adjusted within the limits specified until the mix meets with the approval of the Engineer.

SECTION 5.3.0 - MATERIAL TESTS

5.3.1 CEMENT. The Contractor shall furnish a mill Certification of Compliance for the type and source of cement to be used on the project. Cement shall have been shipped from the mill not more than three months prior to use on the project.

5.3.2 FINE AGGREGATE. Standard tests shall be made in advance of concreting by an independent laboratory per ASTM C33 on each fine aggregate proposed to be used. Tests shall have been conducted within 12 months prior to use on the project. Tests shall also be made as the work progresses to assure uniformity.

5.3.3 COARSE AGGREGATE. Standard tests shall be made in advance of concreting by an independent laboratory, on each grading of each coarse aggregate proposed to be used, per ASTM C33. Tests shall have been conducted within 12 months prior to use on the project. Tests shall also be made as the work progresses to assure uniformity. Limestone aggregate tests shall include the specific parameters listed in Section 5.1.2 (b).

5.3.4 REINFORCING STEEL. The Contractor shall furnish a supplier’s Certificate of Compliance.

5.3.5 CONCRETE TESTS.

A. Advance Concrete Tests (refer to Section 5.2.0 Proportioning):

1. Where more than 10 and less than 50 cubic yards of concrete are required for the project:

At the start of concreting or before, if practicable, make from a single trial batch a set of 4 standard 4" or 6" cylinders per ASTM C31 and cured per Paragraph 10.1 thereof. Test 2 at 7 days and 2 at 28 days per ASTM C39.

2. Where a total or more than 50 cubic yards of concrete are required for the project:

Advance tests of the concrete shall be made in an independent laboratory in accordance with ASTM C39. Six standard 4" or 6" compression cylinders, 3 to be tested at 7 days and 3 at 28 days, shall be made with the proportioning and materials proposed to be used in the major part of the project. The slump should not be less than the greater slump expected to be used in the structure. These tests shall be repeated if necessary because of changes in materials or unsatisfactory results.

B. Additional Concrete Tests:

Concrete: During progress of the work for each concrete pour of 15 cubic yards or more, a set of 3 standard 4" or 6" concrete cylinders shall be made with one tested at 7 days and one tested at 28 days. Cylinders will also be collected and tested for each change of mix. The remaining cylinder(s) may be tested if necessary to confirm results. These cylinders are to be moist closet cured at the designated laboratory per ASTM C31, Paragraph 10.1. Reports shall be sent to the Engineer.

Curing: When the Contractor requests early form stripping or backfilling, additional cylinders shall be field cured and tested at intervals to be determined by the Engineer. These cylinders shall be field cured under conditions equivalent to the concrete in the structure per ASTM C33, Paragraph 10.2. Results will be used to determine when the concrete has attained sufficient strength for form stripping and/or backfilling.

C. Required Strength: Where using standard separated fine and coarse aggregates, and regardless of the design strength adopted and compressive strength test results actually obtained, the minimum amount of standard Portland cement per cubic yard of concrete in place shall not be less than 6 bags per cubic yard. The specified 6 bag mix is expected to yield 28-day strengths in excess of 4,000 psi. If test results indicate 28-day strengths less than 3,000 psi, the Contractor will be required to remove and replace the substandard concrete. The Engineer may allow in-place field tests to measure compressive strength to assist in determining the extent of removal. These tests shall be conducted by an independent laboratory at the Contractor's expense.

D. Standard Slump Tests: A uniform consistency shall be continuously maintained in consecutive batches of concrete. Slump tests per ASTM C143 shall be conducted at the rate of one per 15 cubic yards poured. Slump shall be maintained between 1" and 4" (1/2" tolerance) or the batch shall be rejected. These slump numbers do not apply if an approved high-range water reducer is used.

E. Air Content Tests: Where more than 50 cubic yards of-concrete are being used, air content shall be field tested by the air pressure method, ASTM C231. Testing shall be performed by the concrete supplier under the observation of the Engineer on the job site. Air content shall be 6.0 $\pm$ 1% by volume unless other content is determined by proportioning tests.

5.3.6 TEST REPORTS

Laboratories engaged to conduct the tests shall be approved by the Engineer and must be independent of the supplier or Contractor. The specified tests and samples shall be furnished by the Contractor at no cost to the Owner. The results shall be certified and submitted to the Engineer within 3 days of completion. The tests conducted shall be the basis for requiring the replacement of substandard material. Where test results are inconclusive, the Engineer may order additional tests at the Contractor's expense. All test lab results shall be certified by a Professional Engineer licensed in the state where the project is located.

SECTION 5.4.0 - READY-MIXED CONCRETE

5.4.1 REQUIREMENTS. Ready-mixed concrete may be used if it complies with these specifications and ASTM C94. The Engineer shall have free access at all times to the batching and mixing plant for sampling of all materials and inspection of work performed for this project. Concrete shall be delivered in water-tight containers which will not permit segregation of the materials. When delivered, the concrete shall be uniform throughout the mass.

5.4.2 DELIVERY TIME. When a truck mixer or agitator is used for transporting concrete, the concrete shall be delivered to the site of the work and discharge shall be completed within 1-1/2 hours, or before the drum has been revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates. or the introduction of the cement to the aggregates, unless a longer time is specifically authorized by the Engineer. In hot weather, or under conditions contributing to quick stiffening of the concrete, a time less than 1-1/2 hours may be specified by the Engineer. When a truck mixer is used for the complete mixing of the concrete, the mixing operation shall be within 30 minutes after the cement has been intermingled with the aggregates.

5.4.3 DELIVERY TICKET. With each load of concrete delivered to the job, there shall be furnished by the ready-mix plant a duplicate delivery ticket, one copy to be retained by the Contractor and the other given to the Engineer. The ticket shall indicate the mix (amount of cement, weights of aggregate, total mixing water, additives), the time the mixing water was added to the cement and aggregates, the time the cement was added to the aggregates, reading of revolution counter at the first addition of water, all as outlined in ASTM C94, paragraph 13, "Batch Ticket Information".

SECTION 5.5.0 - FORMS

5.5.1 GENERAL. Formwork shall be designed, constructed, erected, used and removed in accordance with these specifications and ACI 347, "Guide to Formwork for Concrete" and SP-4, "Formwork for Concrete". Forms shall conform to the shape, lines and dimensions of the members as shown on the plans. They shall be substantial and shall be designed to resist the pressure to which they are subjected. Forms shall be sufficiently tight to prevent leakage of mortar. They shall be properly placed or tied together so as to maintain position and shape and ensure safety. Temporary openings shall be provided when necessary to facilitate cleaning and inspection immediately before depositing concrete. Forms shall be assembled in such manner as to facilitate their removal without damage to the concrete.

Pipes passing through walls which are to be water-tight shall utilize ductile iron wall pipe or wall sleeves with an approved mechanical seal in the annular space.

All pipes, sleeves, anchor bolts, steps or castings shown on the plans shall be placed in the forms before pouring concrete. The Contractor shall be responsible for proper location. Anchor bolts for all machinery and equipment shall be placed by the Contractor.

Edges of the top of walls, walks and slabs shall have a 1” chamfer. All inside corners between beams and slabs, walls and slabs, or walls and beams shall have a 1” by 1” fillet, built as part of the forms.

5.5.2 TIMBER FORMS. Forms for exposed surfaces shall be made of dressed lumber of uniform thickness and shall be mortar-tight.

Forms or form lumber which is to be reused shall at all times be maintained clean and in good condition as to accuracy, shape, strength, rigidity, tightness and smoothness of surface. Any lumber which is split, warped, bulged or marred, or which has defects which may produce work inferior to that resulting from new material shall not be reused.

5.5.3 METAL FORMS. The metal used for forms shall be of such thickness that the forms will remain true to shape. All bolt and rivet heads in the form face shall be countersunk. Clamps, pins or other connection devices shall be designed to hold the forms rigidly together and to allow removal without injury to the concrete. Metal forms which do not present a smooth surface or line up properly shall not be used. Special care shall be exercised to keep metal forms free from rust, grease or other foreign matter which tends to discolor concrete. Forms designated as "Architectural" shall be used for all concrete visible in the finished structure.

5.5.4 CIRCULAR STRUCTURES. For forms on circular structures, the size of form shall be such that the difference between the chord length (pan) and arc length (diameter specified) shall not be over 1/2” as a maximum.

5.5.5 FORM TIES. Form ties approved by the Engineer shall be used. They shall be adjustable in length and of such type as to leave no metal closer than 1-1/2" of the surface. Cone ties shall be used for all exposed walls and walls intended to be watertight. The cones shall be 1" diameter and 1-1/2" deep. Single rod ties shall have a tightly fitted washer at midpoint or be tapered for complete removal. Wire ties shall not be used.

Tie rod clamps shall not be removed in less than 4 days after the concrete is placed if ordinary concrete is used or two days for high early strength concrete, nor until the concrete has hardened sufficiently to permit the tie rods to be withdrawn, broken off or otherwise removed without damaging the concrete. Care shall be exercised to avoid spalling the concrete on the exposed surface. Ties that are to be pulled from the wall shall be coated with cup grease or other approved material to facilitate removal. Ties of uniform diameter that are wholly withdrawn from the wall shall be pulled toward the inside face.

Tie rod holes shall be plugged with neat cement grout.

5.5.6 WETTING FORMS. The inside surface of forms shall be soaked thoroughly with clean water immediately before any concrete is placed. In case forms have been erected for some time and have become dry so that joints have opened, the forms shall again be thoroughly soaked at least twice. All forms shall be treated with approved release agents with a maximum of 350 g/L VOC's. Note that non-toxic release agents (after 30 days) are required for all tanks intended to contain potable water.

5.5.7 INSPECTION. Concrete shall not be placed until the forms and reinforcing steel have been inspected by the Engineer.

5.5.8 REMOVING FORMS. Forms shall not be removed until the concrete has thoroughly hardened, and in no case in less than 4 days except when high early strength cement or concrete is used, in which case forms may be removed after two days.

When field operations are controlled by curing cylinder tests, the removal of form supports may begin when the tests of the cylinders show a compressive strength of not less than 2,000 psi. The cylinders shall be cured under conditions which are not more favorable than the most unfavorable conditions for the concrete the cylinders represent. In no case shall the forms be removed until the concrete is sufficiently set so that it is self-supporting.

When the Contractor has an established procedure, demonstrated on previous projects, for early form stripping without damage to the concrete, striping wall or ceiling forms after 24 hours may be permitted if the Contractor assumes all risk. Temporary bracing may be necessary. An approved membrane forming curing compound meeting ASTM C309 (minimum 18% acrylic resin) shall be provided for all early stripping.

SECTION 5.6.0 - REINFORCING STEEL

5.6.1 CLEANING. Before being placed, metal reinforcement shall be thoroughly cleaned of mill and rust scale and of coatings that will destroy or reduce the bond. Reinforcement appreciably reduced in section shall be rejected. Where there is delay in depositing concrete, reinforcement shall be reinspected and, when necessary, cleaned.

5.6.2 BENDING AND STRAIGHTENING. Reinforcement shall be carefully formed to the dimensions indicated on the plans. Cold bonds shall be made around a pin having a diameter of 6 or more times the least dimensions of the reinforcement bars. Metal reinforcement shall not be bent or straightened in a manner that will injure the material. Bars with kinks or bends not shown on the plans shall not be used. Heating of reinforcement will be permitted only when the entire operation is approved by the Engineer. No bars partially embedded in concrete shall be field bent.

Except where otherwise shown on the plans, in all slabs every second bar shall be a bent bar and all bent bars and all top bars over supports shall extend minimum to the quarter point of the adjoining span. All bent bars shall be bent up at the quarter point near continuous ends and at the 5th point near non-continuous ends.

All beams and slab steel at non-continuous ends shall be hooked.

All foundations for machinery are subject to revision in order to fit the dimensions of the equipment selected.

5.6.3 PLACING. Metal reinforcement shall be accurately positioned and secured against displacement by using annealed wire of not less than No. 16 gauge or suitable clips at intersections and shall be supported in a manner that will keep all metal away from the exposed surfaces of the wall. Nails shall not be driven into the outside forms to support reinforcement nor shall any other device for this purpose come in contact with the outside forms. Bar chairs shall be furnished.

5.6.4 SPLICING. Splicing shall not be made at points of maximum stress, nor shall adjacent bars be spliced at the same point. In circular tanks, the location of splices shall be staggered.

MINIMUM SPLICE LENGTH			
BAR SIZE	TENSION SPLICE		COMPRESSION SPLICE
	TOP BARS	OTHERS	
3	18"	16"	12"
4	24"	19"	15"
5	30"	23"	19"
6	36"	28"	23"
7	42"	33"	26"
8	48"	37"	30"
9	55"	42"	34"
10	65"	50"	38"
11	80"	62"	42"
Top bars are horizontal bars placed with more than 12" of concrete cast in the member below the bar. When splicing two different size bars use the splice length of the smaller bar unless noted otherwise. Compression splice for vertical column bars only.			

5.6.5 CLEARANCES. All reinforcing steel near the surface shall be covered by the following thickness of concrete:

Location	Minimum Cover (Inches)
Cast against earth	3
Exposed to earth, weather, or water	
#6 through #18 bars	2
#5 bars, 5/8 inch wire and smaller	1-1/2
Not exposed to earth, weather, or water	
#14 and #18 bars	1-1/2
#11 and smaller	1
Beams, grinders, columns	1-1/2

5.6.6 INSPECTION. Concrete shall not be placed until the forms and reinforcing steel have been inspected by the Engineer.

SECTION 5.7.0 - PLACING CONCRETE

5.7.1 PREPARATION OF EQUIPMENT AND PLACE OF DEPOSIT. Before concrete is placed, all equipment for transporting the concrete shall be clean, all debris and ice shall be removed from the spaces to be occupied by the concrete, forms shall be properly coated, masonry filler units that will be in contact with concrete shall be well drenched, and the reinforcement shall be thoroughly clean of ice or other deleterious coatings.

Excess water shall be removed from the place of deposit before concrete is placed unless otherwise permitted by the Engineer. No water shall be allowed to flow over concrete until it has set to the satisfaction of the Engineer.

All laitance and other unsound material shall be removed from hardened concrete before additional concrete is placed.

The Contractor shall, before beginning the placing of any concrete in a given pour, have sufficient labor, material and equipment at the site to complete the pour. The equipment shall be adequate for the work and in first class working order.

Where earth on which slabs are to be poured is so wet that the earth may be mixed with the concrete, the grade shall be lowered and the earth replaced with a layer of crushed stone, pit run gravel or similar material suitable to the Engineer, sufficient to provide a reasonably dry subgrade, at the Contractor's expense.

5.7.2 MIXING OF CONCRETE. All concrete shall be mixed until there is a uniform distribution of the materials.

Ready-mixed concrete shall be mixed and delivered in accordance with the requirements set forth in Chapter 5.4.0. Under careful supervision, a small increment of water may be added to delayed batches providing the following conditions are met: (1) maximum allowable water-cement ratio (0.45) is not exceeded; (2) maximum allowable slump (4") is not exceeded; (3) maximum allowable mixing and agitating time (or drum revolutions) are not exceeded; and (4) concrete is remixed for at least 30 revolutions.

Indiscriminate addition of water to make the concrete more fluid is not allowed as this lowers the quality of the concrete. Remixed concrete should be expected to harden rapidly. Subsequently, concrete placed adjacent to or above remixed concrete may cause a cold joint.

5.7.3 INSPECTION. Concrete shall not be placed unless the Engineer is on the job. If placing of concrete is not continuous or if work is proposed outside regular working hours, the Engineer shall be given 24 hours notice before work begins.

5.7.4 CONVEYING. Concrete shall be conveyed from the mixer to the place of final deposit by methods which will prevent the separation or loss of materials.

Conveying equipment shall be capable of providing a supply of concrete at the site of placement without separation of ingredients and without interruptions sufficient to permit loss of plasticity between successive increments.

When pumping concrete, the flow must be as continuous as possible with movement at least every 15 minutes. Clearing of the lines is required for stops over 30 minutes to 1 hour, depending on temperature. Placements shall start at the farthest point of deposit and work toward the pump location.

5.7.5 DEPOSITING. Concrete shall be deposited as nearly as practicable in its final position to avoid segregation due to rehandling or flowing. The concreting shall be carried on at such a rate that the concrete is at all times plastic and flows readily into the spaces between the bars. No concrete that has partially hardened or been contaminated by foreign materials shall be deposited in the structure, nor shall retempered concrete or concrete which has been remixed after initial set be used.

Special care must be exercised to prevent splashing the forms or reinforcement with concrete. Any such splashes or accumulations of hardened or partially hardened concrete on the forms or reinforcement above the general level of the concrete already in place must be removed before the work proceeds. Concrete shall be placed in the forms for all exterior walls and other places where the concrete is to be exposed in such a way as to prevent segregation. All concrete for walls shall be placed through openings in the inside form spaced at frequent intervals or through tremies equipped with suitable hopper heads. Chutes shall be of variable lengths so that the free fall shall not exceed 4 feet, and a sufficient number shall be placed in the forms to ensure the concrete being level at all times. When placing concrete which is to be exposed, sufficient illumination shall be provided in the interior of the forms so that the concrete at places of deposit is visible from the deck and runways. Concrete shall be placed in continuous horizontal layers approximately 12 to 18 inches thick, except that such thickness may be increased to 24 inches where permitted by the Engineer. Each layer in a continuous pour shall be placed and consolidated before the concrete in the preceding layer has taken initial set.

If concrete is pumped, the loss of slump in pumping shall not exceed 1-1/2 inches.

After the concrete has taken the initial set, care shall be exercised to avoid disturbing the forms or projecting reinforcement.

After concreting is started, it shall be carried on as a continuous operation until the placing of the section is completed. The top surfaces of vertically formed lifts shall be generally level. When construction joints are necessary, they shall be made in accordance with Section 5.7.7.

All concrete shall be thoroughly consolidated by suitable means during placement and shall be thoroughly worked around the reinforcement and embedded fixtures and into the corners of the forms.

5.7.6 MECHANICAL VIBRATION. Concrete shall be consolidated by internal mechanical vibration unless other methods satisfactory to the Engineer are employed. Vibrators shall be capable of transmitting vibrations to the concrete at frequencies of not less than 4,500 impulses per minute. Vibration shall be applied to the freshly deposited concrete by slowly inserting and withdrawing the vibrator. The application of the vibrator and duration of vibration shall be at sufficient points and for such periods of time as is necessary to uniformly and thoroughly consolidate the entire mass of fresh concrete without causing segregation of the aggregates or the formation of localized areas of grout. The vibrator shall be left in place until cement paste first appears near the vibrator head, then withdrawn vertically at about the same rate it descended. The vibrator shall be reimmersed at such intervals that the areas influenced overlap. The vibrator shall be kept constantly moving in the concrete. Each layer of concrete shall be thoroughly consolidated before the next layer is placed thereon. The vibrator shall penetrate through each successive layer and into the preceding layer sufficiently to uniformly blend the two concrete layers together.

Vibration shall not be applied directly or through the reinforcement to sections or layers of concrete which have hardened to the degree that the concrete ceases to be plastic under vibration. The vibrator shall not be used to transport or to flow the concrete within the forms to the extent of causing segregation.

Vibration shall be supplemented by such spading as is necessary to ensure smooth surfaces and dense concrete along form surfaces and in corners and locations impossible to reach with the vibrator.

The use of form vibrators requires the advance approval of the Engineer. Vibrating screeds may be used for slabs.

5.7.7 CONSTRUCTION JOINTS AND WATER STOPS. The placing of concrete shall be carried on continuously between construction joints shown on the drawings. If for any reason it shall become necessary to stop the placing of concrete at places other than those indicated on the drawings, such places shall have the approval of the Engineer and the manner of making the joint shall be approved.

Unless otherwise shown on the plans, joints shall be perpendicular to the forms. Construction joints of the keyed type shall be formed by the insertion and subsequent removal of a template of timber, metal or other suitable material. The method of insertion and removal of the template shall be such as to avoid chipping, breaking or damaging the concrete.

Waterstops shall be provided where shown on the plans. The PVC waterstops shall be manufactured only from virgin polyvinylchloride compound and shall not contain any scrap or reclaim material. The waterstops shall comply with Corps of Engineers' Specification CRD-C572. A Certificate of Compliance shall be submitted to the Engineer before installation. Field splice procedures shall follow the manufacturer's recommendations. Securely tie the waterstops to the reinforcement a minimum of every 12". Use the maximum practical length to reduce splices. When splicing is required, butt weld using thermostatically controlled electric heating tools.

Where specifically authorized, bentonite waterstops may be used. Only Volclay-Waterstop RS by Colloid Environmental Technologies shall be used. Where a minimum of 3" of concrete cover is provided, thickness exceeds 8" and two layers of reinforcing are used, provide 1" x ¾" or 1¼" x ½". Where a minimum of 2" of concrete cover is provided, thickness is 4" to 8" and one layer of reinforcing is used, provide ¾" x 3/8" apply with adhesive as directed by the manufacturer and splice by butting ends with no overlap.

5.7.8 DEPOSITION AGAINST OTHER CONCRETE. Before depositing new concrete on or against concrete that has hardened, the forms shall be retightened, the surface of the hardened concrete shall be roughened as required, thoroughly cleaned of foreign matter and laitance and moistened with water. To ensure sufficient mortar at the juncture of the hardened and the newly deposited concrete, the cleaned and moistened surface of the hardened concrete, including vertical and inclined surfaces, shall be slushed with a coating of neat cement grout against which the new concrete shall be placed before the grout has attained its initial set. An approved bonding agent may be substituted for the grout.

5.7.9 PATCHING. Any concrete work not formed as shown on the plans, or for any reason is out of alignment or level or shows a defective surface shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the Contractor at his expense unless the Engineer grants permission to patch the defective area. Such patching shall be done in accordance with the following procedures. Permission to patch any such area shall not be considered a waiver of the Engineer's right to require complete removal of the defective work if the patching does not, in the Engineer's opinion, satisfactorily restore the quality and appearance of the surface.

Immediately after removing forms all concrete surfaces shall be inspected and any poor joints, voids, stone pockets or other defective areas shall at once be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than 1" with the edges perpendicular to the surface. The area to be patched and a space of at least 6" wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. The patch shall be made of the same material and of the same proportions as used for the concrete except that the coarse aggregate shall be omitted, and white cement shall be substituted for a part of the gray cement to match the color of the surrounding concrete. The amount of water used in mixing the mortar shall be as little as consistent with the requirements of handling and placing. The mortar shall be retempered without the addition of water by allowing it to stand for a period of one hour during which time it shall be mixed with a trowel to prevent setting.

The mortar shall be thoroughly compacted into place and screened off so as to leave the patch slightly higher than the surrounding surface. It shall then be left undisturbed for a period of one to two hours to permit initial shrinkage before being finally finished. The patch shall be finished in such a manner as to match the adjoining surface.

The holes left by withdrawal of rods or the holes left by removal of ends of ties shall be filled solid with mortar. For holes passing entirely through the wall, a plunger type grease gun or other device shall be used to force the mortar through the wall starting at the back face. A piece of burlap or canvas shall be held over the hole on the outside and when the hole is completely filled, the excess mortar shall be struck off with the cloth flush with the surface. Holes not passing entirely through the wall shall be filled with a small tool that will permit packing the hole solid with mortar. Any excess mortar at the surface of the wall shall be struck off flush with a cloth.

SECTION 5.8.0 - PROTECTION AND CURING

5.8.1 GENERAL. All exposed surfaces of concrete shall be protected from premature drying, excessively hot or cold temperatures and mechanical injury. Freshly placed concrete shall be protected against wash by rain. All concrete shall be kept wet for a period of 5 days after placing, except that 2 days curing shall be considered sufficient if high early strength Portland cement or concrete is used.

Ponding, sprinkling or wet coverings shall be used. Polyethylene sheets may be used if they conform with ASTM C171 and do not discolor the concrete. Spray the surface of forms frequently to keep concrete moist.

5.8.2 HOT-WEATHER CONCRETING. Comply with ACI 305 Hot Weather Concreting. The temperature of the concrete, as placed, shall be maintained below 90 °F. Forms, reinforcing steel and the subgrade shall be sprinkled with cool water just before the concrete is placed. Ready-mixed concrete shall be delivered to the site and discharge completed within one hour. Extra precautions shall be taken to avoid cold joints. All finishing shall be done promptly after the water sheen disappears or after the concrete can support the weight of a worker. Membrane curing compounds shall be used only on flatwork, only with permission of the Engineer and only after 24 hours of moist curing. The Engineer reserves the right to restrict concreting to evening hours or nighttime during hot weather.

5.8.3 COLD WEATHER CONCRETING

A. General. Comply with ACI 306 Cold Weather Concreting. Unless otherwise directed, all concrete mixed or deposited when the air temperature is 35 °F or less, or when an air temperature of 35 °F or less can be expected within a period of six days following the placing of the concrete, shall be protected as hereinafter set forth. The same protection shall apply to <u>all</u> concrete mixed or deposited during the period beginning December 1st and ending March 31st.

B. Mixing. When an air temperature of 35 °F or less can be expected in the 24-hour period immediately following the concrete placing, the mixing water or aggregates or both shall be heated to such temperatures, within limits hereinafter prescribed, that the temperature of the resulting batch of mixed concrete will be within the temperature ranges specified below.

The temperature of concrete immediately after placement shall be as follows:

Less than 12"		12" to 36"		Over 36"	
Min.	Max.	Min.	Max.	Min.	Max.
55° F	75°F	50º F	70º F	45º F	65º F

Aggregates which contain frozen lumps shall not be used unless heated. The aggregates shall be heated by steam or by other means in a manner which will heat the mass uniformly and preclude the possible occurrence of overheated areas. Mixing water shall be heated in such a manner that its temperature is maintained under control. Neither the aggregates nor the mixing water shall be heated to a temperature in excess of 100 °F when placed together with the cement in the mixer. If either the aggregates or water is heated to a temperature in excess of 100 °F the water and aggregates shall be premixed in such a way that the resulting temperature of the combined water and aggregates is not in excess of 100 °F before the cement is added to the batch. Cold aggregates, which are not frozen and do not contain frost, may be used with water heated in excess of 100 °F provided the water and aggregates are first pre- mixed as specified above before the cement is added to the batch.

Heating of the cement or the adding of salt or other chemicals to the mix to prevent freezing will not be permitted.

C. Housing. Adequate and approved housing shall enclose each section of a structure before placing the concrete. The Contractor may delay the erection of such housing during the period beginning April 1st and ending November 30th, if the air temperature is not expected to fall to 35 °F or below during the 24 hours immediately following placement of the concrete. Housing may be delayed until the temperature is expected to fall to 35 °F or below during any 24 hours of the succeeding five-day period, provided that an adequate supply of housing material is maintained at the site and sufficient workers and equipment are available to assure that suitable housing can be erected before the temperature falls to 35 °F.

The housing shall be constructed weather-tight in a manner that will insure maintaining specified temperatures uniformly throughout the enclosure during the protection period. It shall be constructed to permit the performance of forming, placing, consolidation and finishing of the concrete within the housing. Housing of floor slabs and similar sections shall provide not less than six feet of clearance above the slab when placing and finishing operations are conducted therein.

Heating. Before starting concreting operations. the Contractor shall have available ample and suitable equipment for heating, curing and protecting the concrete during the protection period. Heating may be by steam or hot air. Means shall be provided by which a humid condition of the air is maintained within the housing during the heating period. Stoves or open burning salamanders will not be permitted within the housing to provide artificial heat. Heating appliances shall not be placed, nor direct application of heat be permitted, in such a manner as to endanger forms, falsework or any part of the structure, or to subject the concrete to drying out or other injury due to excessive temperatures.

When housing is required prior to placement of concrete, heat shall be admitted to the housing sufficiently in advance of placing the concrete to ensure a temperature of the forms and reinforcing steel of not less than 45°F. Within the enclosure or housing, the temperature shall be maintained during placing of the concrete and for a protection period of at least six days (four days for high-early-strength concrete) thereafter or for the remaining number of days of such six-day period that housing is required. The temperature within the enclosure shall be reasonably uniform throughout.

The minimum temperature of the concrete during the protection period shall be as follows:

Less than 12"	12" to 36"	Over 36"
55º F	50º F	45º F

The temperature shall be measured at the concrete surface. The maximum air temperature shall not be over 20 °F above the minimums above.

The Contractor shall provide adequate fire protection when heating is in progress and shall maintain attendants to keep heating units in continuous operation.

E. Temperature Records. The Contractor shall provide reliable thermometers and shall take temperature readings within the enclosure at such points as are necessary to show the true temperature conditions to which the concrete is subjected. Concrete surface temperatures shall be taken with a suitable surface temperature measuring device having an accuracy of ±2°F.

F. Termination Of Protection. At the end of the protection period, the concrete shall be allowed to cool gradually. The maximum decrease in temperature measured at the surface of the concrete in a 24-hour period shall not exceed 40°F. This limit shall not be exceeded until the surface temperature of the concrete is within 25°F of the ambient temperature at which time all protection may be removed. Concrete shall be prevented from drying during the curing period. If water curing is used, it shall be terminated at least 24 hours before any exposure of the concrete to freezing temperatures.

G. Insulated Forms. If the Contractor desires to use insulated forms in lieu of housing and heating, a detailed plan including the type of insulation, method of applying the insulation, method of preheating and the method of temperature measurement, shall be submitted to the Engineer for approval.

H. Responsibility. The Contractor shall assume the entire responsibility for the proper protection and final satisfactory condition of all concrete placed during cold weather or exposed to cold weather within the required protection period. This responsibility shall extend to the adequacy of all equipment and methods necessary to conform to the requirements of the contract. Any concrete damaged by lack of proper protection shall be removed and replaced with satisfactory concrete at the Contractor's cost and expense.

SECTION 5.9.0 - WATERTIGHT TEST

5.9.1 WATERTIGHT TEST. All concrete walls shall be watertight. Concrete tanks designed to hold liquids shall be tested for watertightness before painting or backfilling. Clean the exposed concrete surfaces of the tank, including the floor, of all foreign material and debris. The concrete surfaces and joints shall be thoroughly inspected for potential leakage points and repairs made before filling the tank with water. Seal all tank penetrations. The initial filling of the tank shall not exceed 4 ft. per hour. Fill to the design maximum water level or 4 inches below any fixed overflow level, whichever is lower. The water shall be kept at the test level for at least 3 days prior to the actual test.

5.9.2 REPAIR LEAKS. All leaks (in or out) shall be repaired using a method approved by the Engineer. Some shrinkage cracking is normal as concrete dries. These cracks shall be repaired watertight by the Contractor. After all visible leaks are repaired, water levels shall be recorded. The Engineer shall calculate the water loss and leakage. The allowable loss of water shall be 0.050% of the test water volume in 24 hours.

5.9.3 TEST METHOD. The test method (HST) and tightness criteria (HST-050) are more fully described in ACI 350 1-01, *Tightness Testing of Environmental Engineering Concrete Structures*.

SECTION 5.10.0 - SURFACE FINISH

5.10.1 ORDINARY SURFACE FINISH. Except as otherwise specified, all formed surfaces shall have an ordinary surface finish. **Note that all exposed surfaces receive a special surface finish**.

The concrete shall be worked against all formed surfaces during the operation of placing by means of approved concrete vibrators or spading implements. The working shall be such as to force all coarse aggregate from the surface and thoroughly work the mortar against the forms to produce, in-so-far as practicable, a smooth finish free from water pockets, air bubbles and honeycomb.

As soon as the forms are removed, all pointing of tie rod holes, pits or defects shall be done and all fins and irregularities removed or corrected. Should defects appear in the final surface such that in the judgment of the Engineer, a satisfactory ordinary surface finish has not been secured, the Contractor shall apply a special surface finish to the affected exposed areas.

5.10.2 FLOAT SURFACE FINISH. All upper surfaces which are not formed shall, unless otherwise specified, be given a float surface finish.

In securing a float surface finish, an excess of material shall be placed in the forms and the excess removed or struck off with a wooden template forcing the coarse aggregate below the mortar surface. After the concrete has been struck off, the surface shall be thoroughly worked and floated with a wooden float, followed by a metal float. Before the last finish has set, all exterior surfaces so finished which will be exposed in the finished work shall be lightly striped with a fine brush to remove the surface cement film and leave a fine grained, smooth but sanded texture. All interior slabs shall be power troweled. The appearance shall be uniform, free of stains or blemishes.

Mortar topping shall not be used on surfaces to be given a float surface finish.

All interior building floors shall be treated with an approved floor hardener unless a surface covering is specified.

5.10.3 SPECIAL SURFACE FINISH. **All exposed surfaces shall receive a special surface finish**. The special surface finish shall not be applied until all of the requirements of Ordinary Surface Finish have been performed. The special surface finish shall consist of a mixture of an approved acrylic, latex or other bonding agent with an approved packaged or field prepared mortar applied in one or more coats to the previously prepared surface. The color of the resulting surface finish, after curing and drying, shall be uniform and approximately the same color as the original concrete, but not darker. The bonding agent, dry mortar ingredients and water shall be fixed in the proportions specified by the manufacturer. The ingredients shall not interfere with the painting system specified.

After application of the ordinary surface finish, but prior to starting the special surface finish, the surface shall be thoroughly cleaned and wetted to provide a uniformly damp surface. The cement mix shall be applied using a sponge float, a heavy brush or by spraying. The application shall be thick enough to fill any pin holes and provide complete and uniform cover, but not so thick to leave a plastered effect. Application shall not be made until the special finish can be applied without interruption on any structure. Application shall not be made when the temperature is below 40°F or when a temperature below 40 °F is predicted to occur during the succeeding 24 hours. When a second application is required, at least 24 hours shall elapse between applications.

The special surface finish shall be kept wet and covered for 48 hours.

5.I0.4 CLEANING EXPOSED WALLS. All exposed concrete surfaces to be painted shall be cleaned with a solution of muriatic acid containing not less than 5% nor more than 10% of acid by volume. The solution shall be applied to the surface previously wetted with clean water by scrubbing vigorously with stiff bristle brushes. Immediately after cleaning, all surfaces must be drenched with an abundance of clean water to remove all traces of acid.

SECTION VI
EQUIPMENT SPECIFICATIONS
PUMPHOUSE #5 & WATERMAIN IMPROVEMENTS
ADAMS, MINNESOTA

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SECTION VI
EQUIPMENT SPECIFICATIONS
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SECTION 6.1.0 - INSTRUCTIONS TO SUPPLIERS OF EQUIPMENT

Equipment suppliers shall refer to Section I - General Conditions of the specifications. In addition to general requirements, refer specifically to Patent Fees and Royalties (I.6.07), Shop Drawings and Samples (I.6.17), Supervision of Erection (I .6.06 J.) and Operation and Maintenance Manuals (I.6.22).

Reference to a brand name and model for a particular item of equipment does not waive the requirement to comply with these specifications. All equipment, including designated base bid and approved suppliers, shall fully meet specified requirements. Only deviations specifically approved by addenda prior to bidding will be permitted. ***READ THE SPECIFICATIONS - DO NOT ASSUME THIS IS A STANDARD EQUIPMENT ITEM.***

SECTION 6.2.0 – STANDBY GENERATOR AND AUTOMATIC TRANSFER SWITCH (PROPOSAL #2 – ELECTRICAL)

6.2.1 GENERAL. The intent of this specification is for the Contractor to provide a permanent standby generator system as shown on the plans, that has been prototype-tested, factory-built, production-tested, site-tested, of the latest commercial design, together with all accessories necessary for a complete installation as shown on the plans and as specified. The equipment supplier and installer shall meet the requirements of the National Electrical Code (NEC), along with all applicable State and local codes and regulations. All equipment shall be new, of current production of a national firm, which manufactures the generator, and controls, transfer switch, and assembles the standby generator sets as a matched unit, so that there is one-source responsibility for warranty, parts, and service through a local representative with factory-trained servicemen.

6.2.2 SUBMITTAL. Submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied, schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number, each required interconnection between the generator set and the transfer switch.

6.2.3 TESTING. To assure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and local representative shall be responsible for final production tests and site tests.

6.2.3.1 FINAL PRODUCTION TESTS**.** The generator sets shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

A. Single-step load pickup.

B. Transient and steady-state governing.

C. Safety shutdown device testing.

D. Voltage regulation.

E. Rated power.

F. Maximum power.

G. Upon request, arrangements to either witness this test will be made or a certified test record shall be sent prior to shipment.

6.2.3.2 SITE TEST. An installation check, start-up and building load test up to 2 hours shall be performed by the manufacturer's local representative. The test shall be performed under full load conditions when the facility is complete and operational. The Engineer, Contractor and the operating staff shall be notified of the time and date of the site test.

The tests shall include:

A. Fuel supply, lubricating oil and antifreeze shall be checked for conformity to the manufacturer's recommendations under the environment conditions present and expected.

B. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include block heaters, battery charger, etc.

C. Start-up to check for exhaust leaks, path of exhaust gases, cooling air flow, movement during starting and stopping, vibration during running, normal and emergency line-to-line voltage and phase rotation.

D. Automatic start-up and transfer of the load. Engine coolant temperature, oil pressure and battery charge level along with generator voltage, amperes and frequency shall be monitored throughout the test.

6.2.4 EQUIPMENT. Provide one (1) 80 KW standby generator set, rated continuous standby (defined as continuous for the duration of any power outage)

277/480 volts,
3 phase, 4 wire,
0.8 power factor
80 KW,
52 KVA,
130 kW Alternator
120 amperes

The unit shall meet EPA emission standards for stationary emergency power systems.

The generator set shall be capable of starting motor loads to 180 KVA in-rush, with a maximum voltage dip of 35%. **The unit shall be Blue Star Power Systems, Generac Industrial, Kohler, or equal.**

Vibration isolators shall be provided between the engine/generator-alternator and heavy-duty welded steel base.

6.2.5 ENGINE. The engine shall be a 9-liter liquid propane fueled engine and shall deliver a nominal 120 HP at a governed speed of 1,800 rpm. The engine shall be equipped with the following:

A. Engine speed shall be controlled by an electronic governor capable of regulating the no load to full load frequency isochronous and capable of $\pm$0.25 percent steady-state frequency regulation.

B. 24-volt positive engagement solenoid shift-starting motor.

C. Automatic battery charging alternator with solid-state voltage regulations.

D. Positive displacement, full pressure lubrication oil pump, cartridge oil filters, dipstick and oil drain with extension and valve.

E. Dry-type replacement air cleaner elements.

F. The engine shall be fueled with liquid propane. The unit shall be liquid-cooled by unit-mounted radiator, blower fan, water pump, thermostat and radiator duct flange shall properly cool the engine with up to 0.5 inches H_2O static pressure on the fan.

6.2.6 GENERATOR. The alternator shall be salient-pole, brushless, 12-lead reconnectable, self-ventilated of drip-proof construction with amortisseur rotor windings and skewed stator for smooth voltage waveform. The insulation shall meet the NEMA standard (MGI-22.40 and 16.40) for Class F and be insulated with epoxy varnish to be fungus resistant per MILE-4970A. The excitation system shall be of brushless construction controlled by a solid-state voltage regulator capable of maintaining voltage within $\pm$2% at any constant load from 0 to 100% of rating. The regulator must be protected from the environment by conformal coating.

Upon one step application of any load up to 90% of the rated load at 1.0 power factor, the voltage dip shall not exceed 35% and shall recover to 2% of rated voltage within one second.

The generator shall be capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short by inherent design or by the addition of an optional current boost system.

A resettable line current sensing circuit breaker with inverse time versus current response shall be furnished which protects the generator from damage due to its own high current capability. This breaker shall not trip within 10 seconds specified above or allow selective tripping of downstream fuses or circuit breakers under a fault condition. This breaker shall not automatically reset, preventing restoration of voltage if maintenance is being performed. Field current-sensing breaker will not be acceptable.

The generator, having a single maintenance-free bearing, shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.

6.2.7 CONTROLLER. Set-mounted controller shall be vibration isolated on the generator enclosure. The controller shall be capable of being remote mounted. The micro-processor control board shall be conformal coated. Relays will only be acceptable in high-current circuits.

Circuitry shall be of plug-in design for quick replacement. Controller shall be equipped to accept a plug-in device capable of allowing maintenance personnel to test controller performance without operating the engine. The controller shall include:

A. Fused DC circuits.

B. Complete two-wire start/stop control, which shall operate on closure of a remote contact.

C. Speed sensing and a second independent starter motor disengagement systems shall protect against starter engagement with a moving flywheel. Battery charging alternator voltage will not be acceptable for this purpose.

D. The starting system shall be designed for restarting in the event of a false engine start, by permitting the engine to completely stop and then re-engage the starter.

E. Circuitry to shut down the engine when signal for high coolant temperature, low oil pressure or over-speed are received.

F. Engine cool down timer factory set at five minutes to permit unloaded running of the standby set after transfer of the load to normal.

G. Indicating lights to signal:

1.	Switch “OFF”	flashing red
2.	System ready	green
3.	Emergency stop	red
4.	High water temperature	red
5.	Over-speed	red
6.	Low oil pressure	red
7.	Battery charger fault	red
8.	Low battery voltage	red
9.	Low water temperature	red

H. Test button for indicating lights.

I. Common failure alarm signal for remote reporting of alarm conditions.

J. Three position (Automatic-Off-Test) selector switch. In the Test position, the engine shall start and run regardless of the position of the starting contacts. In the Automatic position, the engine shall start when the start contacts close and stops 5 minutes after the contacts open. In the Off position, the engine shall not start even though the start contacts are closed. This position shall also provide for immediate shutdown in case of an emergency. The Off position shall also be used to reset any fault condition.

6.2.8 INSTRUMENT PANELS. An instrument panel shall include:

A. Dual range voltmeter 3-1/2-inch 2% accuracy

B. Dual range ammeter 3-1/2-inch 2% accuracy

C. Voltmeter-ammeter phase selector switch.

D. Lights to indicate high or low meter scale.

E. Direct reading pointer-type frequency meter 3-1/2-inch.5% accuracy, 45 to 65 HZ scale.

F. Panel illuminating lights.

G. Battery charging voltmeter.

H. Coolant temperature gauge.

I. Oil pressure gauge.

J. Running time meter.

K. Voltage adjust rheostat.

L. Alarm horn.

6.2.9 ACCESSORIES. The following accessories shall be installed for each unit:

A. Block heaters, 120V AC. Thermostatically controlled to main engine coolant at proper temperature to meet the start-up requirements.

B. Overvoltage protection, which will shut down the unit after one second of 15% or more overvoltage.

C. Line circuit breaker 600VAC, 200 amp, 3 pole.

D. Battery rack, battery cables and 2-12-volt batteries capable of delivering the manufacturer's recommended minimum cold-cranking amps required at 0°F shall be supplied dry, along with separate electrolyte ammeter, equipped for conduit installation.

E. Automatic float, battery charger with constant voltage regulation, current limiting capability, cranking disconnect relay, temperature compensation for ambient temperatures from -20°F. Voltmeter, ammeter, equipped for conduit installation. Include alarm board for battery alarm lights.

F. Provide an engine exhaust silencer, coated to be temperature and rust resistant with integral condensate drain, rated for residential application.

G. Weather protective and rodent resistant housing for the genset.

H. Fuel Vaporizer. The generator shall be supplied with necessary components to vaporize the liquid propane fuel prior being delivered to the fuel mixer (carburetor).

I. Provide a 7-day automatic exercise timer to automatically start the generator and transfer the load at a predetermined time.

6.2.10 TRANSFER SWITCH EQUIPMENT. Provide a complete factory assembled automatic transfer switch with electronic controls designed for surge voltage isolation and including voltage sensors on all phases of both sources, linear operator, permanently attached manual handles, positive mechanical and electrical interlocking, and mechanically held contacts.

6.2.10.1 TRANSFER SWITCH RATINGS. The transfer switch shall be an open transition type switch rated for 200 amp, 277/480 volts, 3-phase, 4-wire, 60 hertz and rated for 42,000-amp current fault. The unit shall be

installed inside the MCC in the Pump Room. Contractor shall be responsible for the mounting of the automatic transfer switch.

All transfer switches and accessories shall be UL listed and labeled, tested per UL Standard 1008, and SCA approved. Main contacts shall be rated for 600 Volts AC minimum. Transfer switches shall be rated to carry 100 percent of rated current continuously in the enclosure, in ambient temperatures of –40 to +50 degrees C, relative humidity up to 95% (non-condensing), and altitudes up to 10,000 feet (300M).

Transfer switch equipment shall have a with-stand and closing rating (WCR) in RMS symmetrical amperes greater than the 42,000-amp fault current. The transfer switch and its upstream protection shall be coordinated. 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.

6.2.10.2 CONSTRUCTION. Transfer switch shall be an open transition type, double-throw, electrically and mechanically interlocked, and mechanically held in both positions. Transfer switches shall be equipped with manual operators for service use only under de-energized conditions.

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 interphase flashover. Provide one set Form C auxiliary contacts on both sides, operated by transfer switch position, rated 10 amps 250 VAC.

Transfer switches designated as 4-poles shall be provided with a switched neutral pole. The neutral pole shall be of the same construction and have the same ratings as the phase poles. All poles shall be switched simultaneously using a common crossbar. Equipment using add-on accessory overlapping contacts are not acceptable.

Enclosures shall be UL listed. The enclosure shall provide NEC wire bend space. The cabinet door shall be key locking. Controls on cabinet door shall be key-operated. The transfer switch shall be mounted in a NEMA 3R cabinet enclosure with key-locking front doors. A transparent protective cover shall be provided to protect operating personnel during manual operation, and to allow an operator to visually determine that the main contracts are “open” or “closed”.

Transfer switches shall be mounted in enclosures as designated. The cabinet shall provide required wire bend space at point of entry as shown on the drawings. Manual operating handles and all control switches (other than key-operated switches) shall be accessible to authorized personnel only by opening the key-locking cabinet door. Transfer switches with manual operating handles and/or non-key-operated control switches located on outside of cabinet do not meet this specification and are not acceptable.

6.2.11 ENCLOSED CIRCUIT BREAKER. A three (3) pole circuit breaker shall be provided with the rating as shown on the drawings for the generator. Interrupting rating shall be 42,000 amperes symmetrical at 480V. Enclosed circuit breakers shall be provided in a NEMA 3R enclosure.

6.2.12 AUTOMATIC CONTROLS. Transfer switches that are designated on the drawing as automatic shall be provided with a fully automatic control system, and provisions for manual operation as described in this section.

Control shall be solid-state and designed for a high level of immunity to power line surges and transients, demonstrated by test to IEEE Standard 587-1980. The control shall have optically isolated logic inputs, high isolation transformers for AC inputs, and relays on all outputs.

Solid-state under voltage sensors shall simultaneously monitor all phases of both sources. Pick-up and drop-out settings shall be adjustable. Voltage sensors shall have field calibration of actual supply voltage to nominal system voltage.

Control shall be provided with a solid-state overvoltage sensor, adjustable from 100-130% of nominal, to monitor all phases of both source(s). Provide adjustable time delay of 0.5 to 2.2 sec.

Controls shall be provided with a solid-state over and under frequency sensor to monitor both sources(s). Pickup bandwidth shall be adjustable from a minimum of +/-4% to a maximum of +/-20% of nominal frequency. Dropout shall be +/-5% of nominal wider than pickup frequency bandwidth. Adjustable time delay shall be from 0.1 to 15 sec. Automatic controls shall signal the engine-generator set to start upon signal from normal source sensors. Solid-state time delay

start, adjustable from 0 to 5 seconds (factory set at 2 seconds) shall avoid nuisance start-ups. Battery voltage starting contacts shall be gold, dry type contacts factory wired to a field wired to a field wiring terminal block.

Provide Phase Sequence Monitor and Balance module to protect against inadvertent phase rotation hookup and monitor for voltage phase imbalance between phases.

The switch shall transfer when the emergency source reaches the set point voltage and frequency. Provide a solid-state time delay on transfer, adjustable from 0 to 120 seconds.

The switch shall retransfer the load to the normal source after a time delay retransfer, adjustable from 0 to 30 minutes. Retransfer time delay shall be immediately bypassed if the emergency power source fails.

Control shall signal the engine-generator set to stop after a time delay, adjustable from 0 to 10 minutes, beginning on return to the normal source.

Power for transfer operation shall be from the source to which the load is being transferred.

The control shall include latching diagnostic indicators to pinpoint the last successful step in the sequence of control functions, and to indicate the present status of the control functions in real time, as follows:

A. Source 1 OK

B. Start Gen Set

C. Source 2 OK

D. Transfer Timing

E. Transfer Complete

F. Retransfer Timing

G. Retransfer Complete

H. Timing for Stop

The control shall include remote transfer inhibit and area protection features.

Transfer switches shall be equipped with a field adjustable controls to allow the operator to control the transfer switch operating time during switching in both directions. The controls shall control the time the load is isolated from both power sources, to allow load residual voltage to decay before closure to the opposite source. The transfer switch operating speed control feature shall have an adjustable range of 0 to 7.5 seconds. Phase angle monitor is an acceptable substitute for this feature.

6.2.13 FRONT PANEL DEVICES. Provide the following devices mounted on the front panel:

A key-operated selector switch to provide the following positions and functions:

A. Test. Simulates normal power loss to control for testing of generator set. Controls shall provide for a test with or without load transfer.

B. Normal. Normal operating position.

C. Retransfer. Momentary position to override retransfer time delay and cause immediate return to normal source, if available.

D. Transfer switch position and source available lamps.

6.2.14 ACCESSORY ITEMS. Transfer switches shall be equipped with accessories as follows:

A. Exercise Clock. Provide solid state exerciser clock to set the day, time, and duration of generator set exercise/test period. Provide a with/without load selector switch for the exercise period.

B. Manual Selector Switch. Provide a manual/automatic retransfer selector switch to provide either automatic retransfer after the retransfer time delay, or a manual retransfer when selected by an operator.

C. Signal Module. Provide signal module, to delay the transfer and retransfer of the switch for up to 50 seconds to provide a retransfer warning signal contact. Provide signals for the following conditions:

1. Source 1 Available
2. Source 2 Available
3. Test/Exercise
4. Backup Source Available

6.2.15 CERTIFICATION. On request, the manufacturer shall provide a letter certifying compliance with all requirements of the transfer switch specifications. The certification shall identify equipment by serial number and shall include no exceptions to the specifications, except those stipulated with the submittal.

6.2.16 STANDBY GENERATOR GUARANTEE. The manufacturer shall provide a written guarantee that, for **five (5) years** from the date of field testing, that all equipment therein shall be free from defects in design, materials, and workmanship. In the event a component fails or is proven defective during the guarantee period the manufacturer will furnish and install a replacement part without cost to the Contractor or Owner upon return of the defective part. Normal use items such as grease, light bulbs, mechanical seals, packing and belts are excluded.

SECTION 6.3.0 – TURBINE PUMPS (*PROPOSAL #3 WELL PUMP CONTRACTOR*)

6.3.1 GENERAL. The Contractor shall furnish and install, a turbine pump and accessories for Well Pump #5. Pump shall be vertical line-shaft turbine pump.

6.3.2 SPEED. The pump motors shall operate at a speed not exceeding eighteen hundred (1800) revolutions per minute.

6.3.3 BOWLS AND IMPELLERS. The pump bowl assemblies shall be 10-inch nominal diameter or less and must readily pass in an 18-inch casing. If a larger diameter bowl assembly is provided, the Contractor shall make any modifications necessary to the pump setting location to ensure that the bowl assembly does not touch the casing at the pump setting depth. Pump bowls, suction case, and discharge case shall be ASTM A48 Class 30 cast iron. Bowls shall be coated with an NSF approved catalyzed epoxy or enameled with vitreous porcelain. Impellers shall be closed design SAE 40 or SAE 63 zincless bronze, accurately cast, machined, and balanced for optimum performance. Bowls shall be fitted with removable bronze wear rings. Impellers shall be fastened to the shaft with stainless steel collets. The shaft shall be ASTM A276 Type 410 or 416 stainless steel. The shaft shall be provided with bearings on each side of the impeller. Each bowl shall be provided with a long, bronze sleeve type bearing. The bottom bowl shall be provided with a Venturi type suction nozzle with a bronze sleeve type bearing that requires no grease.

Vertical turbine pumps bowl assembly shall be manufactured by Goulds, Simflo, Flowise or equal.

Impellers shall be fastened to a stainless-steel bowl shaft by means of taper bushing and lock nut, or in an equally secure manner.

6.3.4 PUMP DISCHARGE HEADS. The pump discharge head shall be constructed of ASTM A48 Class 30 cast iron of rugged design and shall have a surface discharge with bolted flange type connection to the discharge line. The discharge head shall be designed to mount the motor and support the pump column and bowls. The discharge head shall be provided with ¼-inch threaded gauge connection with plug, ¾-inch prelubrication connection, and three auxiliary connections for the well vent, airline, and a submersible pressure transducer assembly. The design shall permit the drive shaft to be coupled directly above the seal box (two-piece head shaft) for easy removal of the drive. The discharge head shall be provided with a cast iron stuffing box suitable for not less than six (6) rows of packing. The discharge head shall have a ½-inch tapped seal water drainage connection at the low point in the discharge head. The discharge head shall be capable of lifting a minimum of 26,500 pounds. The discharge head shall be mounted on a cast iron base plate and

gaskets to provide a sanitary seal between the pump base and the well casing. The discharge head and flange shall be rated to operate at a system pressure of 150 psi.

6.3.5 COLUMN ASSEMBLY. The column pipe and shaft assembly shall be of the length indicated in the specifications and/or plans. Column pipe and shaft lengths shall not exceed ten (10) feet. Column pipe shall be Sch. 40 ASTM A53 Grade B pipe. Column pipe shall have threaded couplings with 8 straight threads per inch with not more than 3/16-inch taper. Column couplings shall be ASTM A53 Grade B steel. The column shaft shall be precision turned, ground, and polished ASTM A276 Type 416 stainless steel. The size of the shaft and the spacing of bearings shall be such as to prevent any whipping of the shaft. The line shaft shall be provided with ASTM A276 Type 416 stainless steel shaft couplings and shall have a minimum cross-sectional area of the shaft couple shall be at least 125 percent of the cross-sectional area of the shaft. Line shaft and couplings shall have 8 threads per inch.

Shafting size shall be of the size recommended by the manufacturer for the depth of setting specified, however not less than 1 3/16-inch diameter. All line shaft shall be rolled and straightened to meet the requirements of AWWA E101, Section A4.3.4. Line shaft straightness shall be checked in the field at 2-foot intervals along the entire length of the shaft. Column pipe size to be sufficient for use by the unit and shall not be less than the following:

6-inch diameter column pipe – 18.99 lbs. per lineal foot, Schedule 40, 0.28-inch wall thickness

Bearing retainers shall be the drop-in type. Bearing retainers shall be brass or ASTM B584, Alloy 836 bronze, and three or four spokes. The bearing retainer shall have a 2½-inch by 3⅝ inch deep hub.

6.3.5.1 SUCTION BELL & STRAINER. The pump shall include a suction bell and stainless-steel basket strainer. The maximum opening shall not be larger than 75 percent of the minimum opening of the water passage through the bowl or impellers. Stainless steel strainers shall be AISI Type 304 stainless steel.

6.3.5.2 LUBRICATION. The pumps shall be water-lubricated. The well pump will be provided with a prelubrication assembly.

6.3.6 NON-REVERSE RATCHET. Provide a non-reverse ratchet for each pump.

6.3.7 VERTICAL HOLLOW SHAFT MOTORS. The pump motors shall be the vertical, hollow shaft type designed for 3 phase, 230/460V (dual voltage), 60 cycle current. The temperature rise in continuous operation shall not exceed 60°C above an ambient of 40°C, Class B insulation and the entire design, construction and performance shall conform to the requirements of the National Electric Manufacturer's Association. Motors shall be compatible with starting equipment described in the electric control section of these specifications. All bearings shall be sealed and may either be oil or grease lubricated. The motors shall be manufactured in their entirety by the motor manufacturer whose name shall appear on the nameplate. Motors are to have 1.15 overload factor and non-overloading at all points of the performance curve. Insulation is to meet NEMA requirements. Motors are to be equipped with vis-o-lube window for quick check of oil level. The motors shall be premium efficiency motors with NEMA nominal efficiency of 85 % for the 30-hp motor. The motor shall be provided with a shaft that will connect to the shaft of the driven equipment with a standard shaft coupling. An adjustable top nut shall be provided for lateral adjustment. Motors shall be equipped with a self-release coupling assembly. Motors weighing more than 50 pounds shall be equipped with at least one lifting eye. All hardware shall be corrosion resistant. Motors shall be delivered with the manufacturer's standard paint.

6.3.8 SANITARY SEAL. The high service pump sleeve through the floor, furnished by the Turbine Pump Contractor shall extend 1-inch above the pump base to provide a sanitary lip per MDH Code. The discharge head and base plate shall be sealed with NSF approved caulk after the final pump setting.

The well pump casing shall be modified to fit the discharge head and shall provide a 1-inch sanitary lip. This work shall be provided by the Turbine Pump Contractor.

6.3.9 PUMP PACKING DRAIN LINE. Each pump shall include a seal packing drain line to the nearest floor drain. The drain line shall be Schedule 40 PVC.

6.3.10 DESIGN CONDITIONS - WELL PUMP NO. 5

Elev. Storage Tank Overflow Elev.	1,412.00 ft.
Static Well Elev.	1,259.00 ft.
Total Static Head	**153.00 ft.**
Drawdown	
400 gpm/ 13.5 gpm.ft (specific capacity)	29.6 ft.
Friction:	
Pumphouse Piping, Column pipe/Discharge Losses	27.9 ft.
TDH =	**210 ft.**

The following is the design data for the Well Pump No. 5. Point 1 conditions shall be 320 gpm at 244 total dynamic head (TDH) at 82.2% efficiency. Design condition shall be 400 gpm at 210 ft. TDH at 85% efficiency. Point 2 conditions shall be 480 gpm at 176 ft. TDH at 80.3% efficiency. Points 1 and 2 are specified to designate an anticipated operating range. Pumps with a TDH less than that specified at Point 1 and greater than that specified at Point 2 are acceptable. Pump design shall be 30 Hp maximum as well as non-overloading at all points on the head/discharge curve. Heads that are shown do not include bowl assembly losses which shall be added to the values given.

Pump Setting for Well Pump No. 5

140 feet ± 6-inch diameter column assembly and 1 3/16-inch diameter shaft
Basket Strainer

6.3.11 PUMP BASE. The Well Pump Contractor (Proposal #3) is to furnish and install the pump, anchor bolts, and pump appurtenances. The General Contractor (Proposal #1) will construct the concrete base as required. The Well Pump Contractor will furnish base drawings to General Contractor providing for grout leveling space (±1-inch) and templates to set anchor bolts. The Well Pump Contractor shall install his equipment and use grout level course.

6.3.12 PUMP ASSEMBLY INSTALLATION. Installation of the pump shall only be started after all materials are on site. All surfaces of the bowl and column assembly shall be disinfected with a 50 mg/l chlorine solution as it is installed. The Contractor shall use silicon pipe thread compound as manufactured by Dow Corning on the column threads and molycote compound as manufactured by Dow Corning on the shaft coupling threads.

The cable and airline shall pass through the discharge head in a sanitary stuffing box.

6.3.13 WELL DISINFECTION. Well disinfection includes all materials, equipment, labor, and services as required or necessary to disinfect the well, as shown and specified. The Contractor shall submit his proposed procedure for disinfecting the well to the Engineer for review prior to disinfecting the well.

The well shall be disinfected with chlorine solution. Sodium hypochlorite solution shall be used for disinfection. Sodium hypochlorite solution shall contain 15 percent trade weight (1.25 pounds of available chlorine per gallon). The chlorine solution used for disinfecting the well shall be of such a volume and strength and be applied so that a minimum concentration of 50 ppm of chlorine shall be obtained in all parts of the well. The chlorine solution shall be applied in such a manner that the walls of the well above the water level are disinfected. After the solution is added, the well shall be agitated to distribute the chlorine solution throughout the water. Chlorine solution shall remain in the well for a minimum of 12-hours. After the installation is complete, the well will be pumped to waste until the chlorine has been removed from the well.

The Well Pump Contractor shall send the samples of the water taken after chlorination to a laboratory approved by the State Laboratory of Hygiene for bacteriological tests. The Contractor shall furnish the Engineer with a certified copy of the report. If samples are unsafe, the Well Pump Contractor shall repeat the disinfection and sampling procedure. Disinfecting the well and sending samples to an approved laboratory for bacteriological tests shall be repeated until "safe" samples are obtained. Disinfection of the well shall be considered incidental work.

6.3.14 FACTORY TEST. The bowl assembly shall be factory tested in accordance with the standard of the Hydraulics Institute. The test is to be witnessed and certified by the factory prior to shipment. The pump is not to be shipped until test results certifying efficiencies not less than those supplied with the bid have been complied with. Certified

performance curves showing the full range of discharge flow versus head, efficiency, power requirements, and other characteristics shall be submitted to the Engineer for acceptance prior to shipment to the job site.

6.3.15 FIELD TEST. After the installation of the well pump assembly is complete, a field test shall be performed to demonstrate compliance with the specified performance requirements. Prior to beginning the test, the Well Pump Contractor shall measure and record the static water level. The Well Pump Contractor shall notify the Engineer so that the Engineer may be on-site to witness the test.

One copy of the results of the field test shall be submitted to the Engineer within seven (7) days after the completion of the test. The submittal shall identify the well, the date the test was performed, the static water level before the pump was started, the pumping rates, the pumping water levels in the well, and discharge pressure before any throttling device.

6.3.16 WELL LEVEL TRANSDUCER. Provide a well level transducer for the well. The unit shall provide level indications to the SCADA system for well performance monitoring and to provide well shut down if water levels drop below predetermined levels. The unit shall provide a 4-20 mA DC output, with $\pm$ 0.25% accuracy, titanium construction and intrinsically safe barriers. The units shall be provided with sufficient cable to be mounted at the top of the pump bowls assemblies. The transducer shall be installed inside a PVC conduit. The conduit shall be attached to the column pipe at 10-foot intervals.

The unit shall be rated to provide continuous reporting of water levels and shall be a Druck Model PTX 1230, PMC VersaLine VL4000 or Series 300, KPSI Easterline, or equal.

6.3.17 AIRLINE AND GAUGE. The Well Pump Contractor shall provide an airline and gauge for measuring water levels in the well. The unit shall include an air valve connection. Gauges shall be fitted to the upper end, attached to the airline with brass or copper fittings. The gauge shall read in feet of water, 0-100 feet.

Gauge shall be not less than 3-1/2-inches in diameter and have a stainless-steel bourdon tube, socket, and tip. Gauge connection shall be ¼-inch NPT. Gauge shall be Ashcroft Type 1009, Trerice 690 series, or equal.

The airlines shall be installed in a PVC conduit that extends from the discharge head to directly above the bowl assembly to permit removal of the transducer and airline from the well for maintenance purposes. The PVC conduit shall be attached to the column at 10-foot intervals.

6.3.18 WELL HEAD IMPROVEMENTS. The Well Pump Contractor shall complete the well head improvements to provide the 1-inch sanitary lip and to accommodate the turbine pump, shall provide a 2-inch screened well vent, shall provide a 1-1/4-inch access pipe for the well level transducer.

6.3.19 INSTALLATION REPORT. The Well Pump Contractor shall submit an installation report for the well pump. The report shall include a complete list of all equipment furnished, materials of construction, size of all major components, and settings. The installation report shall include a drawing of the pump showing all of the components.

SECTION 6.4.0 – CHEMICAL FEED EQUIPMENT (*PROPOSAL #1 – GENERAL & MECHANICAL)*

6.4.1 GENERAL. The General Contractor for Proposal #1 shall furnish and install the chemical feed equipment, piping, tubing and connection to feed the following chemicals:

A. A Sodium Hypochlorite (12.5%) for chlorination/disinfection.

B. A Hydrofluosilicic Acid (Fluoride) feed system for prevention of tooth decay.

C. A polyphosphate (LPC-5) feed system for iron and manganese stabilization.

6.4.2 SODIUM HYPOCHLORITE FEED SYSTEMS. The Contractor shall provide the following liquid chlorine feed equipment for Chlorination:

A. Provide one (1) 1.35 GPH metering pump, to feed chlorine to the application point. The metering pump shall be a **Blue White M1 FLEXFLO** peristaltic metering pumps. The pumps shall meet UL Standard, motor operated pump, and NSF/ANSI Standard 61-Drinking Water System Components. The pumps shall be manually adjustable. Pump shall be self-priming, with a 3-point roller design, and capable of tube

replacement without tools. All wetted parts shall be compatible with 12.5% Sodium Hypochlorite solution. Provide a non-corrosive shelf to wall mount metering pump. Pumps shall include suction and discharge tubing, and suction strainer. Discharge tubing shall be Tube Model A1-6T. Provide three (3) spare metering pump hoses.

B. One (1) 120-gallon polyethylene storage tank with open top and overlapping gasketed cover. Provide openings for filling the tank, pump suction, return line and vent. All openings shall have gasketed with bulkhead fittings. The tank shall include readable graduations in readable 1-gallon increments. Provide 100% spill containment consisting of a double wall tank. Tank must fit within the floorplan of the chemical feed room and as noted on plans.

C. One (1) solid state, electronic tank scale to monitor daily chemical usage. The scale shall be capable of measuring 0.1 lb. increments up to 5,000 lbs. The scale shall include one (1) local dual LCD display in a NEMA 4X enclosure. The platform shall be rugged steel construction with a corrosion resistant finish and covered with ½" PVC decking. The unit shall be equal to a **Scaletron or Force Flow.**

D. One (1) PVC calibration column to test pump flow rate on intermediate basis. The size of the column shall be 100 mL. The column shall be installed in the suction line of the chemical feed pump. Three (3) isolation valves shall be provided as shown on the chemical feed schematic. The top of the column shall be vented back to the storage tank. For operation, the column shall be filled to the top mark, then the valve from the chemical tank shall be closed. Switch on the chemical feed pump and draw down the chemical in the cylinder for 30 seconds. Switch the pump off and the reading on the right side of the cylinder is a direct readout of US gph. The column shall be a **Griffco Valve Inc or Equal**.

E. Provide pump discharge tubing and conduit to one (1) discharge point. Provide a ¾-inch PVC chemical injection nozzle and corporation fitting at the connection to the well discharge header. The injection point for the well discharge header shall be in the bottom half of the pipe on the horizontal run. The units shall be equal to a Saf-T-Flo Chemical injection system rated for 100 psi and include a retractable injection tube, check valve and safety chain.

The complete system shall be self-contained and shall function with a minimum of operator attention except for loading of chemical into the solution tank.

6.4.3 HYDROFLUOSILICIC ACID (FLUORIDE). The Contractor shall furnish and install the following fluoride feed equipment:

A. Provide two (2) 0.44 GPH metering pumps, to feed fluoride to the application point. The metering pump shall be **Blue White M1 FLEXFLO** peristaltic metering pumps. The pumps shall meet UL Standard, motor operated pump, and NSF/ANSI Standard 61-Drinking Water System Components. The pumps shall be manually adjustable. Pump shall be self-priming, with a 3-point roller design, and capable of tube replacement without tools. All wetted parts shall be compatible with hydrofluosilicic acid solution. Provide a non-corrosive shelf to wall mount metering pump. Pumps shall include suction and discharge tubing, and suction strainer. Discharge tubing shall be Tube Model A1-4T. Provide three (3) spare metering pump hoses.

B. Provide one (1) polyethylene physical break tank with a capacity of 2 quarts. The break tank shall have four (4) connection points. One for venting to outside of building, one for fill from storage tank, one for suction connection for system pump and one for the return to the storage tank. Wall anchors for mounting of break tank shall be provided.

C. One (1) 40-gallon polyethylene storage tank with open top and overlapping gasketed cover. Provide openings for filling the tank, pump suction, return line and vent. All openings shall have gasketed with bulkhead fittings. The tank shall include readable graduations in readable 1-gallon increments. Provide 100% spill containment consisting of a double wall tank. Tank must fit within the floorplan of the chemical feed room and as noted on plans.

D. One (1) solid state, electronic tank scale to monitor daily chemical usage. The scale shall be capable of measuring 0.1 lb. increments up to 5,000 lbs. The scale shall include one (1) local dual LCD display in a NEMA 4X enclosure. The platform shall be rugged steel construction with a corrosion resistant finish and covered with ½" PVC decking. The unit shall be equal to a **Scaletron or Force Flow**.

E. Provide pump discharge tubing and conduit to one (1) discharge point. Provide a ¾-inch PVC chemical injection nozzle and corporation fitting at the connection to the well discharge header. The injection point for the well discharge header shall be in the bottom half of the pipe on the horizontal run. The units shall be equal to a Saf-T-Flo Chemical injection system rated for 100 psi and include a retractable injection tube, check valve and safety chain.

The complete system shall be self-contained and shall function with a minimum of operator attention except for loading of chemical into the solution tank.

6.4.4 POLYPHOSPHATE (LPC-5) FEED SYSTEM. The Contractor shall furnish and install the following polyphosphate (LPC-5) feed equipment:

A. Provide one (1) 0.44 GPH metering pump, to feed fluoride to the application point. The metering pump shall be a **Blue White M1 FLEXFLO** peristaltic metering pumps. The pumps shall meet UL Standard, motor operated pump, and NSF/ANSI Standard 61-Drinking Water System Components. The pumps shall be manually adjustable. Pump shall be self-priming, with a 3-point roller design, and capable of tube replacement without tools. All wetted parts shall be compatible with polyphosphate solution. Provide a non-corrosive shelf to wall mount metering pump. Pumps shall include suction and discharge tubing, and suction strainer. Discharge tubing shall be Tube Model A1-4T. Provide three (3) spare metering pump hoses.

B. One (1) 85-gallon polyethylene storage tank with open top and overlapping gasketed cover. Provide openings for filling the tank, pump suction, return line and vent. All openings shall have gasketed with bulkhead fittings. The tank shall include readable graduations in readable 1-gallon increments. Provide 100% spill containment consisting of a double wall tank. Tank must fit within the floorplan of the chemical feed room and as noted on plans.

C. One (1) solid state, electronic tank scale to monitor daily chemical usage. The scale shall be capable of measuring 0.1 lb. increments up to 5,000 lbs. The scale shall include one (1) local dual LCD display in a NEMA 4X enclosure. The platform shall be rugged steel construction with a corrosion resistant finish and covered with ½" PVC decking. The unit shall be equal to a **Scaletron or Force Flow**.

D. Provide pump discharge tubing and conduit to one (1) discharge point. Provide a ¾-inch PVC chemical injection nozzle and corporation fitting at the connection to the well discharge header. The injection point for the well discharge header shall be in the bottom half of the pipe on the horizontal run. The units shall be equal to a Saf-T-Flo Chemical injection system rated for 100 psi and include a retractable injection tube, check valve and safety chain.

The complete system shall be self-contained and shall function with a minimum of operator attention except for loading of chemical into the solution tank.

6.4.5 LABORATORY EQUIPMENT, SAFETY EQUIPMENT

A. Provide the following laboratory equipment:

1. Hach Pocket Colorimeter for Iron, Model #5870022
2. Hach Pocket Colorimeter for Manganese, low level, Model #5870018
3. pH meter, Orion Star A321 pH Portable Meter, Model #9567345
4. pH buffer solution (pH 7.0)
5. pH buffer solution (ph 10.0)
6. pH electrode solution
7. Hach Pocket Colorimeter for Chlorine residue, Model #5870000

B. Provide the following safety equipment:

1. 1-chemical goggles;
2. 1-sets of rubber gloves;
3. 1-aprons.

6.4.6 LABELING OF CHEMICAL EQUIPMENT. All storage tanks, metering pumps and control outlets shall be labeled to allow the operators to easily determine the contents and use of the equipment. Labels for the polyethylene tanks shall

be commercially available adhesive tape labels. Labels for the metering pumps and control outlets shall be corrosion-resistant metal or plastic plates with engraved or raised letters with a contrasting background.

6.4.7 FEED TANK VENTING SYSTEMS. Provide a tank vent system for each chemical room. The systems shall vent each tank separately to the building exterior. The systems shall be constructed of polyethylene tubing and SCH 40 PVC pipe. The tubing from each tank shall be inserted into PVC support piping. The PVC support piping shall be securely attached to the wall and positioned for a neat and orderly installation. The PVC piping shall extend through the exterior masonry wall and extend 18" beyond the building exterior. The tubing shall pass through the PVC support piping and terminate with a non-corrodible insect screen. The annular space between the PVC support pipe and the tubing on the building exterior shall be sealed with foam insulation or caulk.

SECTION VII
SPECIAL PROVISIONS
GENERAL, MECHANICAL & ELECTRICAL CONSTRUCTION
PUMPHOUSE #5 & WATERMAIN IMPROVEMENTS
ADAMS, MINNESOTA

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SPECIAL PROVISIONS
GENERAL, MECHANCIAL & ELECTRICAL CONSTRUCTION

SECTION 7.1.0 - SCOPE

The Contract will include all general and mechanical construction for constructing the new Pumphouse No. 5. A separate Contract will include all electrical work and instrumentation for construction of the new Pumphouse No. 5. A separate Contract will include all turbine pump work and appurtenances for Well Pump No. 5 and appurtenances.

SECTION 7.2.0 - EXCAVATION/GRADING

Erosion control devices shall be installed prior to excavation and shall be maintained throughout the project. Any material tracked onto street shall be cleaned daily. See Section 2.8.0.

All black dirt and organic material shall be removed from the limits of the building site cut and fill areas, prior to excavating. The Contractor shall use select, salvaged excavation to backfill and to establish planned grades. No backfill within 24-inches of the building walls shall contain rock larger than 3-inch. Fill shall be placed and compacted in 6-inch lifts to 95% of standard proctor density. The Contractor shall provide four (4) satisfactory density tests by an independent testing laboratory to verify compaction efforts.

The Chosen Valley Geotechnical Report provides guidance on construction. This material shall be excavated and removed from under the Pumphouse footings. The excavation shall extend out 1-foot for each foot of depth below the footing. Off-site granular borrow may be required to complete the fill requirements inside the foundation walls, under the floor, and to establish subgrade on the access road. The material shall be pit run sand, free of organics and stone larger than 3-inch in diameter. The material shall be compacted in 12-inch lifts to 95% of Standard Proctor Density, vibratory compaction equipment.

The parking area and gravel access drive shall be surfaced with 8-inches of compacted aggregate base (Dense Graded Base, 1¼-inch). Sawcut all pavement surfaces at project limits.

All disturbed and lawn areas shall be finished with a minimum of 4-inches of salvaged topsoil. After final shaping and grading of all lawn areas shall be fertilized, seeded and mulched or erosion mat placed. All slopes 5:1 or steeper shall be covered with erosion mat.

The following specifications shall apply:

A. FERTILIZER. MnDOT Spec. 3881, Type 1, Apply at a rate of 7#/1,000 SF

B. SEEDING. MnDOT Spec. 3876, Mixture No. 25-131, 5#/1,000 SF

C. MULCHING. MnDOT Spec. 3882, Type 1 or 2

D. EROSION BLANKET. MnDOT Spec. 3885, Temp Straw Based, Category 2

The General/Mechanical Contractor (Proposal #1) shall be solely responsible for installing, maintaining, and monitoring erosion control devices as necessary to protect the site and neighboring property from effects of erosion. The Contractor shall maintain the lawn areas until a sustained catch of grass is achieved.

The preparation of the subbase and aggregate base, shaping, sawcutting, restoration, and all other work associated with the excavation and grading is incidental.

SECTION 7.3.0 – GRAVEL ACCESS DRIVE

The gravel access drive and turnaround area shall be constructed with 12-inches of compacted aggregate base (MnDOT Standard Specification 3138). The existing trees located in 10th Street right-of-way will be removed by the City prior to construction. Trees and brush will be removed but some stumps will remain in place. It will be the General Contractors responsibility to remove stumps in the location of the access driveway during roadway excavation.

SECTION 7.4.0 - STRUCTURAL LOADS & DESIGN DATA

General structural design loads and data are shown on the Drawings (Drawing No. S1). Building design and classification utilizes Chapter 16 of the 2020 Minnesota Building Code and the International Building Code (IBC). Live loads shall be as shown. Snow and wind loadings and earthquake design shall be in accordance with ASCE 7-10. Concrete mix design shall be in accordance with Section V and the drawings. Cover for reinforcing steel shall be as shown on the drawings (Drawing No. S1).

SECTION 7.5.0 - EXTERIOR DOORS, FRAMES, AND FINISH HARDWARE

7.5.1 EXTERIOR DOORS. Doors shall be seam-less type, 1-3/4-inch flush steel doors with 16 gage outer sheets, perimeter reinforcement with internal reinforcement, and insulated with polyurethane filled core with vinyl strips, weather stripping, and bulbs. "U" valve for doors shall be 0.6, or better. All exterior doors shall be insulated. The interior of the door shall be completely filled with a rigid urethane foam. Urethane foam shall be self-bonding, self-hardening, and self-extinguishing. Doors shall be provided in the size and configuration as shown on the drawings in the door schedule. For double doors the inactive door shall be provided with an astragal with weather stripping and inside mounted dead bolt locks, top and bottom. The Aerator Room doors shall include inside mounted dead bolt locks on both doors, top and bottom. Standard pull handles shall be provided. The door frame shall be set as close to the outside as possible to allow as much opening as possible.

7.5.2 FRAMES. Frames shall be complete with 5 ¾-inch width frames, not lighter than 14 gage with concealed metal reinforcements. Joints for frames shall be mitered or butted and continuously welded on the reverse side to produce rigid, invisible joints. For frames set in masonry, jamb anchor tees shall be at least 10 inches long, adjustable, and corrugated or other deformed type. Jamb anchor tees shall be anchored with recessed anchor heads for frames set in existing masonry walls. Door frames shall be anchored to the floor with a 16-gage base clip at each jamb. Clips shall be drilled for 3/8-inch anchoring devices.

7.5.3 FINISH HARDWARE. Exterior door finish hardware consisting of hold open door closers, latch sets, aluminum thresholds with vinyl strips, weather stripping, 10-inch high by 0.05-inch thick US 32D stainless steel kickplates with countersunk screws shall be provided. All locks shall be keyed alike and shall match the key system used by the Owner. Interior door finish hardware shall be provided with no lock.

All door hardware shall be equal to Schlage D-Series Heavy Duty Commercial, Rhodes style with satin chromium-plated finish.

The inactive door shall be provided with an astragal with weather stripping and inside mounted dead bolt locks, top and bottom. The door frame shall be set as close to the outside as possible to allow as much opening as possible.

7.5.4 FINISH HARDWARE – CHEMICAL ROOMS. Finish hardware consisting of hold open door closers, panic hardware, latch sets, aluminum thresholds with vinyl strips, weather stripping, 10-inch high by 0.05-inch thick US 32D stainless steel kickplates with countersunk screws shall be provided. All locks shall be keyed alike and shall match the key system used by the Owner.

All door hardware shall be equal to Sargent 9804-MAL panic hardware set with exterior lockset pull and thumb piece trim in US 32D. Closer shall be LCN 4110 CUSH Series or equal.

SECTION 7.6.0 - MASONRY

Building masonry includes the provision of all labor, materials, services and equipment to complete all the unit masonry work, including the placing and building in of reinforcement, all as indicated and specified.

7.6.1 CONCRETE BLOCK. Concrete block shall conform to ASTM C90, Grade N, Type II and shall have a unit weight of not less than 125 pounds per cubic foot. Blocks shall have 8-inch by 16-inch nominal face dimension. Thickness shall be as indicated. Half units, jamb blocks, bond beam units, and other special shapes shall be provided as required by the manufacturer. Cutting of blocks shall be held to a minimum. Concrete block shall be as manufactured by County Materials Corporation, or equal.

The exterior above grade masonry walls shall include a 4-inch split face block, a 1-inch Masonry Mat as manufactured by CavClear or equal, 3-inches of rigid polystyrene insulation (R15) as manufactured by DOW or equal. The interior face shall have 8-inch standard concrete units.

Unless otherwise shown, all courses shall be running bond courses, which shall be started from the corners. All walls and partitions shall be laid in running bond with full 3/8-inch joints and reinforced as specified. All masonry walls shall be plumb and true and built to the thickness and bond shown. The maximum permissible variation from plumbness of the wall or of a line of joints in the walls shall be 1/16-inch per foot of height, or ¼-inch in the total height of the walls. The maximum permissible variation from horizontal lines along the base of the walls as a whole or for lines of horizontal joints shall be 1/16-inch per block, or ¼-inch in the total length of walls. The 3/8-inch vertical horizontal joints shall be compressed to a dense, slightly concave joint with a circular tool slightly larger in diameter than the joint.

7.6.2 MORTAR. Mortar and mortar materials for concrete block shall conform to the requirements of Type S for exterior and Type N for interior, ASTM C270. Cement shall be ASTM C150 Type I. Masonry cement shall conform to ASTM C91. Masonry sand shall conform to the requirements of ASTM C144. All exterior masonry and mortar shall use the dry block water proofing system. The waterproofing admixture shall be added only during block fabrication.

The split face block and mortar shall be colored. Colors shall be selected by the Owner from standard color products available by the manufacturer.

The bottom mortar joint shall include a wall flashing to direct all moisture to the exterior of the wall. Provide moisture weep vents in the exterior face block, placed every 24-inches on center for the entire perimeter of the structure. Vents shall also be installed as needed at the top of doorways to allow moisture to exit from above bond beams. Weep vents shall be pre-formed polypropylene plastic units that ensure positive drainage in all cavity wall construction, while restricting insects and other debris entering the head joint. The polypropylene shall conform to ASTM D2240, D790B, D638 and D1238B. Weep vents shall be Mortar Maze Cell Vent as manufactured by Advanced Building Products, Inc. or equal. Color shall be selected to match the mortar.

7.6.3 MASONRY REINFORCING. Masonry reinforcing, shall be wire grille reinforcing and shall be galvanized No. 9 gage as manufactured by Dur-O-Wal or equal. All concrete masonry walls shall be reinforced with wire grille reinforcing at 16 inches on center vertically. All joints shall be lapped 6 inches. Special units shall be used at corners.

Block ties shall also be provided to anchor the 4-inch facing block to the 8-inch CMU's every other course. Metal ties where shown shall be 8 gage galvanized ties, suitable for inserting in anchor slots poured in concrete. Where masonry walls intersect with masonry or concrete, they shall be tied either by interlocking masonry or metal ties. Metal ties shall consist of crimped 8 gage galvanized dovetail anchors inserted in anchor slots in poured concrete at each course.

Seismic reinforcing shall be provided vertically in the 8-inch exterior masonry at each corner, at each side of each opening, at the ends of the walls and at a minimum spacing of 4 feet horizontally apart throughout the walls and cores filled with concrete grout.

7.6.4 REINFORCING STEEL. Reinforcing steel shall be #4 bars. Dowels, #4 bars, shall be provided every 4 feet, where possible, on the perimeter of the slab to anchor the masonry to the floor. Reinforcing steel shall consist of deformed bars conforming to ASTM A615, grade 60. Reinforcing steel shall consist of deformed bars conforming to ASTM A615 and shall be Grade 60. Type N mortar may be used for interior non-load-bearing masonry. All cells containing reinforcing shall be filled with pea-gravel grout. Inspection holes will be left in the masonry to confirm complete grouting.

7.6.5 BOND BEAM. Bond beam units shall be used where shown. Reinforcing for bond beams and lintels shall be as indicated on the drawings. Anchor bolts shall be set in the bond beam to anchor the sill plate. Anchor bolts shall be 3/8-inch diameter anchor bolts spaced every 8 ft on center. Bolts for structural steel framing shall conform to the requirements of ASTM A 307, Grade A. Structural steel nuts shall conform to the requirements of ASTM A 563.

7.6.6 LINTELS. Steel angle lintels shall be used where shown. Build in metal door frames as partition progresses. Fill space between masonry and frame with mortar. Lintels shall be fabricated from structural steel shapes conforming to ASTM A 36. All lintels shall have a minimum bearing of 8 inches. Composite lintels shall be fabricated using fillet welds covering 50 percent of the lap length. All steel angle lintels shall be shop primed in accordance with the painting specifications.

7.6.7 COLD WEATHER REQUIREMENTS. No masonry work shall be undertaken when the temperature is below 40 degrees Fahrenheit and dropping, nor when the temperature is below 35 degrees Fahrenheit and rising. All masonry work shall be protected against freezing for a period of 48 hours after being laid.

SECTION 7.7.0 - CEILINGS

The ceiling shall be covered with 5/8" fire rated, moisture- and mold-resistant gypsum and all joints taped. Panels shall be as manufactured by United States Gypsum or equal. Screws shall be Type S, Phillips bugle head with a 1-inch minimum length. Provide joint tape and compound for moisture-resistant installations as recommended by gypsum board manufacturer. Sand finished joints and filled screws as required to provide a finished surface suitable for painting. The ceiling for the Pump Room shall be textured and painted with finish colors to be selected by the Owner.

7.7.1 CHEMICAL ROOMS. The ceiling in the Chlorine/Polyphosphate room and the Fluoride room shall meet a 1-hour fire rating. The ceiling shall be constructed of two layers of gypsum. The base layer of 5/8-inch Type X gypsum applied at right angles to the trusses with 1 ¼-inch Type S or Type W drywall screws 24-inches on center (OC). The face layer of 5/8-inch Type X gypsum shall be applied at right angles to the truss (lap joints). Attach through the base layer with 1-7/8-inch Type S or Type W drywall screws 12-inches OC and face layer Type G drywall screws placed 2-inch OC back on either side of face layer end joints, 12-inches OC. The gypsum shall have all joints taped. Color and style to be selected by Owner from standard units available.

7.7.2 CEILING INSULATION. Ceiling insulation shall be three (3) - 6-inch layers of fiberglass, total R57 or an equivalent system of loose fill, blown insulation.

SECTION 7.8.0 - TRUSSES

The roof truss system shall be designed for dead loads, live loads, snow loads, wind loads, and seismic loads as shown on the plans and as required by the Minnesota Commercial Building Code. Trusses shall be factory fabricated. Trusses shall be fastened to the wall plate with truss ties equal to Simpson – Strong Tie Type H3 or equal. The shop drawings shall be prepared and submitted to the Engineer for review and approval prior to fabrication. Following submittal approval for layout and dimensional information, design calculations shall be prepared by, stamped and signed by a Professional Engineer in the State of Minnesota and one set of calculations submitted to the Engineer.

SECTION 7.9.0 - PAINTING/COATINGS

The General Contractor shall paint all new construction as specified. All new surfaces to be painted shall be thoroughly cleaned and dried before applying coatings. Surface cleaning shall follow requirements of SSPC-SP-1. Curing times shall be as recommended by the coating manufacturer.

In general, all interior and exterior hollow metal doors and other metal surfaces, concrete, concrete masonry, sheet metal, wood, pumping equipment, exposed piping, HVAC equipment, electrical equipment, and other miscellaneous surfaces receive paint. The intent is to provide corrosion resistant and protective coatings on all susceptible surfaces and to incorporate a selected color scheme throughout the facility. The Owner shall select finish coat colors.

Surfaces <u>not</u> requiring painting include the following:

A. Corrosion resistant ferrous alloys and non-ferrous metals such as bronze, aluminum, monel, stainless steel, and chromium plated.

B. Non-metallic materials such as glass and porcelain except as required for architectural or color-coding painting.

C. Electrical motor control and SCADA control panels with factory applied baked enamel finishes or specified not to be painted.

D. Non-exposed galvanized steel ductwork and conduit.

E. Plastic ball valves and special fittings such as strainers.

F. Equipment identification, name, nomenclature, performance rating, and code required labels.

G. No painting required on below grade concrete.

All coatings subjected to immersion or direct atmospheric contact shall be given seven (7) days cure before immersion service unless specific manufacturers' product data allows earlier immersion and approved by the Engineer. All painting systems shall be by the same manufacturer to assure compatibility of coatings.

7.9.1 MATERIALS. All materials specified shall be as manufactured by **Tnemec Company, Carboline Co**., **Sherwin-Williams, International Paint, Devoe Coatings,** or an approved equal for use on this project. Equivalent materials of other manufacturers may be substituted for approval of the owner or their representative. Requests for substitution shall include manufacturer's literature for each product giving the name, general type and descriptive information. Submittals shall include documented performance data as certified by a testing laboratory equal to the physical properties of the product specified in each specific use area. Materials shall be mixed, thinned and applied in accordance with manufacturer's written instructions. Finish coats shall be uniform in color and sheen without streaks.

7.9.2 METAL

A. Surface Preparation. Non-immersion items or equipment SSPC-SP-6 commercial blast cleaning. Immersion items or equipment - minimum SSPC-SP-10 near white metal blast cleaning. If already prime coated, clean all oils, grease, and dirt from the surface to be painted.

B. Material Application

1. Non-immersion Interior Steel Surfaces or Equipment:

a. Prime Coat: Apply one coat of Carboline Carboguard 893, Tnemec N69 Epoxoline, Sherwin-Williams Series B50NZ6 Universal Metal Primer, Devoe Coatings Devran 224 HS, or International Interseal 670HS, to achieve a minimum dry film thickness of 4 mils.

b. Intermediate Coat: Apply one coat of Carboline Carboguard 890, Tnemec N69 Epoxoline, Sherwin-Williams Tile-Clad HS Epoxy - Series B62WZ, Devoe Coatings Devran 224 HS, or International Interseal 670HS, high build epoxy to achieve a minimum dry film thickness of 4 mils.

c. Finish Coat: Apply one coat of Carboline Carboguard 890, Tnemec N69 Epoxoline, Sherwin-Williams Tile-Clad HS Epoxy - Series B62WZ, Devoe Coatings Devran 224 HS, or International Interseal 670HS, high build epoxy to achieve a minimum dry film thickness of 4 mils.

d. Finish Coat-Exterior Applications: Apply one coat of Carboline 133HB satin or 134HS gloss, Tnemec 74 gloss or 75 satin, Sherwin-Williams Hi-Solids Polyurethane (Gloss or Semi-gloss) or International Interthane 870 Semi-gloss or Interthane 990HS Gloss, aliphatic polyurethane coating to achieve a minimum of 3 mils dry film thickness.

e. Applied systems shall be from the same manufacturer to assure compatibility of materials. Drying time between coats shall be as recommended by the paint manufacturer. Iron and steel with bleeding surfaces shall be cleaned in accordance with SSPC-SP-1 (Solvent Cleaning) and sealed with one coat of Devoe Coatings Pre-Prime 167 Penetrating Sealer, Ameron Amerlock Sealer, or equal applied to a thickness of one mil per coat prior to applying the prime coat.

7.9.3 MASONRY INTERIOR & DRYWALL (NON-IMMERSION). All masonry surfaces shall have aged 30 days and dried to a maximum moisture content of 14 percent prior to coating application.

A. Manufacturer's Coatings:

Manufacturer	Block Filler	Prime Coat	Finish Coat
Tnemec	Tnemec Series 130 Envirofill	Series N69 Epoxoline	Series N69 Epoxoline
Sherwin Williams	Heavy Duty Block Filler	Tile-Clad HS Epoxy, Series B62WZ	Tile-Clad HS Epoxy, Series B62WZ
Carboline	Sanitile 100	Sanitile 655	Sanitile 655
Devoe Coatings	Devran 224HS High Build Epoxy	Devran 224HS High Build Epoxy	Devran 224HS High Build Epoxy
International	Interlac 895	Interseal 670HS	Interseal 670HS
PPG			

B. Surface Preparation Requirements. All masonry surfaces to receive a finish coat shall be scraped and/or rubbed with masonry stone to remove all rough edges and mortar spills.

C. System Thickness, Minimum Dry Film. Apply one coat of Block Filler to achieve a smooth, filled appearance to all masonry surfaces. Apply one prime coat at a minimum 5 mils dry film thickness. Apply one finish coat at a minimum 5 mils dry film thickness. Applied systems shall be from the same manufacturer to assure compatibility of materials. Drying time between coats shall be as recommended by the paint manufacturer.

7.9.4 INTERIOR AND EXTERIOR METAL DOORS. Steel surfaces and doors and frames not exposed to spraying or wetting, impact or abrasion. Finish shall be colored gloss or semi-gloss.

A. Surface Preparation. Steel surfaces exposed to atmosphere shall be cleaned in accordance with SSPC-SP-6 Commercial Blast Cleaning. Doors and frames shall be cleaned with SSPC-SP-3 Power Tool Cleaning and SSPC-SP-1 Solvent Cleaning.

B. Manufacturer's Coatings:

Manufacturer	Prime Coat	Finish Coat
Tnemec	Tnemec Series 10 Primer	Series 23 Enduratone
Sherwin Williams	Kem Kromik Universal Metal Primer B50NZ	Pro Industrial Urethane Alkyd Enamel
Carboline	Carbocoat 150 UP	Carbocoat 30
Devoe Coatings	Devguard 4160 Multi-purpose Tank & Structural Primer	Devshield 475 Alkyd Gloss Enamel
International	Interlac 793	Interlac 800
PPG		

A. Surface Preparation Requirements. Steel surfaces exposed to atmosphere shall be cleaned in accordance with SSPC-SP-6 Commercial Blast Cleaning. Doors and frames shall be cleaned with SSPC-SP-3 Power Tool Cleaning and SSPC-SP-1 Solvent Cleaning.

B. System Thickness, Minimum Dry Film. Apply one coat of primer to a minimum dry film thickness of 2 mils. Apply one finish coat to a minimum dry film thickness of 4 mils. Applied systems shall be from the same manufacturer to assure compatibility of materials. Drying time between coats shall be as recommended by the paint manufacturer.

7.9.5 INTERIOR WOOD

A. Service/Description. Wood surfaces.

B. Manufacturer's Coatings.

Manufacturer	Stain	Finish Coat
Sherwin Williams	Wood Classics Interior Oil Stain	Wood Classics FastDry Oil Varnish
Devoe Coatings	Woodpride Interior Oil Wood Finishing Stain	Woodpride Interior Polyurethane Satin Varnish

C. Surface Preparation Requirements. Wood surfaces to be painted shall be cleaned of dirt, oil, or other foreign substances with mineral spirits, scrapers, sandpaper, or wire brush. Finished surfaces exposed to view shall, if necessary, be made smooth by planning the surface or sandpapering. Millwork shall be sanded where necessary and given a coat of the specified exterior primer on all concealed sides before installation. Small, dry seasoned knots shall be surface scraped, sanded and thoroughly cleaned, before application of the priming coat.

After priming, all holes and imperfections shall be filled with putty or plastic wood colored to match the finish coat, allowed to dry and sanded smooth. Painting of exterior wood surfaces shall be performed as practicable, only after masonry work has cured.

Applied systems shall be from the same manufacturer to assure compatibility of materials. Drying time between coats shall be as recommended by the paint manufacturer.

7.9.6 PROTECTION OF FACILITIES AND SURFACES. All non-blasted surfaces shall be protected with an approved enclosure or covering prior to all abrasive blast cleaning. All blasting residue shall be collected and removed by the Contractor. Abrasive or paint residue shall not be permitted to enter into other wastewater process equipment, instruments, electrical equipment, conduits, and piping. Watertight seals shall be used on all pipes.

Floors and other adjacent areas and installations shall be satisfactorily protected by drop cloths and other precautionary measures. Overspray shall be removed by acceptable methods or the affected surface shall be repainted. The Contractor shall protect completed coatings from damage. The Contractor shall repaint or touch-up damaged coatings.

Finished surfaces shall be free from runs, drops, ridges, waves, laps, and unnecessary brush marks. All coats shall be applied to produce an even film that is of uniform thickness. All coats shall completely cover all corners, crevices, welds, bolts, nuts, threads, and sharp edges.

7.9.7 MISCELLANEOUS. All painting systems shall be by the same manufacturer to assure compatibility of coatings.

Colors shall be selected by the Owner and Engineer from color charts provided by the Contractor. The general items and process piping shall be painted to meet the following color code.

Description	Color Code
Raw Water	Olive Green
Pumps	Dark Blue
Chlorine Feed Line	Yellow
Fluoride Feed Line	Light Blue with Red Band
Polyphosphate Feed Line	Light Green with Red Band
Potable Water	Dark Blue
Non-Potable Water Line	Blue with 6-inch wide red bands spaced 30-inches apart
Interior Walls	To be Selected by Owner
Interior Ceiling	To be Selected by Owner
Doors and Door Frames	To be Selected by Owner
Equipment	To be Selected by Owner
Other	To be Selected by Owner

Labeling shall include direction of flow arrows and process line label twice in each room. Labels shall be Brady Snap-on pipe markers or equal or may be hand stenciled lettering.

SECTION 7.10.0 - EQUIPMENT BASES

All equipment bases shall be provided with a concrete base/pad including the pads for the motor control center, pumps, miscellaneous equipment, and generator shall be installed by the General Contractor as shown and specified. Anchor bolts are as required by manufacturer/supplier. All floor penetrations shall include a 6-inch-high concrete curb around the pipe and extend a minimum of 4-inches beyond the pipe.

SECTION 7.11.0 - ROOFING

The Contractor shall furnish and install an **Interlocking Standing Seam Metal Roof.** The aluminum standing seam roofing, fascia, and soffits includes all labor, materials, and equipment to construct a weatherproof roof covering

complete with flashing, fascia, soffit, and accessories as shown and specified. The aluminum standing seam roofing shall be “Snap-Clad” standing seam metal roofing system as manufactured by **Petersen Aluminum Corporation** or equal.

The aluminum standing seam roofing materials and appurtenances shall have a minimum 20-year warranty for durability covering rupture, structural failure or perforation. The warranty shall also cover color fade, chalking, and film integrity.

Panels shall be of the snap-lock type and provide a weather-tight connection with no exposed fasteners. The panels shall be 12 inches wide and formed from 0.032-inch thick 3105-H14 aluminum with a factory-applied full-strength fluoropolymer system or equivalent steel. The total coating thickness shall be 1 mil on the exposed face and 0.3 to 0.4 mils on the underside. Panels shall be provided with strippable vinyl film applied during panel fabrication and finishing. Seams shall be 1 3/4" high. Panel lengths shall be adequate to provide a continuous sheet from ridge to eave.

Panels shall be attached to the roof sheathing with the manufacturer’s standard fasteners and concealed clips. Fasteners shall be aluminum or stainless steel with neoprene washers. Fasteners and clips shall allow for the expansion/contraction of the system without ripples and buckles. Fasteners shall be placed as indicated in the manufacturer’s standards. Conceal fasteners and expansion provisions wherever possible in exposed work and locate so as to minimize the possibility of leakage.

Vented ridge closures shall be metal clad neoprene fabricated from 0.040-inch thick aluminum or equivalent steel. The color shall match the roof panels where exposed.

The subgirt assembly shall be zinc-coated steel of the required shape and thickness to meet load, deflection, and insulation thickness criteria. Zees shall be used to span between girts and/or joists where required. Thermally responsive clip assemblies which permit movement in two directions shall be fastened to subgirt on 12-inch centers.

The underlayment shall be 30-pound asphalt-saturated felt. Ice and water shield shall be provided as recommended by the manufacturer.

Copings, flashing and soffits shall be 0.032-inch thick aluminum or 24-gauge steel with a finish to match the roof panels. Preformed counterflashing and coping shall be as manufactured by Petersen Aluminum Corporation or equal. Fascia and soffit shall be Pac-Clad as manufactured by Petersen Aluminum Corporation or equal. Fascia and soffit shall have a Kynar finish. The Contractor shall provide all nails, corners, starting clips, caps, and other accessories required for the complete system installation. Prefinished to match the standing seam panels crickets shall be provided to direct drainage around roof curbs, with ice and water shield to extend up the sides of the curb 6-inches and matching flashing. Sealant shall be applied as recommended by the manufacturer. The aerator discharge shall receive a veneer with trim and flashing matching the metal roofing.

Caulking shall be Rodorsil 3B, Dow Corning 780 or 781, or equal.

Nails shall be 6d hot-dip aluminum.

Separate dissimilar materials from each other by painting each surface in the area of contact with a heavy application of bituminous coating, or by other permanent separation approved by the manufacturers of the materials. Provide for thermal expansion of running trim, flashing, and other items exposed for more than 10 feet of continuous length. Maintain a watertight installation at expansion seams.

Colors shall be selected by the Owner from standard colors available.

7.11.1 SNOW RETENTION SYSTEM. The aluminum standing seam roof system shall be provided with a snow retention system. The snow retention system shall be ColorGard as manufactured by S-5! or equal. The retention system shall provide attachment to the standing seam roofing system with only minor dimpling of the panel seams, without penetrations through roof seams or panels, without use of sealers or adhesives, and without voiding roof warranty. Snow retention system shall consist of clamps, cross members, color strips, and snow and ice clips. Clamps shall be of 6061-T6 aluminum extrusions conforming to ASTM B221 or cast aluminum conforming to ASTM B85. Set screws shall be 300 Series stainless steel, 18-8 alloy, 3/8-inch diameter, with round nose point. Attachment bolts shall be 300 Series stainless steel, 18-8 alloy, 10mm diameter, with flat washers. Cross members shall be of 6061-T6 alloy and temper aluminum extrusions conforming to ASTM B221. The cross member shall accept a color strip of the same material and finish color as the roof panels. Snow and ice clips shall be aluminum with rubber foot, minimum of 3 inches wide. Snow retention system clamps shall be placed in straight, aligned rows with set screws on the same side of the clamp. Color matched metal strips shall be inserted into the cross members and staggered as to cover cross member joints.

Color shall match the standing seam roofing.

SECTION 7.12.0 - ALUMINUM FASCIA & SOFFIT

Aluminum fascia and soffit includes all material, labor, and services necessary to furnish and install aluminum fascia, soffit and accessories as shown and specified. Fascia and soffit shall be 0.032 gage aluminum sheets. Fascia and soffit shall have a Kynar 500 finish or equal. The fascia and soffit shall be Pac-Clad as manufactured by Petersen Aluminum Corporation or equal.

The Contractor shall provide all nails, corners, starting clips, caps, and other accessories required for the complete system installation. Install accessories in such manner to provide tight, well fitted joints. Caulking shall be as recommended by the manufacturer.

Color to be selected by Owner.

SECTION 7.13.0 - GABLE ENDS & SIDING

Gable ends shall be finished with 5/8-inch plywood and double 4-inch steel siding.

Face siding for the pump access hatches shall match the gable end siding. Trim, flashing, and corner trim pieces shall be provided and as recommended by the manufacturer.

Color to be selected by Owner.

SECTION 7.14.0 - TEMPORARY ELECTRICAL SERVICE

The Contractor shall be responsible for providing temporary electrical power for construction and making any arrangements necessary through the electric utility (Freeborn Mower Electric Cooperative).

SECTION 7.15.0 - PIPING MATERIALS

7.15.1 INTERIOR EXPOSED PIPING. Interior piping 3-inch and smaller shall be galvanized threaded and coupled steel, ASTM A120, schedule 40 pipe with ANSI B16.3, Class 150 malleable iron fittings. Interior piping, 4-inch to 12-inch diameter shall be flanged piping shall be class 53 ductile iron pipe. The piping shall have steel 150-pound rated flanges. All exposed interior piping shall be epoxy coated exterior and cement lined interior. Piping shall be painted.

On 3-inch flanges and smaller, gaskets shall be 1/16-inch thick. On 4-inch flanges and larger, gaskets shall be 1/8-inch thick. Flange gaskets shall be suitable for the intended service.

7.15.1.1 FLANGED COUPLING ADAPTERS. Flanged coupling adapters shall be Dresser Style 127 or 128, or equal. Coupling gaskets shall be as recommended by the coupling manufacturer for the intended service.

7.15.1.2 MECHANICAL PIPE COUPLINGS. Mechanical pipe couplings shall be Dresser Style 38, Smith-Blair, or equal. Coupling gaskets shall be as recommended by the coupling manufacturer for the intended service.

7.15.1.3 FLEXIBLE RUBBER COUPLINGS. The flexible rubber couplings shall have a single wide flowing arch. The inner tube shall be a seamless, leak-proof layer of nominal ¼-inch thickness that extends from the outside diameter of one flange to the outside diameter of the other flange. It shall be an elastomer compatible with the intended service. The textile reinforcement shall be a minimum of six (6) bias plies of high-quality tire-cord reinforcement and impregnated with a compatible elastomer. The metal reinforcement shall have sufficient radial strength to support the textile loads. The metal reinforcement shall be round to prevent cutting of the textile reinforcement. The exterior cover shall be an elastomer and shall be a seamless layer, of nominal 1/16-inch thickness. Rubber flanges shall be integral with the body and have a full flat face with the same outside diameter as the mating flange. Flanges shall be drilled to Class 150 lb.

Retaining rings shall be fabricated of minimum 3/8-inch thickness high grade carbon steel or ductile iron with hot dipped galvanized finish. Control Units shall be designed to restrict the rubber expansion joints movement range (axial, angular, lateral, and torsional) during normal operation. In the event of main anchor failure. Control units shall be designed to restrain the expansion joints axially while restricting their other movements (angular, lateral and torsional) during normal operation. The tie rods will act as the piping system's

primary restraint by continuously restraining the full pressure thrust loads. The gusset plates shall be high grade carbon steel with hot dipped galvanized finish and the rods shall be high strength ASTM A193, Grade B7 with hot dipped galvanized finish.

Expansion Joints shall be Series 1100 as manufactured by the General Rubber Corporation or equal.

7.15.1.4 INTERIOR VALVE GENERAL REQUIREMENTS. Unless otherwise indicated, the direction of rotation of the valve operating wheel or lever shall be to the left (counterclockwise) to open the valve. All exposed valves, except those which are equipped with power operators/actuators, shall be provided with manual operators. Unless otherwise specified, each manual operator shall be equipped with a hand crank or operating wheel.

7.15.1.5 RESILIENT WEDGE GATE VALVES. Resilient wedge gate valves shall be full opening, non-rising stem, compression seated wedge-type valves conforming to the requirements of AWWA C509. Valves shall have an epoxy coated cast iron body, bronze stem, and a double sealing permanently bonded fully encased gate. Valve stem shall have O ring seals. Valves shall have ends to match the pipe and fittings unless specified otherwise. Resilient wedge gate valves shall be Clow, Waterous Series 500, or equal.

7.15.1.6 BUTTERFLY VALVES. Butterfly valves shall meet or exceed the requirements of AWWA C504 for Class 150 short bodied flanged valves. Valve body shall be ASTM A126 Class B cast iron with 125-pound flanged ends. Valve disc shall be ASTM A126 Class B cast iron, ASTM A48 Class 40 cast iron, or ASTM A536 ductile iron with ASTM A276, AISI Type 304 or 316 stainless steel shafts. Valve disc shall have a stainless steel or nickel chrome surface that seals against a resilient seat in the body. Shaft sleeves shall be O-ring seals or V-type packing. The valve operator shall be a totally enclosed worm gear or traveling nut, as required, for a maximum pull of 80 pounds and input stops capable of withstanding 450 ft. lb. Valves shall be M & H 450, Pratt, Mueller Lineseal III, or equal.

7.15.1.7 BALL VALVES. Bronze, cast iron, and steel ball valves shall be of a two-piece design with threaded end connections and blow-out proof stem and adjustable packing nut. Bronze ball valves shall have a hard chrome plated brass ball, Teflon packing and seat rings. Bronze ball valves shall be Crane, or equal.

1. PVC ball valves shall be a full port, true union design with self-lubricating TFE seats and threaded end connections. PVC ball valves shall be Hayward True Union ball valves, or equal.

7.15.1.8 SWING CHECK VALVES. Swing check valves shall be cast iron Class 125 and shall have an outside lever and spring, or lever and weight where indicated, bolted cap and flanged end connections conforming to the requirements of AWWA C508. The valve shall have a clear opening equal to or greater than the connecting pipe. Cast iron Class 125 swing check valves shall be M & H Style 259-02, or 159-02, Clow Eddy-Iowa, Pratt 8001 Series, or equal.

7.15.1.9 SOLENOID VALVES. Solenoid operated valves shall be of the normally closed-type with encapsulated coils and watertight enclosures, unless otherwise shown. All solenoids shall be rated for continuous duty. Solenoid valves shall be able to operate with little or no pressure drop in downstream pipeline. Solenoid valves for water service shall be ASCO Red Hat slow closing solenoid valves.

7.15.2 EXTERIOR PIPING / BURIED PIPING. Exterior piping is incidental to the contract.

Exterior buried pipe shall be pressure class 350 ductile iron pipe with mechanical and/or slip joints. All buried and exterior pipe shall be asphalt coated and cement lined ductile iron pipe. Mechanical joints shall be restrained with locking glands, EBBA Iron Mega Lug Series 1100, or equal.

Buried ductile iron pipe shall include polyethylene wrap – 8 mil low density polyethylene wrap per AWWA C 105 and in accordance with Section 3.6 on all piping and fittings with tracer wire in accordance with Section 3.8.

Hydrants shall be as specified in Section 3.14, meeting City standards. Gate valves and valve boxes shall be in accordance with Section 3.13 and shall include Gate Valve Adaptors for each.

Drain and vent piping shall be Schedule 40 PVC on the building interior. Building drain piping buried from the building to the discharge point shall be SDR 26 PVC with rubber gasket joints.

Tracer wire shall be in accordance with Section 2 and Section 3. The cost shall be incidental. Following completion of the installation and connections, the pipeline shall be tested with water and the tracer tested for wire conductivity.

7.15.3 CHEMICAL PIPING CARRIER CONDUITS. The Contractor shall furnish and install PVC conduit in the floor to carry polyethylene tubing from the chemical feed pumps to the injection points. The locations are shown on the plans. The conduit shall be provided with long sweep elbows to allow easy installation and removal of the feed lines. The following conduits are required:

- One (1) – 1 ½-inch diameter conduit for chlorination from Chemical Room No. 1 to the 6-inch diameter well pump discharge.
- One (1) – 1 ½-inch diameter conduit for polyphosphate from the Chemical Room No. 1 to the 6-inch diameter well pump discharge.
- One (1) – 1 ½-inch diameter conduit for Fluoride from the Chemical Room No. 2 to the 6-inch diameter well pump discharge.

See Section 6 for chemical feed requirements.

7.15.4 INSULATION. When required due to insufficient cover over pipe, install closed-cell extruded polystyrene (blueboard) 2 inches thick, incidental to the contract, as follows:

A. Place bedding material to a height of 6 inches over the top of the pipe; level; and compact.

B. Place the insulating board on the cover material with the long side parallel to the centerline of the pressure sewer for a minimum width of O.D. +24-inches. Place boards in a staggered arrangement to eliminate continuous transverse joints. If two or more layers of insulation board are used, place each layer to cover the joints of the layer immediately below.

C. End or side dump the first lift of backfill material, consist of 6 inches of bedding material, onto the insulation board and spread in such a manner that construction equipment does not operate directly on the insulation. Compact this layer with equipment that exerts a contact stress of 70 to 80 psi. Once this layer has been compacted to the specified density, the remaining layers of backfill may be installed using conventional procedures.

SECTION 7.16.0 - DISCHARGE PIPING

The discharge piping shall be provided for the well pump and other equipment, and appurtenances. The discharge piping shall be provided for the pump discharge from Well No. 5 by Proposal #1 - General & Mechanical and coordinated with the Well Pump Work Contractor. The pump discharge head will be provided under Proposal #3 – Well Pump Work. The sizes of pipes are shown on the drawings. The pipe layouts shall be adjusted to avoid new or existing architectural, structural, HVAC, piping, electrical and other features and shall be coordinated with construction by others. Following completion of acceptance testing, all potable water pipelines shall be disinfected in accordance with Section VIII. The Contractor shall provide for a sampling tap at the end of each pipeline to be sampled. Water for the testing will be provided by the Owner. The Contactor shall provide all labor and materials to flush the pipeline, and to dispose of the water so as to not cause harm to public or private property.

Provide piping and fittings, swing check valve, flexible rubber coupling, flange coupling adapters, isolation and throttling valves, pipe supports, and other piping and appurtenances as shown on the plans. Provide tap for smooth end sampling faucet(s) as required.

The magnetic flow meter (magmeters) shall be provided. The units shall be furnished with grounding rings.

Provide taps for pressure gauges, control devices, pressure switches, and for smooth end sampling faucet(s); and other such appurtenances as shown and / or specified.

7.16.1 PRESSURE GAUGE. Discharge pressure gauge, including shut-off cock and impulse damper. Gauge shall be rated 0-100 psi, 3-1/2-inch dial, and a ¼-inch NPT tapped connection. Pressure gauges shall be Ashcroft Type 1009, Trerice 890 Series, or equal.

Provide tap for a pressure gauge and tap for smooth end sampling faucet and combination air and vacuum valve.

7.16.2 COMBINATION AIR & VACUUM VALVE. 1-inch combination air and vacuum valve, Val-matic 201C for potable water or equal with 1-inch discharge piping to the hub drain (sch.40 galvanized steel with galvanized 150 pound malleable iron fittings), two (2) ball valves, elbows, unions and screen. Provide tap for combination air and vacuum valve for Well Pump No. 5.

SECTION 7.17.0 - PLUMBING

The building shall include the floor drains, water supply and hose bibs, hub drains, emergency eyewash connection, and other appurtenances as shown on the plans.

7.17.1 FLOOR DRAIN SYSTEM. The **floor drains shall be JOSAM 30000-E Series or equal with 7-inch NIKALOY strainer.** The drains shall be provided with a trap. Cleanouts shall be installed as indicated on the drawings. All drain and vent piping shall be Sch. 40 PVC. Venting shall be per Minnesota Department of Labor and Industry requirements. All trim, exposed pipe and fittings and other exposed metal items associated with fixtures shall be polished chrome plated unless otherwise noted. Chrome plated escutcheons shall be provided at all exposed finished wall penetrations. All roof openings for vent piping shall be flashed and counter flashed. Flashing and counterflashing to be soldered watertight. Outside diameter of flashing to be no less than 16 inches greater than the outside diameter of the vent pipe. Material shall be 16-ounce copper. Where bell and spigot pipe is used pipe shall terminate with spigot with counterflashing turned into end. Equipment hub drains shall be Zurn Z-326 with bottom dome strainer and extension, Wade, JOSAM, or equal.

The contract shall include the 4-inch SDR 26 sanitary sewer service line from the building to the point of discharge as shown. Provide a #4 mesh stainless steel screen banded to the end of the pipe.

7.17.2 WATER SUPPLY SYSTEM. The building shall include a water supply as shown. Provide 2-inch water service from the 8-inch watermain to the building, Type K Copper. Service to include a corporation stop and curb stop and box.

Contractor shall install water meter furnished by City (Owner). One (1) 1 ¼-inch non-potable and one (1) 1 ½-inch potable reduced pressure principal backflow preventers, **Watts 009**, or equal. Installation shall include initial testing and inspection. Strainers for water service shall conform in rating and end connections (screwed or flanged) to Piping System and shall be the Y-type unless indicated otherwise with bronze or carbon steel body with AISI Type 316 stainless steel or monel screens and tapped blow off connections. Screen perforations for water service shall be 40 mesh for strainers up to 2 inch. Strainers shall be Leslie Co., Charles M. Bailey Co., or equal.

Interior exposed piping for the water service shall be ASTM B88 Type L drawn copper with soldered joints with ANSI B16.22 wrot copper fittings.

Exterior buried piping for the water service shall be ASTM B88 Type K annealed copper with compression fittings.

All hose bibs shall be protected with vacuum breakers, Watts Model 8 and 8FR, or equal. Exposed isolation valves shall be Bronze Ball Valves. Bronze ball valves shall have a hard chrome plated brass ball, Teflon packing and seat rings. Bronze ball valves shall be Crane Capri No. 9302, Grinnell Fig. No. 3700, or equal. Interior piping shall be insulated.

7.17.3 LOW TEMPERATURE INSULATION. Exposed water service piping shall be insulated with low temperature insulation. Insulation for low temperature applications (-30° to 120° F) shall be flexible unicellular-type. Adhesive and accessories shall be as recommended by the manufacturer. The insulated pipe shall be painted in accordance with the color code system specified in this section.

7.17.4 EYEWASH & SHOWER. Provide emergency eyewash and shower as required on the drawings. The unit shall be a **Haws Model 8300 w/plastic showerhead, self-closing brass ball valve, stainless steel eyewash bowl w/push-flag valve operator**, or equal.

7.17.5 EYEWASH & SHOWER WATER HEATER. Provide one (1) 85-gallon electric water heater to serve the eyewash and shower. The water heater shall be located in the Pump Room. Heater shall have an electrical input of 18 kW, 480 Volt, 3-phase, have a recovery rate of 186 GPH and listed by Underwriters' Laboratories.

The water heater shall have a maximum working pressure of 150 psi, and shall be completely assembled. The water heater shall have a nominal storage tank capacity of 85 gallons with a separate ¾-inch tapping for temperature and pressure relief valve installation. Unit shall be non-metallic, lightweight composite tank with no anode rod required. The exterior of the tank shall have a high density polyethylene dent and scratch resistant jacket. Water connections shall be 1" swivel nuts.

Electric heating elements shall be titanium upper and lower elements. The controls shall include a thermostat with each element and a high temperature cutoff. The jacket shall provide full size control compartments for performance of service and maintenance through front panel openings and enclose the tank with foam insulation. The drain valve shall be located in the front for ease of service. The 85-gallon electric water shall be a Rheem, A.O. Smith, Bradford White, or equal.

SECTION 7.18.0 - LOUVERS AND VENTILATION

The Contractor shall provide all materials, labor, and services necessary to provide the ventilation equipment, air intakes, louvers, duct work, and all other appurtenances.

7.18.1 VENTILATION EQUIPMENT (as indicated). The exhaust fans shall be direct-drive ceiling mounted units. The unit shall be constructed of corrosion resistant galvanized steel housing. Unit shall include a ceiling grille and an integral back draft damper. Fan and motor shall be removable. The units shall pull air through the grilled inlet and exhaust through ductwork to the vented soffit. Units shall be manually switched as shown.

Exhaust Fans:
Pump Room: 275 CFM @ 0.125-inch sp., 120V, single phase, **Loren-Cook ACED or equal.**

Intake Units:
Pump Room: 8-inch H x 16-inch W

7.18.2 VENTILATION EQUIPMENT - CHEMICAL ROOMS. The exhaust fan shall be a spun aluminum, roof mounted, direct driven, downblast centrifugal exhaust ventilator. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16-gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have a rolled bead for added strength. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. The motor shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. The unit shall bear an engraved aluminum nameplate that indicates the design CFM and static pressure. Wheel shall be centrifugal backward inclined, constructed of 100% aluminum, including a precision machined cast aluminum hub. An aerodynamic aluminum inlet cone shall be provided for maximum performance and efficiency.

Exhaust fan shall be provided with backdraft damper, aluminum insulated pitched roof curb, and an aluminum damper with a damper actuator.

The aluminum insulated roof curbs shall be designed to support the ventilation equipment for installation on pitched roofs. Curbs shall have 2 inches of rigid insulation enclosed by a welded aluminum housing. The roof curbs shall have a ¼ inch thick by 2-inch wide continuous rubber pad around the top of the curb. Aluminum insulated roof curbs shall be Model RCA as manufactured by Loren-Cook or equal.

Electrical motor shall be NEMA design B with a minimum of class B insulation rated for continuous duty and furnished at the specified voltage, phase and enclosure. Motor shall be an electronically commutated motor rated for continuous duty and furnished either with internally mounted potentiometer speed controller or with leads for connection to 0-10 VDC external controller.

Exhaust Fans:
Chemical Room #1 – Chlorine/Polyphosphate : 275 CFM @ 0.125-inch sp., 120V, single phase, ¼-HP, Loren Cook - ACED Model 70C13DEC with roof curb or equal.
Chemical Room #2 – Fluoride: 147 CFM @ 0.125-inch sp., 120V, single phase, ¼-HP, Loren Cook - ACED Model 70C13DEC with roof curb or equal.

Intake Units:
Chemical Room #1 – Chlorine/Poly.: 8-inch H x 16-inch W
Chemical Room #2 – Fluoride: 8-inch H x 16-inch W

7.18.3 DUCTWORK AND DAMPERS. All duct work shall be flexible, wire reinforced and insulated duct. All ductwork shall be 0.025-inch aluminum. All joints shall be sealed with duct tape. **The chemical room exhaust fan intakes shall be connected to aluminum duct work from the units to 12-inches above the floor.**

Air intakes shall be aluminum construction with flanges for interior wall mounting, and aluminum dampers mounted on the inside of the walls. An aluminum stormproof fixed louvre with bird screen shall be mounted on the exterior wall. Exterior louvers shall not have flanges. The masonry opening shall be lined with galvanized ductwork to cover the space between the exterior and interior masonry.

Dampers shall be motor actuated, aluminum construction with parallel blades and seal tight, low leak design. Damper actuators shall be power open, spring return and operate on 120V, single phase, 60 Hz power. Actuators shall be provided with support brackets constructed of hot-dipped galvanized steel or aluminum. Damper motors shall be controlled by exhaust fan switch. Damper actuators shall have motors that operate on 120V, single-phase, 60Hz power.

Damper actuators for aluminum dampers shall be provided with support bracketry constructed of hot dipped galvanized steel or aluminum. Support bracketry shall be designed to have zero deflection when the actuator operates. Damper actuators shall be mounted on the wall and shall sufficient torque to position the size of damper served at the specific conditions. The actuators for aluminum dampers shall be Barber-Colman, Belimo, or equal.

7.18.4 LOUVERS. Louver frames and blades shall be fabricated from 0.081-inch extruded aluminum. Miter and weld all corners and intersections. All blades are to have the double water bar with drainable feature. Provide extruded sill extensions where shown on the drawings and where required to cover unfinished materials. Use only aluminum or stainless-steel fasteners. Louvers shall be Model DBE as manufactured by Dowco Products Group or equal.

All louvers shall be provided with a mesh aluminum insect screen secured on the inside in a removable extruded aluminum frame. The size of the screen shall match the louver. All intake louvers shall be furnished with a factory applied baked-on enamel finish.

Back draft damper frames and blades shall be aluminum with polyurethane blade edges. The blades shall be linked with stiffeners and have nylon bearings, ½ inch expanded aluminum face grilles, and be counterweighted. The back draft damper shall be Series SHL as manufactured by Safe-Air Dowco or equal.

Colors are to be selected by the Owner from samples provided by the Contractor.

SECTION 7.19.0 - DEHUMIDIFIER

The Contractor shall provide one (1) dehumidifier. The dehumidification unit shall be portable, refrigerant type which cool incoming air streams to below the dew point. The cooled, dry air is also used to pre-cool incoming air. The unit shall include a humidistat (20-80 percent relative humidity), positive on/off switch, a separate fan switch independent of dehumidifier operation and internal condensate pump.

The unit shall operate on 7 amps, 115V, single phase power. The unit shall be capable of removing 195 pints per day at 80^{o} F and 60% relative humidity.

The dehumidifiers shall be **Hi-E Dry 195 as manufactured by Quest**, or equal.

SECTION 7.20.0 - FIRE EXTINGUISHER

The Contractor shall provide two (2) carbon dioxide fire extinguishers and they shall be UL and ULC rated at 10 B:C. All fire extinguishers shall be the pull-pin, squeeze-grip operation-type, and shall be painted high gloss OSHA red. The fire extinguishers shall be the pressure discharge type in lightweight seamless aluminum or welded steel containers having a corrosion resistant grip-type valve, flexible hose discharge nozzle, visual pressure gage, and wall mounting bracket. Fire extinguishers shall be J. L. Industries, General Fire Extinguisher, or equal.

SECTION 7.21.0 – FLOORING

The Pump Room and Chemical Rooms shall have hardened concrete floors. Upon completion of the water cure, all interior floor surfaces shall be hardened with curing and hardening compound. Application shall be in accordance with manufacturer's recommendations.

Concrete curing compound shall be of a nature and composition not deleterious to concrete and shall be of a standard and uniform quality ready for use as shipped by the manufacturer. At the time of use, the curing compound shall be in a thoroughly stirred condition. Curing compounds shall not be diluted by the addition of solvent or thinners, or be altered in any manner without the specific approval of and in a manner prescribed by the manufacturer. Curing compound shall conform to the requirements of ASTM C309 Type 1. The maximum allowable moisture loss with one coat shall be 0.11 lbs per square foot in the 72¬ hour period. The curing compound shall be sufficiently transparent and free from color that there will be no permanent change in the color of the concrete. The compound shall contain, however, a temporary dye of sufficient color to make the membrane clearly visible for a period of at least four hours after application at locations required by the Engineer. Curing compound shall be Kure-N-Seal as manufactured by BASF Building Systems, Inc. EUCO Super Floor Coat as manufactured by Euclid Chemical Co., or equal.

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SECTION VIII
CONSTRUCTION – WATER SYSTEMS

Note: This standard specification includes general requirements for water system projects and is supplemented and superseded by the Special Provisions that apply to this project only.

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CONSTRUCTION - WATER SYSTEMS

SECTION 8.1.0 - GENERAL

8.1.1 SCOPE. The work to be done under this contract shall consist of the complete construction of a water distribution system or extension ready for immediate and continuous use including the furnishing of all the required pipe, fittings, hydrants, valves and accessories, as well as the necessary materials, equipment and labor, all as shown on the accompanying plans, described in these specifications and/or listed in the proposal.

8.1.2 MATERIAL FURNISHED. The Contractor shall furnish all materials unless specifically noted on the plans or Contract Documents. All materials furnished by the Contractor shall be new and conform to the requirements of the Material Specifications (Section III). The types of materials are specified on the plans, in the Proposal and/or in the Special Provisions.

8.1.3 LOCATION. Water mains shall be placed approximately fifteen (15) feet from the centerline of the street on the side of the street indicated on the plans, or as staked by the Engineer.

Fire hydrants shall be placed a minimum of twelve (12) inches clear from the present or future curb at the location on the plans. Curb stops and curb valves are to be located seven (7) feet from the property line. The Contractor shall continue the service piping to the property line.

The Engineer may revise the location of pipes, hydrants, valves or services before work on their installation is started, and the Contractor shall install them in the revised locations at the unit prices stated in the proposal.

8.1.4 RECORD DRAWINGS. The Contractor shall be responsible for furnishing exact information on the location of fittings, valves, corporation stops, curb boxes and the deadend location of all mains and services. Ties shall be provided. These Record Drawings shall be provided before final payment is released.

SECTION 8.2.0 - EXCAVATION

8.2.1 LENGTH AND DEPTH OF TRENCH. No more than 450 feet of trench shall be open at any one time, except with special permission of the Engineer. In no case shall such excavation extend at the same time across any two parallel streets which intersect the street in which the work is being done. The depth of the trench is to be such that the top of the pipe is at least seven (7) feet below the surface of the existing or proposed ground, whichever is deeper, unless specified elsewhere. The width of the trench shall be adequate to insure good workmanship and proper inspection of joints.

8.2.2 WIDTH OF TRENCH FOR WATER MAIN. The maximum width of the trench excavation at the top of the pipe shall be the outside diameter of the pipe used plus twenty-four (24) inches, except where sheathing or trench boxes are requited.

All pipe to be laid in open-cut trench shall have 6 inch minimum clearance between the outside face of the pipe barrel and the face of the sheathing.

SECTION 8.3.0 - LAYING OF WATER MAIN

8.3.1 LINE AND GRADE FOR OPEN-CUT CONSTRUCTION. If the Contractor is not able to maintain the depth of cover and grade by other means, the Engineer may require the use of line and grade boards. A substantial stake shall be driven on the side of the trench on a line at right angles to each stake of the primary line. A substantially straight 2" x 6" inch board shall be nailed or clamped to the stakes in a level position and at some even foot height above the grade line of the proposed water main. The elevation of each pipe shall be obtained by sighting across at least three batter boards to a mark on an approved type of grade pole. If, in the opinion of the Engineer, the accurate elevation of the pipe cannot be determined by sighting over the grade boards, the Contractor may be ordered to fasten a line to the boards at the center alignment marks and obtain the elevation by measuring down from the line by means of an approved type grade pole. The alignment of each pipe shall be obtained by plumbing down from the center marks or line, by means of a plumb bob. Methods other than described above may be used only if approved by the Engineer.

8.3.2 PREPARATION. The bottom of the trench will be excavated to the exact form and size of the lower portion of the pipe with additional excavation at the joints so that bearing will be continuous and the load equally distributed.

8.3.3 BEDDING CONDITIONS. The maximum width of trench excavation at the top of the pipe shall be the outside diameter of the pipe plus 24 inches. All pipe, regardless of the material, class, size, or use shall follow the same specifications. Refer to the Standard Details on the plans.

A. Soil Classifications. For purposes of pipe installations, the following Soil Classification Chart applies. The Engineer shall make the initial determination of soil classification for the native soils. If the Contractor contests the determination or the material is difficult to classify, the Contractor shall retain an Independent Laboratory to determine classifications. The Soil Classification of the native material is used to guide the pipe installation. In general, coarse grained soils like sands and gravels are suitable for most foundation, bedding, haunching and backfill purposes and fine grained soils like clay may be suitable for foundation and backfill but not for bedding.

SOIL CLASSIFICATION CHART			
COARSE-GRAINED SOILS			
Gravels			
GW	Well-graded gravel	More than 50% of coarse fraction retained on #4 sieve	Clean gravels <5% fines
GP	Poorly graded gravel		
GM	Silty gravel		Gravel with fines >12% fines
GC	Clayey gravel		
Sands			
SW	Well-graded sand	50% or more of coarse fraction passes #4 sieve	Clean sands <5% fines
SP	Poorly graded sand		
SM	Silty sand		Sand with fines >12% fines
SC	Clayey sand		
FINE-GRAINED SOILS			
Silts and Clays			
CL	Lean clay	Liquid limit <50	Inorganic
ML	Silt		
OL	Organic clay/silt		Organic
CH	Fat clay	Liquid limit >50	Inorganic
MH	Elastic silt		
OH	Organic clay/silt		Organic
PT	Peat		Organic

B. Soil Classes For purposes of pipe installations, the following Soil Classes applies to the backfill material.

SOIL CLASSES			
Crushed rock			Class I
Clean coarse grained	SW, SP, GW, GP	<12% passing #200	Class II
Coarse grained with fines	GM, GC, SM, SC	>12% passing #200	Class III
Silty Clay	CL, ML	>30% retained #200	Class III
Fine grained	CL, ML	<30% retained #200	Class IV
	MH, CH, CL, CH, PT		Class V

C. Use of Soil Classes for Pipe Foundation, Embedment and Backfill

USE OF SOIL CLASSES FOR FOUNDATION, EMBEDMENT AND BACKFILL	
Foundation	4" minimum in rock excavation
Foundation - no water	Class I, II or III or subcut and use Class I or II
Foundation - with water	Class I or II or subcut and use Class I or II
Bedding	4" minimum Bedding Sand (3.24.2) or 3/8" Crushed Rock (3.24.1)
Embedment - no water	Class I, II or III or replace with Class I, II or III
Embedment - with water	Class I or II or replace with Class I or II
Foundation and embedment	No rock > 1", No Class IV or V
Final Backfill	No rock > 8"
Embedment includes Bedding, Haunching and Initial Backfill	

COMPACTION FOR FOUNDATION, EMBEDMENT AND BACKFILL	
Foundation	90% Modified Proctor
Bedding	90% Modified Proctor
Haunching	90% Modified Proctor
Initial Backfill	90% Modified Proctor
Final Backfill	90% - 95% Modified Proctor

D. Bedding and Backfill Description

1. Foundation. No subcutting is required where a stable foundation of suitable soil exists below the bedding. If the bottom of the excavation is of undesirable material, such as rock, Class IV or Class V material, or the presence of ground water causes a condition which cannot adequately support the work, an additional four inches (4”) of foundation shall be excavated and backfilled with compacted Class I or II and included as part of the standard sections at no additional payment. In the event that it becomes necessary to extend the foundation to a greater depth, such additional amount of removal and replacement will be paid for as Unsatisfactory Subgrade.

2. Bedding. Place a minimum of 4” Bedding Sand or 3/8” Crushed rock below the invert of the pipe to provide a firm, stable, uniform bed.

3. Haunching. Work in and tamp the haunching material in the area between the bedding and the underside of the pipe before placing and compacting the rest of the haunching up to the springline. Use Class I, II or III material. If water is present, use Class I or II only.

4. Initial Backfill. Place and compact the initial backfill to 12” above the crown of the pipe. Increase initial backfill to 24” in rock excavation.

5. Embedment - Haunching and Initial Backfill. Use special care near the pipe and only select Class I, II or III material free of debris, frozen material or organic matter. If water is present, use Class I or II only. No rock greater than 1” shall be placed in the embedment. No Class IV or V material shall be placed in the embedment. Compact the embedment to 90% Modified Proctor using vibration or impact for Class I and II and impact for Class III. Use care to avoid damage to the pipe.

6. Final Backfill. Use native material with no rock greater than eight inch (8”). Compact in 12” lifts (Class I and II) or six inch (6”) lifts (Class III or IV) to 90% Modified Proctor in open fields and to six feet (6’) deep and 95% Modified Proctor from six feet (6’) deep to the surface in streets.

The base bid for pipe installation shall include furnishing and installing appropriate material for the first four inches (4”) of Foundation and Embankment (Bedding, Haunching and Initial Backfill). Where appropriate, suitable material may be salvaged from within the trench or from other areas of the job.

7. Minimum Cover. The minimum cover for sewer shall be four feet (4’) and the minimum cover for water and forcemain shall be seven feet (7’). Provide the minimum unless otherwise indicated on the plans.

E. Water Checks. To prevent water from following the granular backfill, provide a clay or bentonite water check at 100 ft. intervals.

8.3.4 WOOD BLOCKING PROHIBITED. Water mains shall be installed without the use of wood blocking. Valves, hydrants and special fittings shall be supported on solid concrete block.

8.3.5 HANDLING OF PIPE, FITTINGS, ETC. The Contractor shall have sufficient and adequate equipment on the site of the work for unloading and lowering pipe and fittings into the trench. Extreme care shall be exercised by the Contractor in handling all pipe, fittings and special castings so as to prevent breakage and coating damage. Any damage to coating shall be repaired before installation. Under no circumstances shall pipe or fittings be dropped or so handled as to receive hard blows or jolts when being moved. All mud or dirt shall be removed prior to installation.

8.3.6 FIELD INSPECTION OF MATERIALS. All pipe or fittings shall be inspected for defects. All materials used in the work must pass field inspection.

8.3.7 DIRECTION OF LAYING. Unless otherwise ordered, pipe shall be laid with the bell ends facing the direction of laying. When the grade exceeds 10 feet of rise per 100 feet of trench, the bells shall face upgrade.

8.3.8 JOINING PIPE. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed. If the pipe-laying 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 be placed over each end and left there until the connection is to be made to the adjacent pipe. During laying operations, no debris, tools, clothing or other materials shall be allowed in the pipe.

After placing a length of pipe in the trench, the spigot end shall be centered in the bell and the pipe forced home and brought to correct line and grade. The open ends of the pipe shall be closed by a watertight plug at all times pipe laying is not in progress.

The pipe shall be secured in place with bedding material, placed by hand or equally careful means, keeping the bell end open. Existing pipe fittings which do not allow a sufficient and uniform space for joints shall be removed and replaced with pipe and fittings or proper dimensions to insure such uniform space. Precautions shall be taken to prevent foreign materials from entering the joint space.

8.3.9 CUTTING OF CAST IRON PIPE. 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. 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.

8.3.10 OBSTRUCTIONS IN LINE OR GRADE. Whenever it becomes necessary to lay a main over, under or around a known obstruction, the Contractor will furnish and install the required fittings. Such fittings will be paid for at the unit price bid. No additional compensation will be paid to the Contractor for any expenses incurred because of such obstruction. When an unknown underground structure interferes with the work to such an extent that an alteration of the plan is required, which alteration results in a change in the cost to the Contractor, the Engineer will issue a written change order, acceptable to the Owner, specifying the basis of payment or credit for such altered work.

8.3.11 CONFLICT WITH STORM AND SANITARY SEWER. A minimum horizontal distance of 10 ft. (8 ft. in Wisconsin) shall be maintained between storm or sanitary sewer and watermains. A vertical separation of at least 18" (6" in Wisconsin) shall be maintained whenever a water main passes over a sewer. If the specified depth of cover over the water main cannot be maintained at this separation, the water main shall pass under the sewer. A vertical separation of at least 18 inches between the top of the water main and bottom of the sewer shall be maintained. The water main shall be centered at the point of crossing so that the nearest joints will be equidistant and as far as possible from the sewer. Extra fittings and pipe required will be paid for at the unit prices bid. No other payment shall be made.

8.3.12 JOINT RESTRAINT. At all bends, elbows, tees, dead ends, valves and hydrants, installed approved joint restraints per Section 3.9.0. Joint restraints are also required on all joints within the "L", "Lr", or "b" dimensions from a fitting or deadend as shown on the standard details.

8.3.13 PIPE INSTALLATION AND BACKFILLING. Requirements for pipe installation are included in Section III under the type of material. Refer to Section 2.4.0 for backfilling and compaction requirements.

8.3.14 TRACER WIRE. All non-mettallic pipe shall be marked with Tracer Wire.

SECTION 8.4.0 - WATER SERVICES

8.4.1 WATER SERVICE PIPING. Water service piping is the section of pipe from the main to the customer. Water service piping is designated as either tap service piping or branch service piping depending on size and arrangement

A. Tap Service Piping. All water service piping two inches in diameter or smaller is designated "Tap Service Piping". The component parts of a tap service are the corporation stop, copper piping and the curb stop with a service box.

The standard water service shall have a minimum internal diameter of 1" with the curb stop located as specified by the Engineer. This size of tap service shall be installed unless otherwise specified. The copper piping shall be extended to the lot line.

B. Branch Service Piping. All water service piping 3 inches in diameter or larger is designated "Branch Service Piping". The component parts of a branch service are a tapping sleeve and valve or a branch 3-way and valve, a valve box, and ductile iron piping extending to the lot line at which point the end shall terminate with a plug or cap.

8.4.2 TYPE OF PIPE.

A. Tap Water Services. For water services up to and including 2 inches in diameter, copper pipe conforming to the requirements of Section III shall be used, unless otherwise specified in the Contract Documents.

B. Branch Water Services. Branch service pipe shall be Class 350 ductile iron pipe, conforming to the requirements of Section III, unless otherwise specified in the Contract Documents.

8.4.3 TYPE OF JOINT. Copper pipe shall have flared or rubber gasket compression type joints. When copper tubing is used to extend existing water service piping, the connection of the copper tubing to the existing pipe shall be made with an approved mechanical joint.

Ductile iron pipe shall have approved gasket joints.

A. Flared Joint. The joint shall be the standard flared or rubber gasket compression-type of joint for copper tube using only extra-heavy three-part unions. The ends of the copper tubing shall be accurately sized and rounded with copper tubing sizing tools to remove any imperfections in the tubing due to coiling or handling. All ends shall be cut squarely and rough edges or burrs removed. The flared or flange-end of the copper tube which is to be joined shall only be formed with the proper size and type of Range tool designed for that purpose. The flared end shall be fitted against the bevel of the fitting and secured against leakage by tightly screwing and fitting into the sleeve nut. The use of any jointing compound with copper tube flared fittings is prohibited.

B. Gasket Joints. Gasket joints shall be as specified in Section III.

8.4.4 TYPE OF TRENCH SECTION. The placing of the water service pipe on a shelf dug out of the sidewall of the building sanitary sewer trench is permitted when spot sheathing is used and the ground is sufficiently stable to maintain such a section. When the ground is not sufficiently stable to maintain a shelf, two-inch by six inch planks shall be used.

Where the water service pipe only is to be installed, it shall be laid in a separate trench of the necessary depth and approximately 2 feet in width.

8.4.5 WATER SERVICE BEDDING. Water service piping shall be laid with a minimum of 4 inches of bedding material below the pipe. If the trench has an unstable foundation, the trench bottom shall be treated in accordance with Section 8.3.3. Bedding may be placed by machine up to the bottom of the pipe. From the bottom of the pipe, bedding material shall be placed by hand or equally careful means to a depth of 6 inches over the top of the pipe. The bedding shall be such that uniform bearing is provided at every point along the length of the pipe. If installed in a separate trench, a minimum 10 foot horizontal separation must be maintained between the water service and the building sewer.

A. Tap Service Bedding. Where ground conditions permit, Tap Service piping shall be placed on a shelf in the side wall of the building sanitary sewer trench. It shall be laid on solid ground, free from stones or hard lumps, or otherwise satisfactorily supported. The minimum width of this shelf shall be 6 inches plus the outside diameter of the water service pipe.

B. Branch Service Bedding. The excavation for Branch Service piping 3 inches or larger in diameter shall be made in such a manner that the pipe can be laid at least 2 feet clear of the building sanitary sewer. This may be done by increasing the width of the building sanitary sewer trench, by a wide shelf in the trench wall, or by the use of a separate trench for the branch pipe.

8.4.6 CONNECTION TO WATER MAIN**.** The connection to the water main shall be made with an approved corporation stop or, if specified, tapping sleeve and valve.

Size of Service	Size of Main	Type of Connection
Any Size	3" or smaller	Approved tees or service clamps
3/4"	4" or larger	3/4” corporation stop
1" or 1-1/4"	4"	2-3/4” stops with 2 branch connection
1"	6" or larger	1” corporation stop
1-1/4"	6" or larger	1-1/4” corporation stops with saddle
1-1/2"	4"	3-3/4” corporation stops with 3 branch connection
1-1/2"	6" or larger	1-1/2” corporation stop with saddle
2" or larger	Any size	Approved fitting or tapping tee

The minimum distance from the bell end of a water pipe or fitting, or from another tap on either side of the watermain, to a corporation stop or tapping valve shall be:

Corporation Stop = One Foot
Tapping Valve = Four Feet

When two insertions are made, one on each side of the main, they shall be separated by at least 1 foot (measured along the pipe length). Multiple insertions made on the same side of the main shall be staggered and separated by at least one foot.

Service connections to PVC water main with 6 inches or greater nominal size may be direct tapped wet or dry for insertion of corporation stops. The largest size corporation stop which may be tapped directly into the pipe is one inch. Service clamps or bossed sleeve must be used for larger outlet sizes. Use only shell type cutter with multiple cutting teeth.

Teflon tape shall be placed on the corporation stop threads prior to installation. Corporation stops shall not be torqued to more than 35 ft-lb. Manufacturer's recommendations more stringent than the above shall be adhered to.

8.4.7 TRACER WIRE. Tracer wire systems shall be provided on all watermain and services. See Section 3.11.0

8.4.8 SEPARATION OF WATER SERVICE AND BUILDING SEWERS. Except as permitted below, the underground water service pipe and building sewer shall not be less than 10 feet apart horizontally and shall be separated by undisturbed or compacted earth. The water service pipe may be placed in the same trench with the building sewer under the following conditions:

A. The water service and the building sewer are installed concurrently.

B. The bottom of the water service pipe at all points shall be at least 12 inches above the top of the sewer line.

C. The water service pipe shall be placed on the solid shelf excavated at one side of the common trench.

D. The number of joints in the water service pipe shall be kept to a minimum. For tap services, the service pipe shall be laid on a straight line at right angles to the water main or parallel to the building sewer. The center line of the pipe shall be offset approximately 6 inches from the wall of the building sanitary sewer trench and approximately 18 inches from the center line of the building sanitary sewer. For branch services, the pipe (3 inches and larger in diameter) shall be laid with a clear horizontal space of not less than 2 feet between the sanitary building sewer and the branch service.

8.4.9 GRADE. The water service piping shall be laid with a minimum 7 feet cover from the established or proposed street grade.

The curb stop of the tap water service or the gate valve of the branch service shall be placed not less than 7 feet and not more than 7-1/2 feet below the established or proposed street grade. The unit price shall include the necessary fill or excavation for a 10 foot radius to fit the surrounding terrain.

8.4.10 LAYING WATER SERVICES. Water service piping which crosses either above or below a pipe conduit or other underground structure shall have at least 3 inches clearance provided at the crossing point and such clear space is to be filled with sand.

Copper water service piping 1-1/4 inches in diameter and smaller shall be installed without any coupling or joint from the corporation stop at the water main to the curb stop, except with permission of the Engineer.

Copper water service piping 1-1/2 inches in diameter and larger shall be laid in lengths of 20 feet or more between the corporation stop and the curb stop except for one shorter length permitted for closure.

8.4.11 CLOSING END OF SERVICE PIPE. The open end of copper water services shall be closed by peening the end.

The open end of branch service pipe shall be closed by a cast iron plug with an approved gasket joint. The end shall be securely blocked.

8.4.12 SETTING WATER SERVICE BOX. The water service box shall be centered over the curb stop and shall be brought to proper grade. The legs of the service box shall rest firmly upon a 2-inch by 6-inch by 8-inch solid concrete block. Clearance shall be provided so that the service box does not rest upon the water service pipe. Where the bench does not afford a firm support for the service box blocking, such support shall be furnished by the use of a 2-inch by 6-inch hardwood plank placed across the building sanitary sewer trench and firmly supported in each bank.

The service box shall be plumbed and braced so it will remain vertical throughout the backfilling. Sufficient excavation shall be made for the service box installation to insure proper setting and backfilling around the service box. Before placing backfill around the water service box, the Contractor shall wrap 8 mil polyethylene around the base and bedding material shall be tamped in place from a point above the pipe to a point 6 inches above the blocking to prevent entrance of backfill materials into the openings at the base. A copper disc shall be inserted in the curb stop coupling on the building side.

8.4.13 TESTING. The water service installation shall be tested for leaks prior to the placement of the hand backfill, and before the service box is installed, before the disc is inserted and before the end is peened. The corporation stop at the water main shall be turned on and the curb stop opened until a full flow of water is obtained. The curb stop shall then be turned off and all joints and couplings checked for leaks. Upon acceptance of the service piping, the remainder of the installation work shall be completed. The corporation stop shall be left open.

At the completion of the project, the Contractor shall, in the presence of the Engineer, open and close each curb stop to check for proper operation. In case of difficulty in operation, the Contractor shall make the necessary repairs at no cost to the Owner.

8.4.14 LOCATION OF EXISTING BUILDING SEWERS AND SERVICES. The Contractor will be furnished with available recorded measurements for the location of existing building sewers and water services. Existing service stop boxes, evidence of existing trenches and any other pertinent evidence also shall be used in their location.

When necessary to locate existing services, the Contractor shall commence excavation for the location of the existing building sewers and water services at such point as the weight of evidence demands. In case the initial excavation for the location of existing building sewers and water services fails to uncover same, the Contractor shall explore a distance of 10 feet in each direction, or a total of 20 feet, immediately in back of and parallel to the curb, or along the water main, at no additional cost.

In case the existing building sewers or water services cannot be located in these limits, and additional trenching is required, the Contractor shall make application to the Engineer for a written order for extra work, covering such additional exploratory trench. The price shall be established before the extra excavation begins.

8.4.15 WATER SERVICE EXTENSION, RELOCATION, DISCONNECTION AND RECONNECTION.

A. Water Service Curb Extension. To extend tap service piping, a length of copper piping and a new curb stop shall be jointed to the end of the existing service. The new curb stop shall be located as specified by the Engineer. The copper tubing shall be extended to the lot line and the end closed.

To extend branch service piping, a length of pipe equal in size to the existing branch service piping shall be jointed to the existing branch service piping. This pipe shall be laid to the property line and the end plugged.

B. Relocation of Curb Stops and Service Boxes. To relocate curb stops and service boxes the existing curb stop shall be closed. The existing tap service piping shall be severed at the point specified by the Engineer. A new curb stop of the same size as the existing water service piping shall be installed and opened. The old curb stop shall then be opened and the new service box installed in its proper position over the new curb stop. The Contractor shall freeze the existing water service piping between the main and the existing curb stop. The existing curb stop shall be removed and replaced with piping of the same size as the existing water service piping.

C. Disconnection of Water Service. To disconnect tap service piping at the main, the corporation stop shall be closed and the service pipe severed from the tail piece of the corporation stop. The union shall be uncoupled and the tail piece shall be closed by peening the end. A solid disc shall be inserted into the union and the union again coupled securely to the corporation stop. The curb stop and box shall be salvaged and delivered to the Owner's stockpile.

SECTION 8.5.0 - CONNECTION, REMOVAL AND ABANDONMENT

8.5.1 CONNECTION TO EXISTING WATER MAIN. Before excavation of trenches is begun, the Contractor shall uncover the existing water main to which the new main is to be connected. This will permit adjustments in line and grade to avoid the use of extra fittings. The exposed section of an existing main must be protected and blocked by the Contractor to prevent the blowing out of the plug or cap at the end of the main.

8.5.2 CUTTING OF EXISTING MAINS. The Owner will assist the Contractor in locating distribution system valves. The Contractor shall cut the water main, remove any plugs or caps, and pump the water out of the trench caused by cutting of the main or removal of the plugs or caps. All excavations required shall be made by the Contractor. The Contractor shall have all the necessary fittings at the site and shall expose the pipe before requesting that valves be closed.

8.5.3 NOTICE TO WATER UTILITY. The Contractor shall give a minimum of 48 hours written notice to the Water Utility when requesting a water shut-off. The Water Utility shall determine the time and duration of the shut-off. The Contractor shall continue the work to completion and restore service to the interrupted main. No claim for extra compensation will be considered for overtime due to the hours of shut-off.

8.5.4 REMOVAL OF WATER MAIN MATERIALS. The Contractor shall remove all abandoned gate valves, tapping valves, valve boxes and all other water main material indicated on the plans or as the Engineer determines. The cutting of pipe and burning and chipping out of joints shall be started only after permission is given by the Engineer.

All water main material removed by the Contractor shall be carefully handled. Any water main material broken by carelessness of the Contractor in removing will be replaced. If the material is to be re-used by the Contractor, it shall be cleaned thoroughly inside and outside. If any water main materials are not to be re-used, they shall be piled neatly on a site designated by the Owner. Lead removed shall become the property of the Contractor. Asbestos cement pipe requires special handling and shall be disposed of at an approved landfill at the Contractor's expense. All other material shall remain the property of the Owner.

8.5.5 ABANDONMENT. The open ends of all water mains, large services and branches that are abandoned in place shall be filled with a heavy masonry plug. The minimum thickness of plugs shall be 8 inches for mains up to and including 16 inches in diameter and 12 inches for mains over 16 inches in diameter.

Valves on the section of main to be abandoned shall also be abandoned if the special provisions or plans do not require their removal.

When valves or curb stops are to be abandoned, the Contractor shall close the valve or curb stop and remove only the top section of the valve or stop box and backfill the remaining hole with the required backfill material.

When a hydrant is to be removed and its branch is to be abandoned and it is connected to an abandoned or to be abandoned water main, the Contractor shall remove the entire hydrant and bulkhead the open end of the remaining hydrant branch and drain, if any.

When a hydrant is to be removed and its branch is to be abandoned and it is connected to a water main that will remain in service, the Contractor shall excavate and plug the hydrant tee or cross.

SECTION 8.6.0 - GATE VALVES AND HYDRANTS

8.6.1 GATE VALVES. The Contractor shall install valves where indicated on plans. Valves shall be set on a solid concrete block (2"x 6"x18") and leveled.

8.6.2 VALVE BOXES. Valve boxes shall be set over all valves unless valve manholes are specified.

8.6.3 SHIFTED VALVE BOXES. Valve boxes and covers shall be centered over the valve operating nut and the entire box assembly secured in place before backfilling operations. Valve boxes that become shifted or filled during backfilling shall be entirely uncovered and reset.

8.6.4 INSTALLATION OF VALVES AND BOXES. The valves and boxes shall be installed in a vertical position as far as feasible. The box shall be suitably braced to prevent displacement during the backfilling. The top of the box shall be level with the finished grade of the street unless other vise directed by the Engineer. A sheet of 8 mil polyethylene shall be used to prevent bedding material from entering around the operating nut. Where gravel pavement or no pavement occurs at the location of the valves, the Contractor shall provide the pavement described below, extending a minimum of two (2) feet in each direction from the valve box after the backfill material has thoroughly settled.

The pavement shall be a minimum of 8" thick and shall consist of thoroughly tamped gravel with all voids filled with a substantial bituminous binding material placed in layers in a maximum of four (4) inches thick, the top finished with the same binding material. At least one-half (1/2) of the gravel shall be one-half (1/2) inch to one and one-quarter (1-1/4)

inch in size and the balance shall be smaller. These paving materials and all workmanship shall conform to the standard specifications of the Wisconsin Department of Transportation for asphalt aggregate pavements.

8.6.5 INSTALLING HYDRANTS. Hydrant units shall be installed or relocated by the Contractor where indicated on the plans, unless otherwise directed by the Engineer. The hydrant shall be installed in accordance with the Standard Detail. Hydrants shall be set on solid concrete blocking and solidly blocked against the trench wall. The centerline of hydrants, when set, shall be vertical and the pumper nozzle shall face the curb. A minimum of 6 cubic feet of approved gravel shall be supplied for the hydrant drain. Whenever the main is over 6" in diameter or a valve is provided on the lead, metal strapping or retainer glands shall be provided from the main line tee to the hydrant. If hydrants are located in an area with known high groundwater, the drain ports shall be plugged and the barrel pumped dry. Hydrant drains may not be located within 8 feet of sanitary sewers, storm sewers, or storm sewer inlets. If it is impracticable to maintain 8 feet of separation between hydrant drains and sewers or inlets, the hydrants shall be installed without drains or have the drains plugged. The Engineer shall be notified prior to plugging drain ports.

8.6.6 TESTING HYDRANTS AND VALVES. At the completion of the project, the Contractor shall, in the presence of the Engineer, open and close each valve and hydrant to check for proper operation. In case of difficulty in operation, the Contractor shall make the necessary repairs.

8.6.7 DEPTH. Valves and hydrants shall be suitable for seven (7) feet depth of cover. The hydrant unit price shall include the additional excavation or fill necessary for a 10 foot radius around the hydrant to fit the surrounding terrain. Where grading is not feasible, the Engineer may allow hydrant extensions by Change Order.

SECTION 8.7.0 - MANHOLES

8.7.1 CONSTRUCTION. Manholes shall be built where shown on the plans, and shall be constructed according to the requirements of Section III and as follows:

A. Valve Manhole. All valves to be installed in manholes shall be installed in the Standard Valve Manhole, as shown on the Standard Detail.

B. Air-Release Manhole. When an air-release manhole is required on the plans, it shall be as shown on the Standard Detail, and shall include the cost of furnishing and installing the air-release assembly.

SECTION 8.8.0 - DISINFECTION OF WATERMAINS

8.8.1 GENERAL. Disinfection shall be in accordance with AWWA C651 except where altered by the following. In general, disinfection includes the following steps: (1) Keeping pipe clean, (2) Chlorination and (3) Flushing.

8.8.2 PIPE KEPT CLEAN. The interior of all pipe, fittings and other accessories shall be kept as free as possible from dirt and foreign matter at all times.

Every precaution shall be used to protect the pipe against the entrance of foreign material before the pipe is placed in the new line. At the close of the day's work, or whenever the workers are absent from the job, the end of the last laid section of pipe shall be plugged, capped or otherwise tightly closed to prevent the entry of foreign material of any nature.

If the pipe-laying 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.

Unless extreme care and thorough inspection is practiced during the laying of water mains, small stones, pieces of concrete, particles of metal or other foreign material may gain access to mains newly laid or repaired. All hydrants on the lines shall be thoroughly flushed and carefully inspected after flushing to see that the entire valve operating mechanism of each hydrant is in good condition.

8.8.3 METHOD OF CHLORINATION. During construction, 5-g calcium hypochlorite tablets shall be placed in each section of pipe and also one such tablet shall be placed in each hydrant, hydrant branch, and other appurtenance. The following table shows the number of tablets required for commonly used sizes of pipe. They shall be attached by an adhesive such as Permatex No. 1, Oatey 30236 or equal. There shall be no adhesive on the tablet except on the broad side attached to the surface of the pipe. Attach all the tablets inside and at the top of the surface of the main, with

approximately equal numbers of tablets at each end of a given pipe length. If the tablets are attached before the pipe section is placed in the trench, their position shall be marked on the section so it can be readily determined that the pipe is installed with the tablets at the top.

NUMBER OF HYPOCHLORITE TABLETS REQUIRED FOR DOSES OF 25 MG/L			
Pipe Diameter (inches)	Length of Pipe Section (feet)		
	13 or less	18	20
4	1	1	1
6	1	1	1
8	1	2	2
10	2	3	3
12	3	4	4
16	4	6	7

*Based on 3.25 g available chlorine per tablet, any portion of tablet rounded to next higher number.

When installation has been completed, the main shall be filled with water at a rate such that water within the main will flow at a velocity no greater than 1 fps. Precautions shall be taken to assure that air pockets are eliminated. This water shall remain in the pipe for at least 24 hours. If the water temperature is less than 5 degrees C (41 degrees F), the water shall remain in the pipe for at least 48 hours. Valves shall be positioned so that the strong chlorine solution in the main being treated will not flow into water mains in active service.

8.8.4 CHLORINATING VALVES AND HYDRANTS. In the process of chlorinating newly laid pipe, all valves or other appurtenances shall be operated while the pipeline is filled with the chlorinating agent.

8.8.5 FINAL FLUSHING AND TEST. Following chlorination, all treated water shall be thoroughly flushed from the newly laid pipeline at its extremities until the replacement water throughout its length shall, upon test, be proved comparable to the quality of water served the public from the existing water supply system and approved by the public health authority having jurisdiction. The Contractor shall collect samples at various locations for bacteriological analysis. A tap located and installed in such a way as to prevent outside contamination shall be used to collect samples. Samples should never be taken from an unsterilized hose or from a fire hydrant because such samples seldom meet bacteriological standards. All flushing and testing shall be done at the Contractor's expense. If necessary to protect the receiving stream, dechlorination shall be provided.

8.8.6 REPETITION OF PROCEDURE. Two bacteriologically safe samples must be obtained for each 1,000 lineal feet of pipeline installed. The tests shall be collected 24 hours apart. Should the initial treatment fail to result in safe samples, chlorination shall be repeated until safe results are obtained.

8.8.7 REPAIR AND EXTENSIONS TO EXISTING MAINS. Disinfection procedures for cutting into or repairing existing mains shall be in accordance with the applicable procedures of A.W.W.A. C651-86, Section 9.

8.8.8 STERILIZATION OF RESERVOIRS. The completed water reservoir is to be sterilized and thoroughly cleaned by the Reservoir Contractor on completion of the work. The interior is to be swept clean and the entire interior is to be sprayed with a 50 p.p.m. concentration of chlorine including floor, walls, ceiling, manholes and piping. On completion, HTH or Perchloron is to be mixed with water in an amount sufficient to insure 50 p.p.m. of available chlorine in the reservoir when full of water. Clear solution is to be decanted into reservoir (balance is to be disposed of) and the reservoir filled with water to the overflow and left to stand for 24 hours. Reservoir is to be drained and refilled with clean water. If a safe sample is not obtained from the system, the procedure is to be repeated. Water will be furnished from the municipal supply without charge for up to two (2) tests. Water will be billed at cost for additional tests. If necessary to protect the receiving stream, dechlorination shall be provided.

SECTION 8.9.0 - WATERMAIN TESTS

8.9.1 TESTS REQUIRED. All new mains shall be tested by the Contractor and shall successfully pass the pressure, and leakage described in the following sections. These tests are in addition to the bacteriological tests specified in the previous section. The Contractor shall notify the Engineer at least 48 hours before performing the tests. The tests must be witnessed by a representative of the Owner.

The Contractor shall furnish the gauges and measuring device for the leakage and pressure tests, including the pump, pipe, connections and all other necessary apparatus and shall furnish the necessary assistance to conduct the test.

Where a new main will be connected to an existing main, it may be necessary for the Contractor to install a temporary plug in the new main for testing purposes. After the specified pressure and leakage tests have been completed on the new main, actual connection to the existing main shall be made. The section of new connecting main between the removed test plug and the existing main shall be subject to line pressure prior to backfilling. Any visible defects observed in the connecting main shall immediately be repaired at the Contractor's expense, prior to backfilling.

When existing water mains are used to supply test water, they shall be protected from backflow contamination by temporarily installing a double check-valve assembly between the test and supply main. Prior to pressure and leakage testing, the temporary backflow protection should be removed and the main under test isolated from the supply main.

8.9.2 PRESSURE TEST. After the test connections are made and the main filled with water, the test section shall be subjected to water pressure normal to the area. After examination of exposed parts of the system, the test pressure shall be increased to 150 pounds per square inch on the main at the lowest elevation. The main shall be examined and if any defects are found, the Contractor shall immediately make the necessary repairs at his own expense. The pressure test shall be repeated until no defects can be found. The duration of the final pressure test shall be one hour. The pressure shall be kept within 5 psi of the specified level.

8.9.3 LEAKAGE TEST. The leakage test shall be conducted after satisfactory completion of the pressure test. The test section shall be subjected to a pressure of 50 psi above normal operating pressure at the point of highest elevation of the main under test. The minimum test pressure shall be 100 psi gauge pressure.

The leakage lest shall be conducted for not less than two (2) hours. The test pressure shall be kept within 5 psi of the specified level.

Leakage is defined as the quantity of water to be supplied into the newly laid pipe, or any valved section of it, necessary to maintain a pressure within 5 psi of the specified leakage test pressure after the main has been filled with water and the air expelled.

Maximum allowable leakage rate according to AWWA C600: $L = \frac{(S)(D)(P)^{0.5}}{148{,}000}$

Where:
L = allowable leakage, in gallons per hour
S = length of pipe tested, in feet
D = nominal pipe diameter, in inches
P = average test pressure, in pounds per square inch

ALLOWABLE LIMITS OF LEAKAGE GALLONS/HOUR/1000 FEET							
Nominal Pipe Diameter - Inches							
		4	6	8	10	12	14
Average Test Pressure (psi)	225	0.41	0.61	0.81	1.01	1.22	1.42
	200	0.38	0.57	0.76	0.96	1.15	1.34
	175	0.36	0.54	0.72	0.89	1.07	1.25
	150	0.33	0.50	0.66	0.83	0.99	1.16
	125	0.30	0.45	0.60	0.76	0.91	1.06
	100	0.27	0.41	0.54	0.68	0.81	0.95

8.9.4 COMBINATION PRESSURE/LEAKAGE TEST. In lieu of separate leakage and pressure tests, a combination leak/pressure test can be run at a pressure of 150 psi for a duration of two hours with the approval of the Engineer.

8.9.5 TEST LENGTH. Pipe lines shall be tested between valves in lengths of not more than 800 feet unless approved by the Engineer.

8.9.6 REPAIRS AND RETESTING. All visible leaks at exposed joints, and all leaks evident on the surface where joints arc covered shall be repaired and leakage minimized, regardless of the total leakage as shown by test.

All pipe, fittings, blocking and other materials found to be defective shall be removed and replaced at the Contractor's expense.

Lines which fail to meet the tests shall be repaired and retested as necessary, all at the Contractor's expense, until test requirements are complied with.

8.9.7 ELECTRICAL CONTINUITY. All metal pipe shall be tested for electrical continuity or trace wire signal. Lead tipped gaskets will not be permitted. Copper jumpers or cable bond are to be utilized to secure electrical continuity on metallic pipe. Contractor is to check the line for electrical continuity or signal after backfilling is completed. Sections shall be tested in lengths of 1,000 feet or less. Where continuity signal is not obtained, it must be established at the Contractor's expense. The Engineer or Owner shall witness each test.

SECTION IX
ELECTRICAL AND CONTROLS
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MINNESOTA

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SECTION 9.0 - ELECTRICAL AND CONTROLS SPECIFICATIONS

9.1 GENERAL PROVISIONS

The scope of this section includes a new Motor Control Center, building electrical requirements, and connection to equipment furnished by others. The Contract also includes a standby generator and transfer switch. The specifications for the generator and transfer switch are found in Section VI.

The Contract includes furnishing and installing all electrical controls, switches, outlets, conduit, wire and mounting structures, coax cable and modifications to existing telemetry equipment. The Contractor shall provide all general use electrical equipment including devices, disconnects, starters and control devices, and equipment. Motors, instrumentation, and selected control equipment as described in other sections of these specifications will be furnished by others but will be interconnected by the Contractor.

The electrical plan drawings are generally diagrammatic, and the location of outlets and equipment terminals are approximate unless detailed or dimensioned. The exact locations and routing of cables and conduits shall be governed by structural conditions, physical interferences, and the location of electrical terminations on equipment. The Electrical Contractor shall examine the plans and shop drawings for the various equipment in order to determine exact routing and final terminations for all conduit, cables and conductors. Conduits shall be stubbed up as near as possible to equipment terminals.

9.1.1 Electric Service

Electric service to the pumphouse will be through Freeborn-Mower Electric Cooperative. The system will be a 480 volt, three phase service. The Contractor shall provide a meter socket, service entrance disconnect, underground service conduit and sleeve as required by Freeborn-Mower Electric Coop. The Owner will pay for any service connection fees required.

The Contractor shall obtain and pay for all permits and inspections incidental to providing the electrical installation. All necessary permits and plan approvals shall be secured from the proper regulatory inspection authority before any progress payments will be approved for electrical work. The Contractor shall be responsible for coordinating with the electric utility to ensure that the new electric service(s) is brought into the facilities as required.

The base bid shall include furnishing and installing a control system as specified herein and constructed by a UL 508 Certified panel board assembler.

9.1.2 Manufacturer

Major electrical components such as motor control centers, control devices, and power distribution equipment components shall be supplied by a single manufacturer. Major electrical components shall be as manufactured by Cutler Hammer, Allen-Bradley, or equal.

9.1.3 SCADA

The existing SCADA system is by S&M Controls, Inc. of Adams, MN. A radio telemetry supervisory controls system shall be incorporated into the proposed Pumphouse No. 5. The existing radio telemetry supervisory control systems at Pumphouse No. 4 and the WWTP shall be modified by S&M Controls, Inc. as required to accommodate the proposed Pumphouse No. 5. Complete wiring diagrams, dimension prints and description of operation shall be furnished to the Engineer for approval, prior to manufacture of equipment.

9.1.4 Shop Drawing Requirements

Complete shop drawings shall be submitted for review prior to manufacture for all power distribution and control equipment. Drawings are required showing elevations, plan layouts, dimensions, construction details, elementary diagrams, connection and interconnection diagrams, and bill of materials. Motor control center diagrams and motor controller diagrams shall be of the elementary-type as shown in the contract documents and shall show the terminal identifications and the associated field connections. Each line shall be numbered in a sequential manner and all relays shall have their contact location summary on the line with the relay coil. Interconnections with other systems shall be clearly shown and completely identified.

9.1.5 Operation and Maintenance Manual Requirements

Complete operation and maintenance manuals shall be provided by the Contractor in accordance with Section 1 of the General Conditions.

9.2 WARRANTY

The control system manufacturer shall warrant to the Contractor that the Control System supplied shall be free of defective material and workmanship for one year from date of substantial completion. Six months after acceptance, a one-day warranty call shall be made to calibrate the equipment and resolve any in-warranty problems. The manufacturer shall be obligated to furnish and install at no charge to the Owner, replacement materials or units proven defective in the field within this warranty year. The warranty shall not be construed to cover fuses, lights or other materials normally consumed in operation, nor shall it cover damages through vandalism or acts of God.

Work shall be coordinated between the control system manufacturer and SCADA provider. The manufacturer's price shall include everything required to make the proposed system work, including additional control changes if required.

9.3 INSTALLATION AND START-UP SUPERVISION

The controls manufacturer shall provide the services of a qualified Engineer to assist the Contractor in the initial installation of the control equipment. The trip scheduling shall be mutually arranged by the Electrical Contractor, the Engineer, and the equipment manufacturer and shall consist of not less than one trip prior to final checkout and start-up.

In addition, the controls manufacturer shall provide the services of a qualified factory Engineer to make final adjustments and instruct the operators in the use and maintenance of the equipment furnished at the various locations. This latter service shall be for a minimum of one (1) day on the jobsite or as is necessary to complete the supervision to the satisfaction of the Engineer and the Owner. Manufacturer is to include in his price to the Contractor one added trip without charge within one year of acceptance. Engineer and Owner are to receive notice of trip ten days prior to the checkout and final inspection test.

9.4 FACTORY TEST

Prior to shipment, a certified final inspection and factory test shall be run on the entire Control System as a unit with simulators connected to provide characteristics identical to that which the equipment will experience in the field. These tests shall be certified by the factory and may be witnessed by the Engineer and representatives of the Owner should they desire. The Owner and Engineer shall be notified at least ten days prior to the checkout and final inspection test.

During the inspection, each of the units shall be checked segment by segment and component by component with the Engineer and/or Owner representatives against the plans and specifications and equipment characteristics as supplied by other manufacturers, to be sure that the System will respond in the field providing the required and specified service.

9.5 SERVICE AND SPARE PARTS

The controls manufacturer shall certify that he maintains factory trained personnel available on 4-hours of notice with complete spare parts and maintenance items and stocks as may be required under any and all circumstances.

9.6 MOTOR CONTROLS MANUFACTURER / INTEGRATOR

The equipment and material deemed most suitable for the motor control center (MCC) installation have been specified. The base-bid MCC integrator shall be Altronex (L.W. Allen Inc.). Other alternates may be considered. Requests for alternate approval shall be accomplished by complete and detailed specific wiring diagrams, dimension prints, material lists and material specifications as they apply to this project with other information as may be required by the Engineer for his review, not less than ten days prior to bid. Catalog cuts and general information shall not be acceptable. If an alternate equipment item bid request is approved, the Engineer will notify the alternate manufacturer/integrator via an addendum, that his equipment may be listed as an alternative on the bid Proposal.

The Contractor shall guarantee that any equipment offered in substitution shall provide the same features as that of the base bid. The Contractor shall be responsible for any mechanical, electrical or other equipment changes as well as any engineering changes resulting from the installation of alternate materials.

9.7 GOVERNING CODES AND INSPECTIONS

The completed electrical installation shall meet all the requirements of the latest edition of the National Electric Code. This shall not be construed to permit a lower grade of construction where plans and specifications for workmanship or materials are required in excess of code requirements.

The work herein specified shall be subject to inspection and approval by authorized representatives of the National Board of Fire Underwriters, State and local governing authorities and the Engineer.

All control panels shall be built by a UL certified 508 control panel manufacturer.

The Contractor shall cooperate with the Engineer and shall provide assistance at all times for the inspection of the electrical work performed under this contract. The Contractor shall remove covers, operate machinery, or perform any reasonable work which, in the opinion of the Engineer, will be necessary to determine the quality or adequacy of the work.

9.8 IDENTIFICATION AND LABELING OF ELECTRICAL EQUIPMENT

All control devices and device enclosures shall be labeled with individual nameplates or legend plates. Individual nameplates or legend plates shall be one of the following types:

1. Black laminated plastic or micarta with white cut letters.
2. Corrosion-resistant metal plates with engraved or raised letters and backfill.

9.9 ENVIRONMENTAL REQUIREMENTS

The complete control system shall function reliably within an operation temperature of -20 to +70 C (4 to +158 F). Humidity shall be 10% to 95% non-condensing. Each supervisory or remote unit shall be furnished with integral lightning protection devices to protect against lightning induced transients on leased telephone and power lines.

The entire control system shall provide a typical system accuracy and repeatability of better than plus or minus 1% over a temperature range of 0 to +50 C (+32 to + 122 F).

9.10 ELECTRICAL MATERIALS & METHODS

9.10.1 General

Material and installation requirements for conduit and fittings, wire and cable, and wiring devices.

Conduit shall be constructed with runs parallel or perpendicular to walls, structural members of intersections of vertical planes and ceilings. A separate conduit shall be provided for each power circuit and each control circuit unless indicated otherwise. No conduit shall approach closer than 6-inches to any object operating above the rated temperature of the conductor insulation within the conduit.

Where required for ease of pulling and as necessary to meet code, the Contractor shall supply and install cast junction or pull boxes even though not shown on the drawings. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit bending machine. Turns shall consist of cast-metal fittings or symmetrical bends.

All conduit entering sheet steel boxes, or cabinets shall be secured by locknuts on both the interior and exterior of the device and shall have an insulating bushing over the end of the conduit.

9.10.2 Rigid Metal Conduit and Fittings

Exposed conduit shall be rigid steel conduit, with supports spaced not more than 8 feet apart. Conduit supported directly from the concrete structure shall be spaced out at least ¼-inch using one-hole malleable straps with backs and nesting backs or, if three or more conduit are located in a parallel run, they shall be spaced out from the wall approximately 5/8-inch to 1-inch by means of framing channel. Runs of individual conduit suspended from the ceiling shall be supported with galvanized wrought steel pipe hangers.

A. Rigid metallic conduit shall be galvanized inside and out, UL listed, and conform to NFPA 70, Article 346 and UL-6.

B. Rigid metal conduit fittings shall be threaded couplings and fittings only; no set screws, gland type, or split fittings.

C. Grounding type insulated bushing shall be O-Z/Gedney Type BLG, or equal.

D. Insulated Bushings shall be Midwest Electrical Mfg. Co., O-Z/Gedney Type B, or equal.

E. Sealing Nuts shall be Midwest Electrical Mfg. Co., RACO, or equal.

F. Expansion fittings shall permit 4-inch conduit movement. Aluminum; O-Z/Gedney Type AX, or equal. Aluminum external bonding jumper; O-Z/Gedney Type ABJ, or equal.

G. Pull fittings shall be copper free aluminum, clamp type, stamped aluminum covers with gaskets and stainless-steel screws and clamps; Appleton FM7, Crouse-Hinds Form 7, or equal.

H. Conduit Hubs shall be full contact type with sealing “O” ring. Material shall be stainless steel for galvanized steel conduit and aluminum for aluminum conduit. Myers “Screw Tight”, or equal.

I. Conduit size shall be as required by NFPA 70 with a minimum size of ¾-inch except ½-inch may be used to connect to devices that have ½-inch fitting only. All raceways shall be exposed and shall be rigid steel unless written approval otherwise. Install raceways in accordance with NECA Standard of Installation.

J. Conduits shall run parallel or perpendicular to building lines and shall be supported at appropriate intervals with trapeze or bracket type hangers’ constructer of galvanized Power-strut, Unistrut, or equal. All hangers and hardware shall be galvanized or stainless steel. Support fasteners shall be beam clamps, preset inserts, expansion shields, or gun-driven studs, as appropriate. Do not attach raceways, fixtures, and boxes to grating, equipment, or mechanical duct work; attach them to supports that are attached to structural supports or are bracketed from walls and/or ceilings. Empty conduits shall have a nylon pull cord installed.

K. All conduit runs that go through an exterior wall or between rooms with a temperature change of 30° F or more shall be sealed at the wall internally with duct sealing compound. All conduits leaving Class I, Division 1 or 2 Hazardous locations shall be sealed at the point they leave the location.

L. All conduits entering major equipment such as the MCC and service entrance switchboard shall use grounding type insulating bushings. Conduit terminations to terminal boxes, enclosures, and terminal boxes shall have double locknuts and insulated bushings. External locknuts shall be sealing locknuts.

M. Provide expansion fittings at building expansion joints and where the length of straight run requires it.

N. Rigid metal conduit installed underground or in contact with concrete shall be primed with one coat of Koppers 40 PASIVATOR or equal followed with two coats of Koppers “coal tar epoxy 300M or equal, or shall be wrapped with two layers of 3M-50 corrosion protection tape. Rigid metallic conduit shall be used for the vertical elbow and riser out of the ground.

9.10.3 Rigid Nonmetallic Conduit and Fittings

Unless otherwise shown, all concealed inside structures and all buried, embedded or encased conduit shall be rigid PVC conduit. All conduit constructed in concrete which is in contact with the earth shall be adequately separated from the earth by at least 3-inches of concrete. The transition between rigid steel conduit and PVC conduit shall be made in a concealed, buried, embedded, or encased location.

Conduit constructed in concrete slabs or walls shall be placed in the middle third where possible. Conduit rising through a slab shall be protected by a dry pack concrete pad approximately 6-inches in diameter and 3-inches above the finished floor or the conduit shall come up through the equipment pad. Clearances equal to the conduit trade diameter shall come up through the equipment pad. Clearances equal to the conduit trade diameter but not less than 1½ inches shall be maintained between conduits encased in slabs.

A. Rigid PVC conduit shall be high impact Sch. 40 (heavy wall-type). Rigid nonmetallic conduit shall be EPV-40 PVC and EPC-80 PVC for Type II and Type III applications, sunlight resistant, and approved for direct burial, concrete encasement, and exposed above ground applications. Conduit shall conform to NEMA TC2, NFPA Article 347, UL-651, and shall be UL listed; Carlon, Certain Teed, or equal. Minimum size shall be ¾-inch.

B. Rigid nonmetallic fittings used with PVC conduit shall be PVC solvent weld-type. All fasteners for access fittings shall be AISI Type 304 stainless steel.

C. Raceways installed under floors shall be rigid non-metallic. Underground conduit runs shall be rigid non-metallic conduit with a minimum cover of 2 feet. Slope conduits to drain to drain to hand holes or pull boxes.

D. Do all trenching for all underground conduits with a minimum sized trench. Underground warning tape shall be installed 9 inches below the surface in the trench. Restore the surface beneath which the conduit is installed to equal or better than original.

9.10.4 Liquidtight Flexible Metal Conduit

Liquidtight conduit shall be used for all motor connections without motor plugs. Motor cord shall be used for all motor connections with motor plugs. Where flexibility is required for electrical raceways on equipment, Liquidtight conduit shall be used in accordance with JIC standards, these specifications, and the local inspection agency. The maximum length of flexible conduit shall be 24-inches and the terminating fittings and sealing shall be as shown in the motor details.

A. Conduit shall be PVC vinyl jacketed galvanized steel core with built-in continuous copper ground in ½-inch through 1 ¼-inch sizes, conforming to NFPA Article 351, UL-360, and shall be UL listed; Anamet Anaconda Sealtite Type U.A., Amer-Tite Type UL, Electri-Flex Liquatite Type L.A., or equal.

B. Connectors shall be grounding ferrule and insulated throat type and UL listed: Midwest Electric LTB, Crouse-Hinds LTB, Appleton STB, or equal.

C. Liquidtight flexible conduit shall be used to connect to equipment and devices from rigid conduit if rigid connections are improper or impractical. Liquidtight flexible conduit 1 ½-inch or larger shall have an external bonding jumper sized in accordance with NFPA 70, Table 250-95, up to No. 6 gauge. Grounding liquidtight connectors with insulated throat, O-Z/Gedney, Efcor Brand, or equal, may be used in lieu of a grounding clamp on the conduit.

9.10.5 Electrical Metallic Tubing

Electrical metallic tubing (EMT) may be installed in interior partitions, walls, and in ceilings of all portions of non-process buildings and in the attic space of other buildings unless otherwise noted. EMT shall not be used in earth, exposed to weather, in floor slabs, in concrete walls, where mechanical protection is required, or in trade sizes larger than 1½-inch.

Electric metallic tubing (EMT) shall be galvanized mild steel with compression fittings. Boxes used with EMT shall be galvanized. Minimum size shall be ½-inch.

EMT connectors and couplings shall be threaded galvanized steel, watertight, gland compression type. Indenter set screw or diecast fittings are not acceptable.

9.10.6 Pull and Junction Boxes

A. Junction boxes, device boxes, fixture support boxes, oblong, round and rectangular conduit fittings (condulets) used with rigid steel conduit shall be cast ferrous alloy material, hot-dip galvanized to match the conduit after fabrication. Integrally cast threaded hubs or boxes shall be provided for all conduit entrances and shall provide for full 5-thread contact on tightening. Drilling and threading shall be done before galvanizing or finishing. The cover plate shall be of similar cast ferrous alloy material and finishing. A full body neoprene gasket shall be provided with the cover. AISI Type 316 stainless steel screws shall be provided for all covers. Before finish is applied, a ground pad drilled for two bolted ground lugs or a grounding stud shall be welded to the inside of the box. Device covers shall be provided with neoprene full body or ring gaskets. Covers shall be of cast ferrous alloy finished as described for box unless the particular device requires a cover that is not manufactured in this material.

B. Pull and junction boxes shall be fabricated from galvanized steel with neoprene gasketed hinged covers. The cover shall be retained by stainless steel screws located within ½-inch of the box corners opposite the hinges and not more than 12-inches O.C. Boxes shall be sized per NFPA 70 and shall have sufficient capacity to add to each side a minimum of two conduits equal to the largest conduit entering the box. Use Type FS or FD copper-free aluminum cast device boxes for all surface mounted small boxes.

C. Outlet and device boxes used with rigid PVC conduit shall be PVC with solvent weld-type joints. All fasteners for outlet and device boxes shall be AISI Type 304 stainless steel. All outlet and device boxes shall be suitable for use in wet locations.

D. Outlet and device boxes used with EMT conduit shall be of galvanized or zinc plated sheet steel construction. These boxes shall be gang-type using raised covers and suitable to the class of wall or partition construction involved. Outlets and device boxes shall be ganged where two or more devices are to be installed side by side.

E. Explosion proof junction boxes used with rigid steel conduit shall be Crouse-Hinds GUA series, Appleton equivalent, or equal. Where mounting ears are required, the boxes shall be GUJ series. Large boxes may be the GU, GUE, or GUB series with all machine work such as drilling, and installation of hubs done in the manufacturer's facilities.

F. Install all pull and junction boxes plumb. Boxes for recessed wiring shall be set flush with the finished surface. Boxes shall be UL rated for the location in which they are installed.

G. Hubs for connection of conduit to sheet metal or die-cast boxes shall be zinc plated to match the conduit. Hubs for connection to stainless steel boxes and fiberglass or plastic boxes shall be AISI Type 316 stainless steel. The hubs shall provide a liquidtight connection to the box and an insulating bushing for the wiring.

H. Cable and cord connectors shall have malleable iron body and gland nut, nylon gripper, neoprene grommet, PVC or Buna-N sealing, and a steel locknut. Connectors shall be liquid tight, oil tight, and raintight and shall be suitable for NEMA 4 enclosures. Cable and cord connectors shall be OZ/Gedney Type SR Grip-Tite Strain Relief connectors.

9.10.7 Conduit Accessories

A. Conduit clamps for rigid metallic conduit shall be malleable iron, one-hole clamps with malleable iron clamp backs: RACO 1303/1324, Appleton CL75M/600M, Crouse-Hinds MW500 Series, or equal.

B. Conduit seals shall be provided where conduits penetrate exterior concrete walls below grade. For conduits 60-inches or less below grade: OZ/Gedney Type FSK, or equal. For conduits more than 60-inches below grade use OZ/Gedney Type WSK, or equal.

C. Duct Sealing Compound shall be a fibrous, soft, slightly tacky, non-hardening clay-like material easily applied by hand at all working temperature; J.M. Clipper Corp Duxseal, O-Z Gedney DUX, or equal.

D. Fire Retardant Material shall be UL rated foam or sealant with 3-hour fire rating conforming to UL 1479; General Electric, Chase Technology Corp., Dow Corning, 3M, or equal.

E. Cable Fittings shall be rated for Class I, Division II locations with stainless steel or aluminum threaded body and gland nut, neoprene bushing, and stainless-steel wire mesh cable grip; Crouse Hinds CGB with RPE cable grip, Kellums CG, or equal.

F. Hazardous location seal fittings shall be Appleton, "EYS", Crouse-Hinds, or equal. Sealant shall be Appleton or Chico "X" Fiberdam and Apelco or Chico "A" compound, or equal.

G. Provide cable fitting and wire mesh grip for cable entry into conduit.

H. Ceiling hangers for single conduit shall be of the adjustable wrought steel ring-type. Hanger rods shall be ½-inch all-thread rod. Hangers and rods shall be hot-dip galvanized after fabrication.

9.10.8 600 Volt Wire and Cable

A. All wire shall be new and coiled or on the manufacturers reels and bear a label with the manufacturer's name, trade name of the wire, wire size, and UL listing. All wire shall have insulation conforming to NEMA-WC5, NEMA WC-7, NFPA 70, and UL-83.

B. Feeder and branch circuit wire shall be stranded copper conductor. Use solid copper conductor for convenience receptacle and lighting circuits only. Conductor sizes #4 AWG and smaller shall have THWN insulation. Conductor sizes #3 AWG and larger shall have THWN or XHHW insulation.

C. Control Wire shall be #14 AWG, 7 or 9 strand copper conductor, solid color THWN or XHHW insulation.

D. Care shall be exercised in pulling cables into conduit or racks so as to avoid kinking, putting undue stress on the cables or otherwise abrading them. No grease will be permitted in pulling cables, only soapstone, talc or UL approved pulling compound will be permitted. The raceway installation shall be complete and protected from the weather before cable is pulled into it.

E. No splices shall be used for power or control wiring. Terminations of cable at 460V motors shall be made by bolt connecting the lugged conductors and then using three ½-lap layers of adhesive varnished cambric tape covered with two ½-lap layers of vinyl plastic electrical tape.

9.10.9 Multi-Conductor Instrument Cable

A. Multi-conductor instrument cable shall be two, three, or four conductor shielded #16 AWG wire with rubber color coded 600-volt insulation. Conductors shall be stranded tinned copper. Shield shall be braided tinned copper with drain wire. Jacket shall be black neoprene resistant to oil, moisture, sunlight, and ozone. Cable shall be Alpha 1450/16 Series, or equal.

B. Equipment suppliers shall provide special signal and instrument cable with the equipment that requires it.

9.10.10 Wire Color Coding

A. Color coding is discretionary except for the following colors that shall be used only as designated below for both control and power circuits:

Voltage	208Y 120	480Y 277
Phase A	Black	Brown
Phase B	Red	Orange
Phase C	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

B. Any conductor used for grounding shall be green or bare. Conductors that are green or white shall be used for ground or neutral only, respectively.

C. Conductors for ac and dc circuits shall be installed in separate conduits.

D. All 4-20 mA circuits shall be 2/c #16 shielded.

9.10.11 Terminals and Connectors

A. Solderless tool compressed connectors and terminals shall be made of corrosion resistant tin-plated copper: 3M, Burndy, or equal.

B. Fork terminals shall be nylon or vinyl self-insulated locking type with terminal insulation that supports wire insulation; Panduit Type PNF, Bundy Type TP-LF, 3M Type MNG, Thomas & Betts Type FL, or equal.

C. Electrical spring type connectors shall be 3M “Scotchlok” or “Ranger”, Ideal “Wing-Nut”, or equal.

D. All outdoor underground splices shall use waterproof wrap-around sleeves as manufactured by Raychem, Type CRSM, or equal.

E. Cable ties shall be non-releasable nylon zip type: 3M “Scotchflex”, Burndy “Uniwrap”, or equal.

9.10.12 Wiring Devices

A. Switches shall be heavy duty, specification grade, silent, toggle type, Ivory colored, back and side wired, and rated 20 amperes under all loads. Switches shall be Leviton 1200 Series, Eagle 2221 Series, Hubble 1220 Series, General Electric GE 5930 Series, Pass & Seymour AC Series, or equal.

B. Duplex receptacles shall be specification grade, 3 wire grounding type, side wired, rated for 20 amperes at 125 volts, and Ivory colored. Duplex receptacles shall be Leviton 5362, Eagle 5362, Hubble 5362, General Electric GE 4108, Pass & Seymour 5342-I, or equal.

C. Ground fault circuit interrupter receptacles shall be rated for 20 amperes at 125 volts and Ivory colored.; Leviton 6399, Eagle 647, Hubble GF-5362, General Electric GF 5242, or equal.

D. Switches shall be installed where shown on the Drawings, on the lock side of doors, and located four feet above the floor unless otherwise noted.

E. All surface mounted receptacles shall be mounted at four feet above floor level and shall be grounded to a separate, green insulated, grounding conductor.

F. All receptacles on a GFCI breaker shall be identified with a red laminated plastic nameplate with white ¼” letters reading “GFCI PROTECTED”.

G. Switches and receptacles mounted outside or in damp locations shall have weatherproof cover plates.

H. All boxes shall be covered with device plates or blank plates. All plates shall be AISI Type 304 stainless steel. Outdoor weatherproof receptacle plates shall be metal with individual, spring loaded covers with gasket for each opening of a duplex receptacle.

9.10.13 Disconnects

A. Local Disconnects, if required, shall be UL listed, heavy duty, 600 volt, 3-pole non-fusible safety switches with quick-make, quick-break operating mechanism, rated for the connected load, with provisions for padlocking in the open and closed positions. Provide NEMA 1 enclosure for non-hazardous locations and NEMA 7 enclosures for hazardous locations and NEMA 4X for outdoor locations. Local disconnects as manufactured by Square D, General Electric, Cutler Hammer, or equal.

9.10.14 Receptacles/Outlet Boxes

Unless otherwise noted, receptacles shall be parallel blade grounding type for general duty 15 ampere, 125V applications. Receptacles shall be of the grounding-type and shall have NEMA contact configurations and shall be UL listed for the current and voltage indicated. The receptacle bodies shall be manufactured of molded phenolic, melamine or polycarbonate. Receptacles shall be specification grade.

Outlet boxes shall be located to provide ample clearance between fixtures and pipes, beams, and ducts. The location of all outlets shown is approximate. The exact location shall be verified on the job to avoid conflict with other work. Boxes shall be accurately placed and independently and securely supported. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure boxes, nor shall welding or bracing be used for attachment. Boxes shall be secured by galvanized brackets, expansion bolts, toggle bolts, or machine or wood screws depending on the type of construction. Unless otherwise indicated, receptacle boxes shall be mounted 24 inches above the floor in all areas. Switch boxes shall be mounted 48 inches above the floor. Blank covers shall be provided for all unused openings.

All receptacles shall be duplex, ground fault protected, unless otherwise shown. All boxes shall be covered with device plates or blank plates. All plates shall be AISI Type 304 stainless steel. Outdoor

weatherproof receptacle plates shall be metal with individual, spring loaded covers with gasket for each opening of a duplex receptacle.

9.10.15 Motor Cords

Motor cords shall be heavy-duty, neoprene or T-Prene jacketed construction cord. Cords with No. 10 AWG conductors and smaller shall be NEC Type SP or SEO. All portable cords shall contain a grounding conductor.

9.10.16 Control Devices

A. Selector Switches

Selector switches located in motor control centers, combination starters and field control stations shall be of the heavy-duty oil tight-type. Operating knob shall be of the lever-type. Contacts shall be rated 10 amperes continuous current and shall have a noninductive interrupting rating of 40 amperes at 115V AC and 10 amperes at 125V DC for each contact. Switches shall be Square-D, Type K, Cutler Hammer, or equal.
Switches shall be provided complete with cover, front escutcheon, handle and with the legend plate engraved by the switch manufacturer in accordance with the drawings.

The manufacturer's standard contact development diagram shall be submitted for each different switch arrangement required. The development diagram shall identify each switch it describes and shall call out all special operating features in addition to providing the standard contact status for each switch position.

B. Pushbuttons

Pushbuttons shall be heavy-duty oil tight-type. Contacts shall be rated as specified for selector switches. Unless shown otherwise, pushbuttons for field control stations shall be provided with a watertight boot if the pushbutton is mounted on the outer surface of the enclosure.

C. Relays and Timers

1. Control Relays

Control relays shall be rated in accordance with ICS-1970 and shall be of the heavy-duty solenoid-type with contact rated not less than 10 amperes continuous at 600V AC. Control relays shall have a minimum of four reversible poles or four universal poles. Relays shall be Square-D Type X, Cutler Hammer Type M or equal.

2. Power Relays

Power relays shall be UL listed for controlling single-phase motors up to 1½ Hp. Power relays shall be rated at 30 amperes up to 300V AC and horsepower rated at 1½ Hp for each pole. Power relays shall have a DPDT contact arrangement. Power relays shall be Square-D Type C, Cutler Hammer Type AA, or equal.

3. Timing Relays

Timing relays shall be solid state or electropneumatic. Electropneumatic relays shall be of the sealed timing-head type having a linear variable orifice timing system. A visible time dial shall be provided for adjustment of the setting. Setting ranges shall be as called out or as required. Double head units shall have the same contact timed on energizing and de-energizing of the single coil and shall provide individual adjustment for each function. Contacts shall be capable of 500,000 operations at 120V AC, 15 amps with a resistive load. Electropneumatic relays shall be Agastat 7000 Series or equal. Solid-state relays shall be Agastat Series DSB, SCC or equal.

4. Phase Protection Relay

Phase protection relays shall monitor three-phase power lines for abnormal power conditions of under voltage, phase loss, phase reversal, and phase unbalance. The relay shall have a solid-state voltage and phase angle sensing circuit that drives a DPDT output relay. The relay operation shall be independent of system load and shall be suitable for use on a motor horsepower rating. When a fault condition is sensed, the output relay will drop out. The relay shall have an adjustable trip delay of 1 to 10 seconds, independent adjustment for under voltage and an adjustable restart delay of 20 to 300 seconds. An on/off switch shall be provided with the relay to convert operation from automatic reset to manual reset. Relay shall be Time Mark Corporation Model 2652 Power Monitor or equal.

5. Cycle and Reset Timers

Cycle timers shall be of the synchronous motor driven type and shall provide the sequence function shown. Setting may be made or changed with the timer running. Percent timers shall be HQ9 Series as manufactured by Eagle Signal Division of Gulf and Western, Automatic Timing Controls Company, or equal. Reset timers shall be HP5 Series as manufactured by Eagle Signal Division of Gulf and Western, Automatic Timing Controls Company, or equal.

6. Electronic Alternator

Alternators shall be a solid-state device designed to sequence multiple loads. Output shall be SPDT electromechanical contacts rated at 10 amps at 120V AC. Two position alternators shall be equipped with a toggle switch that will allow the alternator to be placed in an automatic mode or locked in to Load 1 or Load 2. Two position alternators shall be Time Mark Model No. 261 DT or equal.

D. Miscellaneous Control Devices

1. Indicating Lights

Indicating lights shall be oiltight-type. Indicating lights for alternating current systems shall include a 120-6V transformer and 6-8V No. 44 lamp and shall be of the illuminated pushbutton-type with the pushbutton wired for the push-to-test function required. Lens caps shall be provided as shown. Lamps shall be provided for each unit installed and three dozen spare lamps of each type used shall be provided.

2. Hour Meters

Hour meters (elapsed time meters) shall be 2½-inch diameter case-type for flush panel mounting. The meter face shall be of the style that most closely resembles the switchboard indicating instruments and shall have black trim with white or aluminized face. The meters shall have a 6-digit nonreset register with the last digit indicating tenths of an hour.

3. **Control Transformers**

Control transformers shall be of the volt-ampere rating required to supply the coil and device loads in the control circuit, but not less than 75V amperes. In no case shall the control circuit load exceed the rating of the control transformer for either continuous loading or inrush loading.

Starter	Minimum Transformer Volt-Ampere Rating
Size 1	100
Size 2	150
Size 3	200
Size 4	300

Control transformers will be required on each starter unless otherwise shown and shall be connected to terminals L1 and L2 on the load side of the branch circuit breaker. Control transformers shall be rated 240x480-120V.

4. **Control Circuit Fusing**

Drawout indicating fuseholders and fuses shall be provided as shown for the protection of all control circuits. Fuseholders for the protection of a control circuit transformer (primary fusing) shall be of the molded phenolic-type, having side barriers and a barrier between the fuse clips. The fuseholder shall accept 13/32 by 1½-inch glass melamine fuses to

interrupt 10,000 amperes at 500V. Spare fuses shall be provided in quantities of 10 percent, but not less than ten, of each type and current rating used.

E. Flow Sensor

Provide a flow sensor for the Well Pump discharge line. The flow sensor shall be a thermal dispersion type flow sensor, Model FLT93-B as manufactured by FCI or equal. The unit shall be capable of sensing flow in the range of 0.1 to 5 ft/s. The sensor shall be provided with a 316 stainless steel spherical tip.

F. Pressure Switch

1. Type A Pressure Switch. Type A pressure switches shall be actuated by a brass bourdon tube. Switch operation shall be fully automatic. Switch shall have adjustable differential, dual external adjustments, 1/4-inch process connection, 1/2-inch conduit connection and snap action switch contacts. Switch contacts shall be rated for not less than 5 amps at 120V AC. Pressure switch shall be Mercoid Series DA or equal.

2. Type B Pressure Switch. Type B pressure switches shall be actuated by a brass body transducer with a Buna "N" diaphragm. Housing shall be cast aluminum. Switch operation shall be fully automatic. Switch shall have adjustable differential, dual external adjustments, 1/4-inch process connection, 3/4-inch conduit connection and snap action switch contacts. Switch contacts shall be rated for not less than 5 amps at 120V AC. Pressure switch shall be ASCO Tri-Point S Series or equal.

G. Pressure Transducer

A solid-state transducer shall be used to accurately sense pressure/level for distribution systems over its factory calibrated range and produce a 1-SVDC or 4-20 MADC signal proportional to its variable input. Unit shall be suitable for use in water and wastewater process control applications. Various pressure ranges shall be available for the specific application. Pressure transducer shall

be 150% of rated pressure proof with 12-30 VDC power input and a ±0.5% accuracy over the calibrated range. All wetted parts shall be Ni-Span-C, aluminum, or stainless steel. Pressure transducer should be externally adjustable with zero and span adjustments. Pressure Transducer shall be a Foxboro IGP-10 or equal.

H. Door Switches

Standard switches shall be surface mount high security magnetic contact with an anodized aluminum housing. Switches shall contain three (3) independent contacts, wired in SPDT configuration. Switches shall be provided with pry and magnetic tamper prevention. Switches shall be General Electric 2707A or equal.

I. Flood Switches

Flood switches shall be lightweight reed type level switches that have a reversible float containing a small permanent magnet which shall activate the reed switch when the float is raised. Flood switches shall be rated at not less than 2-amperes at 120V AC. Lightweight level switches shall be Gems Liquid Level Sensors or equal.

J. Temperature Switches

Temperature switches shall be activated by a thermal unit suitable for the intended service. Switch shall be fully automatic. Switch shall have an adjustable differential with external adjustments and ½-inch minimum conduit connection. Switch shall be rated for not less than 5 amps at 120 V AC. Temperature switches shall be Johnson Controls (Penn) Model A19 series or equal.

9.11 MOTOR CONTROL CENTER - GENERAL

The Motor Control Center shall be an Allen Bradley Centerline or Cutler-Hammer Freedom series. No substitutions allowed. The control center shall be metal enclosed and shall meet the requirements of NEMA type 1A as specified for that particular location. It shall be designed, manufactured and tested in accordance with the latest applicable standards of NEMA, IEEE and ASA. The Motor Control Center shall be suitable for operation on 480 volt, 3-phase, 3-wire, 60 Hz. Motor Control Center construction shall be NEMA 1, Class 2, with Type B wiring. Horizontal bus shall be 600 amperes braced for 42,000 ampere fault. Vertical bus shall be 300 amperes. All protective devices shall be rated for 42,000 fault current.

9.11.1 Sections

Sections shall be nominally 90-inches high, 20-inches wide, and 20-inches deep. Each vertical section housing plug-in starter unit shall have an integral vertical wiring trough on the right side of the motor starter cubicle. The trough shall be covered by a separate hinged door which shall extend from the bottom gutter to the top gutter of the section. Approximately 9-inches shall be reserved for bottom gutter and ground bus and a similar dimension for the gutter and horizontal main buswork. Each section shall be constructed of 14-gauge minimum sheet steel, suitably formed and braced to make a rigid free-standing structure.

All control units and wiring shall be accessible from the operator's side of the assembly. Starter and breaker assemblies shall be front mounted only, and each unit compartment shall be provided with an individual front door. Starter and feeder tap unit doors shall be interlocked mechanically with the unit disconnect device to prevent removal or reinsertion of a unit when the disconnect is in the "ON" or "TRIPPED" positions.

Means shall be provided for releasing the interlock for intentional access and/or application of power. Padlocking arrangements shall permit locking the disconnect device off with at least three padlocks with the door closed or open. Means shall be provided to padlock the unit in a partially withdrawn position with the stabs free to the vertical bus.

All full voltage starter units through NEMA Size 5 shall be of the draw out type. Draw out provisions shall include a positive guide rail system and stab shrouds to absolutely ensure alignment of stabs with the vertical bus. All draw out units shall be secured by a spring-loaded quarter turn indicating type fastening device, located at the top front of the unit.

All doors, blank spaces, covers and top sheet shall be fully gasketed around their entire periphery. The finish of each control unit shall be over a bondarized and primed steel surface with an enamel color selected by the Engineer. MCC interior shall be white.

9.11.2 Units

Spare units shall be complete drawout modules containing all devices shown including such devices that are required on the door for each standard unit. Spare units shall be completely wired to the unit terminal block. Designated spaces for future units shall be complete with plug-in module pan and covered cutouts to provide for future mounting of all components shown on the referenced diagram.

All starters shall be furnished with individual control transformers and all starters shall have individual adjustable timers to start units in a timed sequence after a power failure. Starter heater size will be determined by actual verification of motor furnished at the job site.

Each starter will be provided with a phase failure/phase reversal relay, with automatic reset.

A. **Finish**
Each panel shall be finished with zinc chromate primer over which is applied an ANSI gray enamel color.

B. **Selector Switches and Pushbuttons**
Selector switches and pushbuttons shall be full size Allen-Bradley 800T or equal, and shall be heavy duty, oil-tight and shall be rated at not less than 10 amps at 110 volts.

C. **Lights**
All status and alarm indicating lights shall be full size Allen-Bradley 800T push-to-test oil-tight transformer type or equal.

D. **Elapsed Time Meters**
Elapse time meters shall be provided for all motors. They shall record the running time of the motors from 0 to 99,999 hours in tenths of hours. **Meters shall be General Time 96005300 or equal.**

E. **Nameplates**
Each motor control center compartment, individual controller, control stations, field panel and control device shall have a nameplate designating the function of the device and its identifying number. All relays, pressure switches, solenoid valves, and similar devices mounted outside of their associated motor controller cubicle shall be identified with nameplates. All numbered instruments and devices shall be identified with nameplates.

Nameplates shall be made of 1/16-inch thick machine engraved laminated phenolic having white letters not less than 3/16-inch high on a black background. Equipment titles shall be completely spelled out on nameplates as shown on the drawings. The nameplate schedules shall be submitted for acceptance prior to inscription.

Nameplates on steel panels shall be secured with stainless steel drive screws. Nameplates for identifying relays and devices that are located inside of panels shall be of the sandwich phenolic described above.

9.12 PUMPHOUSE NO. 5 - MOTOR CONTROL CENTER

The new Motor Control Center will be served by a 200 amp, 480V, 3-phase, 4-wire, 60 Hz service provided by Freeborn-Mower Electric Cooperative. The Contractor shall furnish and install the service entrance equipment as required by the power company. The Contractor shall furnish and install a 200 amp automatic transfer switch following the meter that is to be installed inside the Motor Controls Center (MCC). The following components shall be included in the MCC.

SECTION 1

200-amp main breaker with TVSS, surge capacitor and voltage monitor relay to detect power failure. Main breaker shall be service entrance rated.

200-amp automatic transfer switch for the engine generator.

SECTION 2

Main lugs.

One (1) VFD for the 30 Hp, 3-phase, Well Pump. Provide the following internal and door mounted devices:

1. Input circuit breaker;
2. 3%-line reactor;
3. HIM module;
4. Hand/Off/Auto selector switch;
5. Required, Run, Fail, & VFD fault Indicator lights;
6. ETM;
7. Automatic control will be from the run signal from the supervisory section, pressure switch.

Provide one (1) 20-amp 3-pole circuit breaker for 3-phase 5-kW electric unit heater for the Pump Room.

Provide one (1) 30-amp 3-pole circuit breaker for 3-phase 18-kW water heater located in the Pump Room.

SECTION 3

24-circuit, 120/208V, 1 phase lighting panel (LP-1). All Breakers to be bolt-in type.

Minimum 15 kVA 480-120 transformer for LP-1.

9.13 VARIABLE FREQUENCY DRIVES

9.13.1 General

Provide adjustable frequency, drive control systems capable of converting the specified voltage into variable voltage, adjustable frequency, 3-phase output of suitable capacity and waveform to serve as input power to squirrel cage induction motors. **Each drive shall have an individual 3% input line reactor and a dv/dt output filter.**

9.13.2 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, 1992.

4. If harmonic filters are needed to meet these requirements, then the manufacturer shall provide and be responsible for the design and manufacture of the filters.

9.13.3 Environmental

1. Altitude: 3,300 feet without de-rating.
2. Humidity: 5 to 95 percent, noncondensing.
3. Temperature: 32 to 104 degrees Fahrenheit, in NEMA 1 enclosure.

9.13.4 Electrical

1. Input voltage tolerance: 10 percent of rated voltage.
2. Rated voltage: as shown on drawings and scheduled.
3. Input frequency: 48 to 62 Hz.
4. Displacement power factor: 0.95, provide inductor on units 5 Hp and smaller.
5. Efficiency at rated current and nominal voltage: 97.5 percent.
6. Maximum short circuit current: 5000 A rms at 600 volts.

9.13.5 Control

1. Method: Sine coded PWM with programmable carrier frequency.
   a. 0.5 to 5 Hp: 2 to 12 kHz carrier frequency.
   b. 7.5 to 30 Hp: 2-8 kHz carrier frequency.
2. Output voltage: 0 to rated voltage.
3. Output frequency: 0 to 400 Hz.
4. Volts per Hertz ratio: fully programmable.
5. Frequency regulation:
   a. Analog input: 0.4 percent of maximum.
   b. Digital input: 0.01 percent of maximum.
6. DC Boost:
   a. Fan mode: two selectable.
   b. Auto mode: eight selectable with independent.
   c. Fixed mode: selectable with independent acceleration and run boosts.
7. Acceleration/deceleration: two independently programmable times, adjustable from 0 to 600 seconds in 0.1-second increments.
8. Intermittent overload capability.
   a. Constant torque: 150 percent of output for one minute.
   b. Variable torque: 115 percent of output for one minute.
9. Proactive current limit:
   a. Constant torque: 20 to 160 percent of rated output.
   b. Variable torque: 20 to 115 percent of rated output.
   c. Inverse time overload: Class 20 protection with speed sensitive response, adjustable from 20 to 115 percent of rated current in 3 speed ranges.

9.13.6 Protective features

1. Detection and trip:
   a. Undervoltage.
   b. Overvoltage.
   c. Overcurrent.
   d. Overtemperature.
   e. External signal.
   f. Output short circuit.
   g. Ground fault.
2. Overcurrent stall.
3. Overvoltage stall.
4. Six alarms.

9.13.7 Signal interface

1. Drive fault contact
2. Drive run contact.
3. Drive alarm contact.
4. Programmable output contact.
5. Potentiometer input.
6. 0-10 VDC analog input.
7. 4-20 mA analog input.
8. 4-20 mA signal loss response.
9. Analog output, selectable.

10. Analog input conversion.
11. Pulse train input.
12. Encoder feedback closed loop speed control.

9.13.8 Programmable Parameters

1. Dual acceleration/deceleration profiles.
2. Three skip frequencies.
3. DC injection braking.
4. Dynamic braking.
5. Slip compensation.
6. Negative slip compensation.
7. Selectable fault reset tries and time.
8. Electronic thermal overload.
9. S-curve acceleration/deceleration profile.
10. Standard and custom volts-per-hertz curves.
11. Traverse function.
12. Proactive current limit.
13. Four event fault memory.
14. Flying start.
15. Automatic DC boost.
16. Seven preset speeds.
17. Phase lock loop

9.13.9 Human Interface Module

1. Display faults in English language:
    a. Power fault.
    b. Control fault.
    c. Logic fault.
    d. Software fault.
    e. Protective fault.
2. Allow control of drive with start-stop function keys and digital speed potentiometers.
3. Allow programming of all programmable parameters.
4. Door mounted on front of enclosure. Provide required interface cable.

9.13.10 Additional Features

1. Agency approvals.
    a. UL listed.
    b. CSA certified.
    c. IEC classified.
2. IGBT Technology.
3. Constant or variable torque rated as required by motor/equipment manufacture.

9.13.11 Overcurrent Protection

1. Provide thermal magnetic main circuit breaker of proper ampacity.
2. UL short circuit withstand rating shall be 65,000A.

3. Provide through door circuit breaker operator which is interlocked with door mechanism and is lockable in the off position. Provide an interlock defeat mechanism which allows authorized personnel to enter the enclosure while circuit breaker is in the on position.

9.13.12 Contactors

1. Provide full voltage bypass and output contactors which allow operator to select full voltage starting or variable speed operation where specified. Contactors shall be mechanically and electrically interlocked to prevent simultaneous operation.

2. Provide full voltage input isolation contactor to disconnect adjustable frequency drive from line power when not required to run.

9.13.13 Overload Protection

1. Provide electronic, self-powered, overload protector of the heaterless design. Unit shall be sized for the actual motor and shall provide a three-second trip on single phase condition.

9.13.14 Pilot Devices On Each Drive

1. Provide the following front of panel mounted pilot devices:
   a. HAND-OFF-AUTO selector switch or as specified.
   b. Constant Speed/VFD selector switch where specified.
   c. Constant Speed Back-up Run Pilot light.
   d. Human interface Module.
   e. Run and Fail indicator lights.
   f. VFD drive failure shall cause unit to go into constant speed Back-up mode automatically.

9.13.15 Enclosure

1. Mount all equipment in single NEMA 1, free-standing, MCC type enclosure sized as needed. Where multiple units are provided for similar service it shall be acceptable to mount multiple units in single MCC structure with multiple compartments, size permitting.

9.13.16 Motor Connections

1. Provide NEMA 4 terminator modular mounted at unit where length of motor feeder exceeds recommendations of manufacturer.
2. All VFD power wiring to the motors shall be in separate metal conduits.

9.13.17 Miscellaneous

1. Adjust overload devices.
2. Adjust all programmable drive features, including but not limited to auto restart parameters. The drive system must automatically restart after a power fail condition.
3. Provide typed label inside each unit identifying motors served, nameplate horsepower, full load current, code letter, service factor, voltage/phase rating, and overload setting.
4. Provide typed label inside each unit identifying configured values for all programmable drive parameters.
5. When requested by engineer, submit system hydraulic analysis including graphs and tabular information for the following:
   a. Input horsepower versus flow (minimum design flow to maximum design flow) taking into account pump, AFD and motor efficiencies.
   b. System curve versus pump curve at 100 percent speed and in 10 percent increments until minimum pump speed at which pump does not generate enough head to overcome static head is reached. Plots must also show curves of constant hydraulic horsepower to verify non-overloading.
   c. Tabulated data shall be calculated at 2 percent speed increments.

d. 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:
e. Calculate percent voltage distortion, with respect to fundamental voltage, for all harmonics up to the 99th.
f. Comparison with IEEE 519 standards for acceptable voltage distortions on such systems.

9.13.18 VFD Cable

Cable from VFDs to motors shall be flexible motor supply cable with foil/braded shield, full size ground wire, three symmetrical conductors, and full-size shield drain wire. Conductor insulation shall be 600V NEC Type

XHHW or RHW-2 suitable for a maximum operating temperature of 90 degrees Centigrade (194 degrees Fahrenheit). VFD cable shall be as manufactured by Belden Cable or equal.

9.14 TRANSIENT VOLTAGE SURGE SUPPRESSOR (TVSS)

Unit shall provide all-mode protection in any surge environment against any type of transient and provide full spectrum protection from both surges and noise for the MCC. Include the following:

1. 80K Amp per phase surge protection;
2. 50/60 Hz operating frequency;
3. 50 dB EMI/RFI attenuation;
4. UL 1449 safety approval;
5. 300,000 AIC fault current rating;
6. 5-year warranty;
7. 120/240 VAC, 1 phase, 3 wire unit.

9.15 ELECTRIC HEATING EQUIPMENT

9.15.1 General

Electric heating equipment includes all material, equipment, labor, and services necessary to furnish, install, and test under operating conditions electrical unit heaters, electric cabinet heaters, electric duct heaters, and appurtenances as shown and specified. All heating equipment shall be UL listed.

9.15.2 Manufacturers

Electric unit heaters shall be Berko HUHAA Series, QMark, or equal. Cabinet heaters shall be Berko FRA Series, Q Mark, or equal. Temperature switches for the electric unit heaters shall be Berko WT12 or equal.

9.15.3 Electric Unit Heaters

Electric unit heaters shall be horizontal fan forced having voltage and power ratings as indicated. Unit shall be capable of operation from a single source of supply power. The unit shall be furnished with a suitable wall or ceiling mounting bracket as required. The unit casing shall be constructed of die formed steel. The units shall be finished in a durable baked enamel.

Fans shall be aluminum propeller-type mounted directly to the motor shaft. The fans shall be statically and dynamically balanced. The motors shall be totally enclosed-type with permanently lubricated bearings. The complete assembly shall be mounted by means of vibration eliminator grommets.

The heating element bank shall consist of a number of individual finned, tubular, resistance-type elements. The individual heaters shall be constructed of the highest quality nickel-chrome wire, coiled and embedded within a refractory material and enclosed within a sheath.

All units shall be provided with factory-mounted and wired contactors of a rating suitable for the particular heater. In addition, each unit shall be provided with a high temperature limiting thermostat which will de-energize the heaters should abnormally high temperature exist. All louvers shall be individually adjustable so that the

discharge warm air stream may be directed as desired. The Contractor shall furnish and install a wall mounted thermostat, unless indicated otherwise. Thermostat shall be Berko WT12 or equal for unclassified areas and shall be Berko WR80EP or equal for explosionproof areas.

The following Wall/Ceiling Mounted Unit Heaters shall be provided:

Location	Description / Size / Voltage
Pump Room	5 kW; HUH-548SA or Equal

Units shall operate on 480V, 3-phase power. Units shall include a 24V control voltage transformer. Provide remote thermostats/temperature switches. Mount units 8-feet above the floor, provide wall and/or ceiling brackets as necessary.

9.15.4 Electric Cabinet Heaters

Electric cabinet heaters shall be designed for recessed mounting. Wall style electric cabinet heaters shall have a built-in thermostat with a range of 40°-85° degrees Fahrenheit. Fans shall have a capacity of not less than 65 cfm. Unit shall be provided with a double pole disconnect switch and a 1-inch semi recessed mounting frame. Heater shall be 208V, single phase.

The following Wall/Ceiling Mounted Unit Heaters shall be provided:

Location	Description / Size / Voltage
Chemical Room No. 1	1.5 kW; FRA4024F or Equal
Chemical Room No. 2	1.5 kW; FRA4024F or Equal

9.16 LIGHTING FIXTURES

9.16.1 General

Lighting fixtures includes all material, equipment, labor, and services necessary to furnish, install, and test all lighting fixtures as shown and specified. All fixtures shall be completely wired and shall meet the requirements of the NEC and shall bear the UL label. Lamps of the size specified shall be provided for all fixtures. Pendent-mounted fixtures shall be supported from swivel fixture hangers. Stems shall be ½-inch galvanized conduit or ⅜-inch smooth rods hot dip galvanized after fabrication.

The lighting fixtures shall be installed as shown on the drawings and in strict accordance with the manufacturer's written instructions. Fixtures shall be carefully and neatly mounted complete with all necessary connectors, adjustable mounting brackets and trim, as required for the ceiling conditions.

Where recessed fixtures are required, the fixture shall be provided with mounting hardware for the ceiling system specified. A concealed latch and hinge mechanism shall be provided to permit access to the lamps and ballasts and for removal and replacement of the diffuser without removing the fixture from ceiling panels.

Fixtures shall be aligned and directed to illuminate an area as specified. Photoelectric cells shall be oriented toward the north. Fixtures shall be directly and rigidly mounted on their supporting structures. Unless otherwise specified, conduit system shall not be used to support fixtures. Where brackets or supports for lighting fixtures are welded to steel members, the welded area shall be treated with rust resistant primer and finish paint.

9.16.2 Interior Lighting

Interior Pump Room lights shall be Type A – Fixtures as indicated on the plans. Interior Chemical Room lights shall be Type C – Fixtures as indicated on the plans.

Fixture Type A. Interior lights shall be 4-ft. LED wraparound lighting fixtures as shown on the plans. Lights shall be Lithonia Lighting LBL4 wraparound, Columbia CWP4, or equal. The lighting unit shall be nominal 10-inch width x 48-inch long. Metal parts shall be die formed from code-gauge steel. Prismatic

diffusers shall be provided and shall be 100% acrylic. Side flanges of the fixture body shall trap light and provide continuous diffuser support. Fixture shall be UL listed, Damp listed, with a 5-year limited warranty. Lights shall be 4,000 lumens, 80 CRI,4000K color temperatures, 32 watts minimum. Units shall be UL Listed for wet locations.

Fixture Type C. Type 'B' light fixtures as shown on the plans are interior lights in corrosive area, shall be nominal 4-ft. LED wraparound fixtures. Lights shall be Larson Electronics HALP-48-2L-G2 or equal. The lighting unit shall be nominal 8.25-inch width x 48-inch length. Fixture shall be non-metallic, corrosion resistant plastic latches to secure the lamp cover to the housing. Fixture shall be UL listed, marine type, rated for Class 1, Division 2, Groups A,B,C,D. Lights shall be an approximate total lumens of 6,700, >80 CRI, 4500K color temperature, 56 watts, with a T4 operating temperature.

9.16.3 Exterior Lighting

Exterior lights, Fixture B as indicated on the plans, shall be slim, low-profile, LED wallpacks. Housing shall be a rugged die-cast aluminum hinged housing with a heavy-duty mounting bracket. The optic shall be with a silicone sealed LED chamber, impact resistant. The units shall be 18 W, 120V, 4000K, 70 CRI LED's with a 5-year warranty. Exterior lights shall be Crosstour LED Wall Pack as manufactured by Lumark, RAB SLIM, Spitzer Lighting Peak JR, or equal. Units shall be provided with photoelectric control and provide manual switches as shown on the plans.

9.16.4 Exit Lighting

Exit signs lights shall be LED lighted in an injection-molded, flame retardant, high impact, thermoplastic housing with snap-fit design. Lamps shall be LED. Universal chevrons shall be easily removable for directional indication. Letters shall be 6-inch high with ¾-inch stroke, with 100 ft viewing distance rating based on UL924 Standards. Lights shall be dual voltage input 120V or 277V AC. Lights shall be UL Listed and meet OSHA illumination standards. Exit sign lighting shall be catalog number EXR LED M6 as manufactured by Lithonia, CARG CE LED emergency exit as manufactured by Compass, or equal.

9.16.5 Emergency Lighting

Emergency lights shall be 8W halogen lamps or nominal 2W LED in thermoplastic housing with a coated 18-gauge steel housing having a hinged faceplate for ease of maintenance. Lights shall be dual voltage input capable 120V or 277V AC. Lights shall be UL Listed and meet OSHA illumination standards. Batteries shall be sealed, maintenance-free, nickel-cadmium with wattage capacities for minimum of 90 minutes of emergency operation and 24-watts. Lights shall be provided with an integral current limiting charger. Emergency lighting shall be series ELT24HN as manufactured by Lithonia, model CU2W LED emergency light as manufactured by Compass, or equal.

9.16.6 Photoelectric Cell Units

Photoelectric cell units shall consist of cadmium sulfide cell housed in translucent Lexan dome assembly. The assembly shall be capable of being rotated 180 degrees. Assembly shall be suitable for outdoor mounting and shall be rated for 1800 VA at 120V maximum capacity. The switch shall be mounted on a condulet or junction box. Photoelectric cells shall be Tork Model 2001 or equal.

9.17 SCADA SYSTEM OVERVIEW

Detailed functions are not necessarily described or shown. The functional description is to be used by the Contractor to assist in understanding the systems and to develop the required detailed design. The existing SCADA system utilizes a wireless communications system. The upgraded SCADA system shall use spread spectrum radio communications equipment to transmit data collected from all of the remote telemetry units (RTU) in the water system to a central location where the data will be displayed. If an alarm condition occurs at one or more of the RTU's, the SCADA system will contact the operators, alerting them of the alarm condition. A new SCADA system RTU shall be mounted in Pumphouse No. 5. The existing SCADA system CTU is mounted in the wastewater treatment plant (WWTP) and shall be modified to accommodate the addition of Pumphouse No. 5. The existing RTU at Pumphouse No. 4 shall be modified as required to accommodate Pumphouse No. 5.

The SCADA system shall include the following functions:

1. SCADA system shall provide alarm and status conditions for each well pumphouse.

2. The SCADA system shall be provided with a RTU located at each pumphouse.

3. The SCADA system central terminal unit (CTU) is located at the WWTP.

4. All units shall be provided with battery back-up to provide continued system monitoring and alarm announcement in the event of primary power failure. It shall be provided with built-in battery charging circuitry to maintain and charge battery. Battery shall be sized to provide a minimum of four (4) hours of back-up power.

9.18 RADIO TELEMETRY SYSTEM

All control signals, status signals, alarm or variable analog data shall be transmitted and received between the central data gathering site (CTU) and the remote sites (RTU) via the SCADA System using digital radio telemetry. The SCADA System shall convert commands, alarms, and variable analog data to digital data blocks and transmit this information between the central and the multiple remote locations.

The digital blocks of data shall be converted to audio tones by a crystal-controlled modulator/demodulator (MODEM) using Bell standard tones sent at a minimum of 4800 baud (bits per second). The tones shall be sent/received in a half-duplex mode over an FM radio system.

Data security shall be provided by a complimentary double scan and a cyclic redundancy check (CRC) code. If communications cannot be verified between central and remote, the central shall try to send the data three times before a data fail output is energized. Tone output level shall be adjustable from +6DB to allow connection to a radio interface.

Each individual pumphouse will be provided with a RTU. The Central Terminal Unit (CTU) and automatic dialer are located at the wastewater treatment plant (WWTP). The following is a list of facilities to be included / modified in the control system:

- Existing Pumphouse / Well No. 4 – RTU;
- Proposed Pumphouse / Well No. 5 – RTU;
- Wastewater Treatment Plant – Master Supervisory Panel / CTU, which includes an Auto Dialer.

The existing telemetry system was designed and installed by S&M Controls, Inc.

Components shall be carefully removed and reinstalled to operate and control the well pump and chemical feed pumps and other appurtenances. All control signals, status signals, alarm or variable analog data are transmitted and received between the central data gathering site and the remote sites via a SCADA using digital radio telemetry.

The Control System Integrator shall provide the required radio path site surveys to determine the minimum power requirements for the site locations and shall design the Radio Telemetry System for at least 99.9 percent reliability. Evidence of the radio path site surveys shall be submitted with the radio equipment submittal as supporting information for the choices of power outputs and frequency proposed. The integrator shall submit the proposed mounting heights for all antennas. **Some of the sites may not have line of site due to the terrain.** The Control System Integrator shall note the repeater station locations contemplated to communicate with all existing and new sites. All repeater stations shall be included in the bid as required.

The Control System Integrator shall provide the necessary assistance to the Owner for applying and obtaining the FCC Operating License and operating frequency as required for the new radio system. **All licensing fees to be included in the Control Manufacturers equipment package**.

The Control System Integrator shall furnish the antennas required for each site in the System. The antennas shall be installed by the Contractor. The Control System Integrator shall provide a mounting detail for a typical antenna installation at all locations. The Contractor shall furnish a tower(s) as may be required for the master and the remote station transmitter/receiver antennas. Particular importance shall be given to the correct installation of the antennas to give adequate radio signal strength, structural and lightning surge protection to the Control System.

9.19 RADIO TRANSCEIVER

Radio transceiver power sources shall be as follows:

1. Master: 12 VDC
2. Remote: 12 VDC

The radio transceivers shall be capable of operating in the following environmental conditions:

1. Operational Temperature range: -30 to +60 Deg. C.
2. Humidity: To 95% at +40 Deg. C.
3. Altitude: 3,000 Ft.

The radio transceivers shall have the following radio system characteristics:

1. The radio transceiver shall be a new current Model Frequency-Synthesized, FM 2-way radio, solid state suitable for sending and receiving audio tones. The radio shall be a 1-watt output for the master unit and a 1-watt output unit at the remotes. The proposed radio system shall operate at a 4800 (minimum) bits-per-second rate. Radio shall be MDS (Microwave Data Systems) Orbit unlicensed radios.
2. Master and Remote (transmit) frequency range shall be 902 MHZ. to 928 MHZ. for UHF. The receiver shall meet FCC RC0177 designation requirements. The Owner has an existing FCC licensed frequency that may be used in place of spread spectrum frequencies.
3. For transient protection, the VF input/output and keying lines shall meet IEEE Std. 587-1980.

9.19.1 TRANSMITTER. The transmitter shall have the following characteristics:

1. Fully synthesized operation.
2. Frequency stability ∀ 1.5PPM (-30 to +60 Deg. C.)
3. Spurious/harmonic emissions at the antenna port shall be -60 dBc.
4. RF output:
   a. 1 Watt
   b. Impedance shall be 50 Ohms

9.19.2 RECIEVER. The receiver shall have the following characteristics:

1. Dual conversion superheterodyne type
2. Fully synthesized operation.
3. Frequency stability shall be ∀ 0.00015% (-30 to +60 Deg. C.)
4. The image/spurious rejection shall be -85 dB.
5. Duty cycle: Continuous
6. Intermodulation Rejection: 59 dB

9.20 ANTENNAS

9.20.1 General

The SCADA System provider shall provide the radio antenna for the site. Unless specifically stated, the antenna shall be attached to the structure. Particular importance shall be given to the correct installation of the antenna to give adequate lightning protection to the System. All antennas and towers shall be suitable to withstand 3/4-inch of ice loading.

9.20.2 Construction

Antennas shall be directional or omni-directional as needed. Antennas shall be of all aluminum construction and rated to withstand at least 100 mph winds. Adequate lengths of Helix cable shall be provided for connection between the antenna and radio transceiver.

9.20.3 Directional Antenna

1. Type – 3 or 5 element Yagi Type, forward gain of 8 to 11 dB
2. Front to Back Ratio – 20 dB to 15 dB
3. Lightning Protection – DC grounded
4. Feedpoint Method – Fully enclosed low loss feed system. No gamma match.

9.20.4 Omni-Directional Antenna

1. Type – Omnidirectional Base Station
2. Gain – 7 dB
3. Lightning Protection – DC grounded

The Contractor shall provide ground rods and grounding materials to properly ground the antenna, antenna tower(s), new equipment and enclosures. All grounding and bonding shall meet or exceed the requirements of Article 250 of the National Electrical Code.

9.20.5 CTU

The CTU antenna may be mounted on the exterior of the WWTP service building in a location determined by the SCADA provider. All conduit wiring and other appurtenances shall be provided.

9.20.6 RTU – Pumphouse No. 4

The existing RTU shall be modified for an antenna which may be mounted on the exterior of the pumphouse in a location determined by the SCADA provider. All conduit wiring and other appurtenances shall be provided.

9.20.7 RTU – Pumphouse No. 5

The RTU shall be provided with an antenna. The antenna may be mounted on the exterior of the new pumphouse in the location shown on the plans by the SCADA provider. All conduit wiring and other appurtenances shall be provided.

9.21 INDUSTRIAL TOUCHSCREEN

A front panel mounted color touch panel operator interface display shall be provided for visual indication of system pressure, flowrate, total flow, set point control for the Well Pumps No. 4 and 5, provide status indication of various pumps and motors, display pump matrix for pump alternation in any sequence/ratio, provide HOA switches for all pumps/motors with required, run, and failed indication, motor ETMs, provide dialer channel allocation screen, and display of all alarms. **Graphic screens shall be utilized to display the above control, status, and alarm functions.**

1. Display type: 10.0-inch viewable minimum, 800 X 600-pixel SVGA screen resolution.
2. Operating Temperature: 0-50 degrees C.
3. Noise Immunity: 1000 Vp-p.
4. Static and Dynamic bitmap graphics for information rich pictures.
5. System memory: 64 Mbytes (Mb) minimum.
6. 128 Mb, Compact flash data logging storage minimum.
7. 10-inch touchscreen as manufactured by Allen-Bradley Panelview Plus7, CMore, Maple Systems, or equal.

9.22 PROGRAMABLE LOGIC CONTROLLER

The programable logic controller (PLC) shall be a Compact Logix 5370 or 5380 Series as manufactured by Alllen-Bradley or equal. The PLC shall be tested to demonstrate compliance with the functional requirements of the control/SCADA system.

A. PLC system shall consist of the following:

1. Processor with memory;
2. Power supplies;
3. Input hardware;
4. Output hardware;
5. Software;
6. Communications hardware;
7. Operator interface (if specified);
8. Cables as required.

B. For 120 VAC (-20%, +10%) Include PI filter.

C. 0 to +60 degrees C operating ambient temperature rating.

D. Humidity 5 to 95% without condensation.

E. UL listed certification.

F. IEC61000-4-2 through 4-6 Noise Immunity.

G. Processor with the following:

1. 750 Kbytes memory minimum (provide 25% spare capacity).
2. 16 I/O modules minimum.
3. LED indicators for run, fault, force, Bat, I/O, Ok.
4. Embedded RS-232 and Ethernet/IP communications.
   a. Serial comms. Via ASCII, DF1 Full/Half Duplex, DF1 Radio Modem, DH 485 and Modbus.
   b. Interconnections of up to 32 IP/32 CIP connections.
5. Battery back-up to prevent program loss on power failure.
6. Program in ladder logic, function block diagram, structured text or sequential function block.
7. Internal diagnostics shall be available to user for troubleshooting.
8. Controller will halt on memory error, other errors to be handled internally with proper alarm notification.
9. Online programming.
10. System protection capability (passwords) to secure user data and program files from unauthorized changes.
11. Available options:
    a. Real-time clock.
    b. Floating point math.

H. Input/Output hardware:

1. Shield against electrical noise and RF.
2. Provide with field wiring arm terminal strip.
3. LED light for each input point and each output point to indicate status.
4. Provide various I/O modules to perform the various functions required.

I. Software and Programming

The system supplier shall provide all the programming and software necessary to make the system function as specified. The PLC logic programs to be written by the system supplier to accomplish the monitoring and control functions of this system. The system supplier shall document and annotate the

programs, update them as required after start-up, and turn the programs over to the Owner in the form of CD ROMS.

Also provide to the Owner, registered in his name, a copy of the commercially available PLC programming and documentation software package to be loaded on the Owner's computer for future software changes and troubleshooting.

J. System shall be American made, with parts stocked locally within a 100-mile radius of this project site. System shall be Allen-Bradley Compact-Logix.

9.23 PUMP CONTROL SYSTEM

The well pumps shall be controlled using the RTU signal from the elevated storage tank and water system pressure monitoring. The processor receives water levels or system pressure from the elevated storage tank to determine the start and stop positions for the well pumps and which well is in operation. The well pumps will work on a ratio alternation sequence in which Well Pump No. 5 will operate to 3 to 4-times to every one time for Well Pump No. 4. The ratio shall be adjustable and the operator shall be provided with controls such that if a well pump needs to be removed from service for whatever reason. They shall be able to deactivate the alternation sequence and operate one well pump only.

Each pump shall have a control module which combines the “Hand-Off-Automatic” selector switch with the pilot lights for “Ready-Run-Fail".

The MCC indicating lights shall be LED type and shall light when the motor is called for, when it is running or activated, and indicate a failure if the motor does not respond after being called for. The fail circuit shall light the fail light and provide an output for an audible alarm. Fail time shall be adjustable from 1-10 minutes. Pump status and control shall be provided on the RTU graphical display.

9.24 PUMPHOUSE / WELL NO. 5 RTU CONTROL SUMMARY

RTU shall be located at Pumphouse No. 5. The RTU shall be capable of sending digital input signals to the CTU. Analog input signals are to be converted to 16-bit accuracy digital format for transmission to the central. The RTU shall contain a tone modulator/demodulator (MODEM), micro-processor-based processing unit, A/D converter, and digital input/output isolators and drivers. All connections to the remote shall be through high density type terminal strips. The RTU shall utilize status and alarms from the pump controller and shall be provided with a radio, antenna, and UPS.

1. NEMA 12 wall mounted enclosure.
2. Control breaker.
3. 120 VAC lightning protection.
4. 24 VDC UPS System.
5. Wireless telemetry Remote Terminal Unit (RTU) specified to transmit/receive the following to the supervisory center:
    a. Pump Run
    b. Pump Fail
    c. Building Low Temperature Alarm
    d. Power failure
    e. Data failure
    f. Well flow signal
    g. Pump start command
    h. Generator fail
    i. Low level alarm
6. Pump room low temperature thermostat.
7. Provide input for magnetic flowmeter instantaneous and pulse input.

9.25 PUMPHOUSE / WELL NO. 4 RTU MODIFICATION

Modify the existing RTU as hereinafter described. RTU shall be located at Pumphouse No. 4. The RTU shall be capable of sending digital input signals to the CTU. Analog input signals are to be converted to 16-bit accuracy digital format for transmission to the central. The RTU shall contain a tone modulator/demodulator (MODEM), micro-processor-based processing unit, A/D converter, and digital input/output isolators and drivers. All connections to the remote shall be through high density type terminal strips. The RTU shall utilize status and alarms from the pump controller and shall be provided with a radio, antenna, and UPS.

1. 24 VDC UPS System.
2. Wireless telemetry Remote Terminal Unit (RTU) specified to transmit/receive the following to the supervisory center:
    a. Pump Run
    b. Pump Fail
    c. Building Low Temperature Alarm
    d. Power failure
    e. Data failure
    f. Well flow signal
    g. Pump start command
    h. Generator fail
    i. Low level alarm
3. Pump room low temperature thermostat.
4. Provide input for magnetic flowmeter instantaneous and pulse input.

9.26 SUPERVISORY CONTROL – CENTRAL TERMINAL UNIT

The central terminal unit (CTU) shall be located in the Service Building of the WWTP and the computer and display shall be located in the room selected by the Owner. The CTU of the SCADA system shall be an Allen-Bradley Compact Logix or approved equal, which consists of multiple printed circuit cards that plug into an industrial style card rack. The CTU shall be of expandable construction with all the cards necessary to process the signals from the specified remotes, but with provisions for expansion. The CTU shall normally sequentially poll all the remotes. Provision shall be included to field-program a time delay between remote terminal unit (RTU) interrogations and between scan sequences.

The CTU shall have provisions to exchange data with a future computer or data logger through an IEEE-488 General Purpose Interface Bus (GPIB),RS-232,or RS-485 bus.

9.26.1 General

The Supervisory Control for the water system is located in a wall mounted NEMA 12 enclosure at the Wastewater Treatment Plant (WWTP). The existing central terminal unit (CTU) shall be modified to accommodate the addition of the Pumphouse No. 5 to the water system and provide alarm notification to the operators for the following:

1. Low water system pressure;
2. Well No. 4 Low Level Alarm;
3. Pumphouse No. 4 Low Temperature Alarm;
4. Pumphouse No. 4 Power Failure;
5. Pumphouse No. 4 RTU Signal Failure;
6. Well No. 5 Low Level Alarm;
7. Pumphouse No. 5 Low Temperature Alarm;
8. Pumphouse No. 5 Power Failure;
9. Pumphouse No. 5 RTU Signal Failure;
10. Pumphouse No. 5 Generator Failure;

9.26.2 Pumphouse No. 4 - Modifications

Reuse the pressure transmitter from service.

9.27 MAGNETIC FLOW METERS

Magnetic flowmeters shall be provided for the following:

- Pumphouse No. 5 - Station Flow Meter, 6-inch diameter;

9.27.1 General

1. The work under this section shall cover furnishing magnetic flowmeter (magmeter) type flow metering systems to monitor flows from the various pumps. The signal converter transmitter associated with the flow meter shall contain a digital rate meter and a digital totalizer. The flowmeter transmitter shall provide a flow proportional 4-20 mA signal to the specified PLC system.
2. The operation and maintenance 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.
3. The manufacturer shall have meters of the DC pulse type in similar flowing mediums for a minimum of 20-years. The manufacturer shall provide an application performance guarantee with submittals.
4. The flowmeter shall be warrantied against defective workmanship or materials for a period of one year from the date of acceptance. The date of acceptance shall be when the installed flowmeter has been started-up, calibrated and accepted for payment.
5. The magmeter shall be hydraulically calibrated at a facility located in the United States and the calibration shall be traceable to the National Institute of Science and Technology (NIST). A computer printout of the actual calibration data giving indicated versus actual flow at a minimum of three flow rates shall be provided with the meter. The accuracy of the magmeter shall be ±1/2 percent rate from 2 percent to 100 percent of meter factory (0.67 fps to 33 fps) without the need for system calibration. The meter shall be factory preset for the calibrated range.
6. The magmeter shall be constructed in a facility operating under a total quality system to provide assurance of product quality. To ensure this, the facility must be certified to be in compliance with the quality requirements of ISO Standard 9001.
7. The flowmeter shall be as manufactured by Krohne, Siemens, ABB, Rosemount or equal.

9.27.2 Meter Body

1. The magmeter shall be of the low frequency electromagnetic induction type and shall produce a pulsed DC signal directly proportional to and linear with the liquid flow rate. The meter shall be designed for operation on 120 VAC ±10 percent, 60 Hz ±5 percent.
2. The metering tube shall be constructed of stainless steel.
3. The magmeter shall be designed to mount directly in the pipe between ANSI Class 150 flanges.
4. The magmeter length-to-diameter dimensional ratio shall be a minimum of 1.5 in order to minimize inaccuracies generated by the effects of inner wall conductivity of adjacent piping.
5. The magmeter shall be housed in a NEMA 6 enclosure and shall be capable of continuous submergence in up to 30 feet of water without damage to the instrument or interruption of the flow measurement.
6. Magmeter shall be lined with Teflon and be supplied with 316 stainless steel electrodes. The use of removable electrodes will not be acceptable.
7. Two orifice plate type stainless steel grounding rings per magmeter shall be required. In order to ensure integrity of the magmeter liner, grounding electrodes which penetrate the liner will not be acceptable.

9.27.3 Signal Converter/Transmitter

1. The signal converter portion of the magmeter shall include both a magnet driver and the converter electronics. The signal converter shall be microprocessor-based. Rate and totalized flow shall be displayed.
2. The converter shall be remotely mounted as shown on the drawings. Necessary length of interconnection cable shall be supplied, **without any splices.**

3. Converters shall be interchangeable without affecting meter accuracy or the need for recalibration for all meter sizes.
4. The converter shall be housed in a NEMA 4X enclosure.
5. The converter shall include a separate customer connection compartment to isolate the electronics from power connections and to protect the electronics from environmental hazards.
6. The converter electronics shall be of the solid state, feedback type, and utilize integrated circuitry.
7. The transmitter circuitry shall be factory set for a low flow cut-off of one percent.
8. The converter shall have input impedance of 1012 Ohms or greater and shall not be affected by quadrature noise. Input and output signals shall be fully isolated.
9. The converter output signal shall be 4 to 20 mA DC into 0 to 750 Ohms and shall be capable of accommodating bi-directional flow. A 50 ms 0-10 Hz scaled output shall be supplied.
10. The converter shall incorporate an integral zero return circuit to provide a constant zero output signal in response to an external dry contact closure to minimize totalizer inaccuracies caused by empty pipe or low flow condition.

9.27.4 Installation

1. Install equipment in accordance with manufacturer's instructions and approved shop drawings.
2. Control wires shall be installed as shown on the drawings and/or the approved shop drawings. The 4-20 mA signal shall be received by ancillary equipment such that this equipment can be operated on a flow proportional basis.
3. The equipment shall be started by a factory-trained representative at the installation site who shall certify to the Engineer that all equipment is properly installed, and the operator has been instructed concerning proper operation and maintenance.

9.28 – AUTOMATIC TELEPHONE DIALER

The unit shall be capable of continuously scanning its own physical input channels plus channels at specific address locations within a variety of Remote I/O (RIO), PLCs, Distributed Control Systems (DCSs) and SCADA systems, using the standard Modbus RTU industrial net-work protocol. Connection for Modbus connected channels shall be via a single serial interface cable. The unit's built-in channels shall be four universal (analog/digital) physical inputs. The unit shall be able to monitor, log events, and take data samples for all channels plus its own primary power source and phone line. For alarms, scheduled reports, and log data file transfers, the unit shall be capable of dialing up to 96 destinations (phone numbers), each up to 60 digits in length, organized by group lists as configured by the user. Destinations types shall include voice telephones, log data collection stations, pagers, and fax machines. Report types shall be configurable, as appropriate for different destination types, to include report items such as alarms, events, configuration changes, and periodically sampled channel data logs. The unit shall also allow incoming calls for the purpose of checking primary power and channel status, making configuration changes, and for retrieving data logs. Incoming calls shall be allowed from voice telephones, and data collection stations. Inquiry and programming calls, if so configured, shall require that users enter their unique 4-digit PIN password in order to proceed in receiving reports or configuring the unit.

The automatic telephone dialer shall communicate via standard wireless or landline telephone networks. The automatic telephone dialer shall be manufactured by RACO or equal.

9.28.1 User Configurable

The unit shall be capable of being configured via a local or remote computer running the dialer software under current version of MS Windows, or alternatively via the system's keyboard, or via a Touch Tone phone, at the user's choice. No reliance on physical jumper or switch settings shall be necessary for configuring the unit. All programming, including speech files shall be capable of being copied, stored, edited, and transferred via the software.

9.28.2 User Flash Memory For Data Logging And User Voice/Text Messages

The unit shall include a minimum of 5 Megabyte of user flash memory to be used both for user recorded voice and text messages and for the data logging file.

9.28.3 Data Logging

Data logging shall be configurable to log, with date/time stamps, events, and periodic data samples. Logged events shall include alarms, acknowledgments, channel state changes, and configuration changes made during front panel and remote operator sessions. The unit shall be able to automatically deliver data logs to destinations configured as faxes, local data logging (LDL) printers and as remote data logging (RDL) computers running generic data collection software. Data logs shall also be retrievable by the computer software. Data logs shall be transferred in the formats of plain text, comma-delimited fields, and comma-delimited key word fields and importable into spreadsheet programs such as Microsoft Excel. The amount of user flash memory reserved for data logging shall be configurable.

The unit shall include a serial printer interface for local data logging. The local printer will automatically print out, with date and time stamp, events, alarms, acknowledgements, programming sessions, inquiry calls, plus data samples at the selected sampling interval.

The unit shall maintain a log of events which can be retrieved, reviewed, and printed at any time locally or remotely via the computer software, and in excess of 1,000 events to be retained.

9.28.4 Voice & Text Message Features

The unit shall be capable of recording and re-recording speech messages in the user's own voice, which shall be stored in permanent non-volatile solid-state user "flash" memory. The unit shall allow these recordings to be made from a remote telephone as well as from a built-in microphone at the front panel.

Total Available Message Recording Time at the "high-fidelity" recording rate setting shall be 24 minutes. These times shall be doubled for the "utility" recording rate setting. The total message recording time may be allocated among the various messages without restriction as to length of any given message, and any given message shall be recordable at either rate for maximum flexibility. Additional user flash memory for additional recording time (and data logs) shall be an orderable option. Recordable message elements shall include at a minimum:

1. Two message segments for each input channel, which may be used for "normal" and "alarm" indications or for two-part analog reports.
2. A separate Station ID message, which is automatically included at the start of each report.
3. A variety of "Tag" words, which are automatically appended to each input channel report, indicating various stages of alarm and acknowledgement for that channel.

In addition to user-recorded messages, the unit shall incorporate:

1. Alternative Generic Default Speech Messages for use when the user elects to not record any or all of the above message types.
2. Provision for user programmable Text Messages corresponding to each of the voice messages, which are automatically substituted for voice messages in any reports directed to text-type destinations such as a computer file, fax report or other printout.

9.28.5 Input Channel Monitoring Function

The unit shall continuously scan all configured 96 input channels on the Modbus serial connection and the four internal physical input channels. The unit shall be capable of monitoring any data register regardless of register type, whether digital, analog, input, output, or status point. Alarm criteria shall be settable as appropriate for different data register type.

1. For digital channels, alarm criteria shall be settable for alarm on 0 raw value, 1 raw value, or alarm never (for status reports only).
2. For analog channels, both a high set point and a low set point alarm criteria shall be settable.

3. All channels shall have settable alarm criteria for alarm on serial communications failure only.

In addition to monitoring the readings of designated input locations, the unit shall be configurable to automatically and continually write the values read at designated input locations into other designated register locations, and to manually write values into register locations from the front panel, via remote telephone or via the computer software.

9.28.6 Alarm Reports to Destination

After the expiration of programmed Alarm Trip Delays, loss of primary power or violation of channel alarm criteria shall cause the unit to go into alarm state and begin dial-outs to destinations configured to receive alarm reports. Upon failure of any communications channel the unit shall enter the Communications Failure alarm state and begin contacting destinations. Selectable Destination types shall include voice telephones, pagers, fax, email, and a locally connectable serial printer. Destination - Channel grouping shall be programmable to designate which destinations are to receive calls and reports initiated by which input channels. Each Destination shall be independently configurable as to which categories of reports are to be delivered to that destination.

The unit shall be capable of making multiple repeat calls to a busy or non-answered phone number before moving on to the next phone number.

9.28.7 Phone Line Testing

Phone line testing shall be programmable to test the unit's phone line at regular intervals and to provide local indication if there should ever be a failure of the phone line.

9.28.8 Alarm Acknowledgement

Alarm report calls shall continue at programmed intervals indefinitely until acknowledged. Acknowledgement of an alarm phone call shall be accomplished by pressing a Touch Tone "9" as the alarm call is being received, and if so configured, by returning a phone call to the unit after having received an alarm call, or via the front panel keypad.

9.28.9 Diagnostics

The unit shall be capable of executing user commands for diagnostics on the Modbus RTU network to determine the health of the network. The unit shall inform the user of the length of scan time for the set of all configured channels on the network.

9.28.10 Primary Power and Battery Backup

Normal primary power shall be either 105-135 VAC, 15 watts nominal, or 12 VDC at 900 mA maximum. The unit shall contain its own sealed lead acid rechargeable battery that is automatically kept charged when primary power is present. The system shall be capable of operating on battery power for a minimum of 10 continuous hours in the event of primary power failure. The built-in charger shall be a precision voltage controlled, +/- 1%, not a "trickle charger," in order to minimize recharge time and maximize battery life available.

9.28.11 Phone Line and FCC Approvals

The unit is to use a standard rotary pulse or Touch Tone "dial-up" phone line and is to be FCC Part 68 approved with a valid registration number. Connection to the telephone is through a standard modular jack (RJ-11).

9.28.12 Pin Security Protection

The unit shall incorporate four separate levels of PIN password protection:

1. Read (inquiry) only
2. Acknowledge
3. Change Configuration Settings
4. Administrator

9.28.13 Integral Surge Protection

All power, phone line and discrete physical 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). Protectors mounted external to the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

9.28.14 Warranty

The unit shall be covered by a five (5) year warranty covering parts and labor performed at the Factory.

9.28.15 Memory Upgrades And Remotely Downloadable Modifications

The unit shall permit expansion of memory capacity via available plug-in memory modules. Firmware upgrades shall be possible from remote computer locations without the need to travel to the unit's location, as well as at the unit's location via serial port connection if so desired.

9.28.16 Appurtenances

All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED's shall indicate normal operation, program mode, phone call in progress, status for each channel or group of channels, AC power failure, and low power, discharging or recharging battery, and disarmed state. On any Inquiry telephone call or on-site status check, the voice shall provide specific warning if no destinations are configured, if the unit is in the "alarm disable" mode, or if AC power is off or has been off since the last report.

9.29 – COMPUTER SYSTEM

The intent of this specification is to provide a fully integrated PC based SCADA system. The system shall consist of computer hardware, networking hardware, and any software necessary to provide a fully integrated and functional SCADA solution. The configuration of the specified SCADA system shall be by the System Integrator, sub-contracting the configuration services will not be allowed. Programing to use WIN 911.

9.29.1 Operator Interface, Maintenance, And Reporting

The supervisory system shall consist of an operator interface software (OIS) system that includes support for process supervisory control, data acquisition, alarming, historical data collection and trending, maintenance, and report generation. It shall be based on the concept of a fourth-generation object-based graphics and object based development. The software shall have an open architecture that allows the system to run in a multitasking environment with support for on-line, DDE and OPC communications with other applications such as expert systems, spreadsheets, database programs, and communication interface products. This on-line DDE and OPC shall be possible with applications running on the local node as well as with other nodes running on a network including distributed alarming and distributed historical trending.

The system shall have the built-in flexibility to permit easy configuration of the system in accordance with the specific objectives of the end user as well as quick and easy modification of the end application by the user in the field. The system shall have the capability to interface with relational databases that have a SQL interface and shall also provide support for ActiveX controls by acting as an ActiveX container. The system shall have the ability to be run as a service under the current Microsoft Windows operating system compatible with Aveva InTouch.

9.29.2 Graphical Displays

Operator interface graphics shall be configured on hierarchical basis with a logical progression of graphics. Approximately 15 graphic displays will be required. As a minimum the following graphics shall be provided:

1. System overview (Town map with the RTU locations shown) and graphic for each lift station and flow meter station. The system overview shall be expandable in the future for the water system and stormwater facilities.
2. Control graphics shall be provided for each area graphic
3. Alarm system interface control graphics shall be developed which allow the user to disable alarm points from causing the auto-dialer to call out specific alarms.

9.29.3 User Interface

The operator shall be able to access displays via a pointing device and/or soft key menus with a choice of function keys, cursor control keys, or any key on the keyboard. Supported pointing devices shall include a mouse, or touchscreen. The system shall support operator access to multiple displays at one time, including split screens where the operator may view more than one process area at a time. The system shall support unlimited use of pop-up displays for additional help or diagnostic information.

Access to all displays and to all command functions shall be based on the operator's security level to protect against unauthorized use. The security level shall be established during the operator sign-on procedure. Security applied to graphical set point screens is not acceptable. Visibility and operation of command buttons, symbols, and other items shall be controllable based upon the operator's security level.

The operator shall be able to have access to context sensitive help at any time during operation of the system. The system shall support distributed access through the alarm, historical and tag name database modules as well as application development and transfer across a network. The system shall be able to access tags, which are defined locally, as well as tags defined on a server. The system shall be able to provide an easy way to connect to OPC compliant servers. The system shall also provide the support of Value, Time and Quality information for I/O points defined in the system. An operator shall be able to control a discrete point using an action command button. This control includes momentary on, momentary off, toggle on off, set, and reset. The operator shall be able to use command buttons to adjust set points up and down on a percentage or absolute basis. Each request for an increase or decrease shall be evaluated against valid operating limits before allowing the adjustment. Control of individual set points shall be enabled based upon a user's security level and password.

9.29.4 Display Capability

The system shall have a graphical display. The system shall allow the user to view animated graphics for process templates including wet wells and pumps. This includes the following:

1. Percentage fill of the object including irregular shapes such as polygons, ellipses, etc.
2. Color Change of the object. Up to 16.7 million colors.
3. Blinking of the object based upon any alarm in the system or upon a designated group of alarms.
4. Each object shall have a visibility attribute option allowing for visibility of the object based upon a condition in the system.
5. The system shall support animation of objects via resizing, moving, and/or rotating objects based upon a change in a process variable.

6. Objects shall be animated based upon any user-defined criteria made up of other Tag-names in the system. This includes the use of expressions containing all mathematical functions and the status of analog and discrete values in the system.
7. Objects shall be able to blink or change color by evaluating any of the 32 bits in an analog register. Up to 16.7 million colors shall be possible.

The system shall support the capability for the operator to view scanned images from desktop or handheld scanners. It shall be possible to animate these images to show a color change based on the status of process operations including alarm or normal state. The system shall support internally as well as third-party developed pre-animated graphical objects, including ActiveX controls.

System shall support use of true-type scalable fonts that may be scaled according to the desired size of the text. Text shall rotate at 90-degree increments. The fonts shall be loaded by the operating system. The user may choose from up to 16.7 million different text colors. Text shall be able to blink based upon any user definable condition occurring in the system such as an alarm on a particular set point, alarm on any value in a process group, or based on the actual value of a process variable. The system shall display process values based upon the security level of the user. Text shall be able to be made visible or invisible based upon an alarm condition in the process or any other state change in the system.

9.29.5 Alarms/Events

The system shall have alarm display capabilities as follows:

1. System shall support displaying of alarms on any display as a user defined sizable object, which may be placed by itself or along with other objects in a window. It shall be possible to scroll forward or backward, page up or down through the alarm displays by depressing command buttons. Current Alarms shall be available as an Alarm Summary Object and a chronological summary of Alarms shall be available as an Alarm History object.
2. The system shall support an unlimited number of alarm displays.
3. Alarms shall be color coded according to the state and priority of the alarm including an acknowledged alarm, unacknowledged alarm, and an alarm that has returned to normal but is not yet acknowledged. The user shall be able to choose from 16.7 million different colors for display of each of these alarm states. The alarm display object may also support event display with the color used for events also being one of the 16.7 million different colors.
4. It shall be possible to configure the system such that the operator is notified of an alarm no matter what display he or she is currently viewing. Notification shall include the option of a pop-up alarm display window, a flashing process symbol such as a process vessel, an alarm text message that is available on each display, or a dedicated alarm display window on the screen.
5. The user shall be able to display alarms on an individual or a group basis, with support for 16 groups each having up to16 sub-groups. The alarm hierarchy shall be capable of being nested up to 8 levels deep.
6. It shall be possible to inform the operator of an alarm condition via an audible tone, a pop-up display, or any combination of animation types on the screen. Alarm acknowledgment may be performed on all alarms, alarms in a single group, alarms in a collection of groups defined in an alarm group hierarchy or on a point-by-point basis.

Alarms shall be logged to a file for future viewing or review of alarm history data. The user shall have the capability to review the file for cause and event analysis. The alarms that are logged shall be configurable.

Alarms shall be capable of being printed to a printer using either a serial or parallel interface. The format of the alarm printout shall be configurable.

Events shall be logged for review by the operator, engineering, or management personnel. The system shall log each new operator log-on and whenever an operator changes a set point or turns any device on or off. Each time the event log records an event it will record the operator logged in and the type of action taken along with a date and time stamp.

9.29.6 Application Control Logic

The system shall have the ability to execute user-defined logic scripts. Logic scripts shall be created in a statement-based programming environment similar to Microsoft Visual Basic for Applications. System logic shall be able to automatically perform functions such as increase set points, perform totalization, and check the status of process set points to take action. System logic shall be able to control and start other application programs running in the multitasking environment, and shall be able to contain locally defined variables that are script specific. System Logic shall be able to use methods and properties of any ActiveX controls used in the application, and the architecture shall be such that user-defined functions can be created, passed parameters and also return values. These user-defined functions shall be usable directly from animation links as well as within other system logic.

9.29.7 Application Builder Capablities

Graphics development tools shall allow the creation of filled rectangles, circles/ellipses, polygons, and arcs. All display elements such as real time and historical trends, alarm summary displays, images, shall be configurable objects with the capability to be placed in any window in any configuration. The graphic drawing system shall be object-oriented. The user shall have the capability to arrange graphic objects based on standard drawing procedures.

A Graphics editor shall allow layering of objects to activate specific objects based upon conditions in the process. Graphics development tools shall allow object placement via a “snap-to-grid” feature with configurable grid spacing. The system shall support a library of “self-configuring” objects that change properties based on dialog box entries made by the configuration. For example, consider a standard set point loader object that has a graduated scale and a default range of 0 to 100.0. The system shall support the import of .DXF files with the drawing elements imported as native objects. It shall be possible to animate these objects using the full set of object animation properties.

The graphics editor shall also allow the user to import drawings and images in .BMP, .JPG, .PCX, and .TGA file formats. Colors contained in the imported images shall be able to be made transparent. The graphics editor shall allow the user to “grab” a color off an image and place that color in a customized color palette. The ability to import custom color palettes shall also be supported. The graphics editor shall also allow the user to edit colors.

Animated graphic objects or process symbols shall copy from one window or display to another with all of their animation characteristics retained, thereby eliminating duplication of effort. The user shall have the capability to add Tag-name database items while building a display without exiting the graphics editor. The user shall be able to configure graphic screens while the system is monitoring the process.

The user shall have the capability to edit Tag-name items and add new Tag-names while the system is running the process. It shall be possible to import and export the entire database in *.csv format for import and subsequent editing to a spreadsheet such as MS Excel.

A built-in script or Visual Basic editor shall be provided for the development of logic scripts. The editor shall be a full-featured editor with single keystroke entry of Tag-names, logic constructs and script functions. When a script function is placed in the editing window any arguments necessary for the script function to operate shall be automatically pasted into the window. On-line help shall be provided for all script and code functions. The user shall be able to configure and edit logic scripts while the system is monitoring the process.

The development environment shall provide a hierarchical graphical view of the application being developed. This view shall show and provide easy access to items configured in the application. These items shall include a window list, script access, configuration information, Tag-name Database access and access to SPC Pro, SQL Access Manager and Recipe Manager. The view shall also provide, in a Windows operating system, the ability to launch any other component or Windows program.

9.29.8 Real-Time And Historical Logging

Real-Time trend displays shall support up to 16 trend pens and unlimited trend windows per display. Real-Time time trend displays shall able to continue to update regardless of whether the operator is currently viewing the trend window, and shall support the use of expressions of Tag-names including add, multiply, divide, to permit proper scaling of variables.

Historical trend display shall allow the user to zoom in and out in time from 1 second up to 6 weeks in one display. It shall be possible to activate the zoom-in and zoom-out features using action scripted command buttons available to the operator. The operator shall have the capability to pan backward and forward in time to view historically logged data. The operator shall have the capability to print out historically trended information in the form of a printed record for documentation purposes. Historical trend display should also allow the user to read and plot data from an external History Provider. Historically collected data shall be available to be exported to a spreadsheet or database format using ODBC and SQL for analysis and additional reports.

9.29.9 System Protection

The system shall be protected to prevent unauthorized actions on the system or accidental damage to the system. The following minimum required system protection capabilities shall be provided:

1. Foreground Program Switching - It shall be possible to configure the run-time system so as to prevent the operator from obtaining direct access to foreground program switching by disabling certain keys in the system. Only the foreground program switching shall be accessible to the operator.
2. File Menu Access - It shall be possible to configure the run-time system so as to prevent the operator from obtaining direct access to the File Menu or any other direct ability to open and close files outside of the desired built-in capabilities of the final operator interface application.
3. System Level Interface - It shall be possible to provide password protection on a moveable mask that can cover the entire system level graphical user interface, including the operating system title bars, and menu bars such that only authorized personnel would have access to this level of control.

It shall be possible to also disable the Microsoft Windows key sequences <CTRL><ESC> and <ALT><TAB> to prevent unauthorized access to applications outside of the operator interface application environment. It shall also be possible to disable the <CTRL><ALT><DELETE> reset function of the PC.

9.29.10 Operator Log-on

It shall be possible to assign each operator a log-on password that defines a unique access level, thereby limiting access to various command functions based on the operator's access level. It shall be possible to log each operator's actions for later review. It shall be possible to define an inactive time span between operator actions on the system, requiring the operator to log on again with his password. This capability is useful in preventing unauthorized access to the operator interface system while an operator is away from his station performing other duties.

9.29.11 Terminal Services Support

The software shall be available in a terminal services edition. Terminal services architectures permit centralized deployment, maintenance, and management of software, high levels of security, and client support for multiple operating systems including MS Windows, Linux, and UNIX.

9.29.12 Redundancy

Software shall allow incorporating a combination of backup SCADA servers, LAN redundancy, and instructions for monitoring and controlling the network using built in functions. Database synchronizations and alarm synchronizations shall be standard.

9.29.13 Web Server Technology

HMI software manufacturer specified herein shall also offer a web server solution should the end user wish to connect the HMI system to the internet in the future.

9.29.14 Manufacturer

Software shall be current version with development capabilities and unlimited I/O count. Software shall be Intouch by Wonderware or equal.

9.29.15 Reporting Software

A Process Data Analysis and Reporting software application shall be provided to manage data that is acquired in the facility. The real-time historical database associated with the application shall be a date and time-stamped database that allows easy storage of both manually input and real-time data that is collected in a facility. The application shall allow reporting, trending and analysis of data collected in a facility. The software system shall be designed for multiple users to access data over the local or wide area network.

The data management application shall include the following minimum functions:

- manual data input
- data import and export
- report display/generation
- daily report display/generation
- weekly report display/generation
- monthly report display/generation
- quarterly report display/generation
- report save/edit features
- multiple page group report assignment
- trend/X-Y plotting in 2 and 3 dimensions
- data analysis
- raw data browse
- system setup

Real-time data shall be directly imported into the data management application from the process control system. The data management application shall be fully developed and provide for all data input screens and report printout. It shall automatically acquire all equipment runtime and equipment cycle data on an hourly basis. Data input screens shall be provided for all data that is not automatically collected.

Software shall be installed pre-configured with regulatory and process variables. Program CD or Flash-drive and documents for all software programs shall be supplied and operator training as specified. The system shall be "user friendly" using standard Windows conventions. The system will store data and provide reports and graphs for analysis and control. Simple back-up routines shall be available.

9.30 – DESKTOP COMPUTER SYSTEM FOR SCADA

Provide a desktop computer workstation with accessories, programs, and required appurtenances in the control room of the City WWTP to monitor the CTU and display the SCADA system.

A. Manufacturer: Dell Precision Workstation 3000 Series, or equal.

B. Computer Hardware:
   1. Processor: 3.4GHz Intel Xeon E-2124G
   2. Memory: 32GB DDR4-2666 MHz
   3. Hard drive: 1TB PCIe SSD
   4. Graphics Card: Nvidia Quadro P2000
   5. Monitor: Dell 24-inch P2422H
   6. Keyboard: Dell Standard Wired Keyboard
   7. Mouse: Dell Standard Wired Mouse
   8. Network Card: Integrated Gigabit NIC
   9. Sound Card: Integrated
   10. Speakers: Monitor Integrated

C. Computer Software:
   1. Operating System: Microsoft Windows 11 Professional
   2. Business Software: Microsoft Office 2021 Professional
   3. Adobe Acrobat Standard 2020
   4. Security Software: Webroot Business Endpoint Protection

D. Accessories:
   1. Power cord
   2. Modem/Ethernet cord
   3. NIC cord
   4. UPS
   5. HP color laser jet printer
   6. 3-year on-site service

SECTION X
SPECIAL PROVISIONS - WATERMAIN
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MINNESOTA

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SECTION X – SPECIAL PROVISIONS

SECTION 10.1.0 – SCOPE

The City of Adams, Minnesota, Watermain Improvements portion of the overall Project is meant to upgrade and replace sections of watermain in the city. The Section of watermain that will be replaced down Tenth Street is 8-inch diameter PVC watermain that has had multiple breaks over the last 30-years. This section will be replaced with 8-inch PVC C900 DR18 watermain. The next section of watermain being replaced is along STH 56, under the Little Cedar River. This section of pipe is currently an undersized 4-inch diameter pipe, that was constructed in the 1960s and it will be replaced with 8-inch fused C900 DR18 PVC pipe that will be directionally drilled under the river.

This Specification Section describes the unit cost line items outlined in Proposal #4 – Watermain Improvements.

SECTION 10.2.0 - EROSION CONTROL

The Contractor shall comply with Minnesota Department of Transportation Standard Specifications for Construction, Volume 2, Section 2573 Storm Water Management and applicable federal, state, and local laws, rules, regulations including but not limited to those relating to ground water quality protection, safety, spills, waterway impacts, waste disposal, and wastewater disposal.

Install and maintain erosion control practices in accordance with Chapter 2.8 of the General Work Provisions. All erosion control measures shall be in place before the start of construction and shall be properly maintained throughout the construction period.

Erosion control includes controlling fugitive dust caused by wind erosion. Any costs for necessary watering shall be included in the bid item for Erosion Control. Streets outside of the construction areas shall be kept clean by sweeping.

Bid items are provided for Inlet Protection, Silt Fence and Erosion Control Management. All other erosion control work is incidental, including protecting existing storm inlets before their removal.

SECTION 10.3.0 - TRAFFIC CONTROL AND ROADWAY MAINTENANCE

Prior to commencing construction, Contractor shall install temporary traffic control and detour signing as shown on the plans and in accordance with Minnesota Manual on Uniform Traffic Control Devices (Mn MUTCD). The Contractor shall coordinate placement of traffic control signing with the Mower County Highway Department and MnDOT.

No work shall commence until the appropriate traffic control devices have been placed in accordance with Project requirements. All Traffic Control Signage and restrictions shall be erected and posted 24 hours before beginning construction operations. When not in use, all traffic control devices shall be removed or covered so as not to be visible to traffic. Traffic control devices shall be in acceptable condition when first erected on the project and shall be maintained throughout the construction period. All unacceptable traffic control devices shall be replaced within 24 hours. All construction warning signs shall be removed within seven calendar days after substantial completion of each street. Traffic Control work includes, but is not limited to:

A. Furnishing, installing, and maintaining necessary temporary barricades, detour signing and related materials.

B. Coordinate with the City, Mower County Highway Department, and DOT as necessary during the construction period.

C. Coordinating access with residents during construction. This includes providing temporary access drives with aggregate base course.

Contractor shall provide all labor and appropriate equipment to close the right shoulder of STH 56 to allow access for through traffic, local traffic and emergency vehicles. Tenth Street will be closed during construction, but emergency access must be provided at all times and the street must be open at the end of each construction day. Traffic control signage shall be in place prior to beginning construction.

The Contractor shall perform a site review of the project area daily and execute necessary maintenance before leaving the job site for weekends. The Contractor shall also perform weekend maintenance due to rain washouts or other causes, as required. All labor and costs for traffic control and roadway maintenance shall be included in the pay item Traffic Control.

The costs for salvaging and re-installing all existing traffic signs shall be included with the Lump Sum bid for Traffic Control.

The costs for salvaging and re-installing all existing Mailboxes shall be included with the Lump Sum bid for Traffic Control.

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SECTION 10.4.0 – WATERMAIN WORK

10.4.1 SCOPE

Work includes installing new watermain, maintaining continuous water service, installation of new valves, providing new water services, and abandoning existing mains. Refer to Standard Specification Section VIII Construction Water Systems.

10.4.2 MATERIALS

Water main – C900 SDR 18 PVC, CL 52 DIP
Special Gaskets – Viton, Fluorel (FKM) Fluorocarbon Gasket (or approved equal)
Water Services – Type K Copper meeting requirements of 3.13.0
Service Saddles –Smith-Blair 372 for 1”, 1-1/4”, 1-1/2” and 2”.
Hydrants – Waterous Pacer WB-67
Gate Valves – Clow F-6100, American Flow Control 2500, Mueller Co. A2370 Series or approved equal.
Curb Stop & Box – Mueller H-10314 or H-10386 or approved equal.
Corporation Stop – Mueller H-15008 or H-15023 or approved equal.
Tracer Wire - Shall Meet CEAM Specification for Construction 2611.2 I

10.4.3 SERVICES

All the cost for saddles are incidental to the corporation installation.

Live Services within the excavation shall be replaced. Existing water services which are judged by the engineer and property owner to be acceptable condition may be left in service by making the reconnection as close to the new main as possible. If the existing water service is to be replaced it shall be replaced for the full length with a minimum size of 1” (Type K copper) and reconnected to the new main. Use approved reducer fitting at Curb Stop/Box for connections to existing smaller diameter service pipe. The Bid quantities are based on replacing the entire water service from the main to the property line, and payment will be the contract unit price for each reconnection to existing water. Continuous water service must be maintained. Coordinate existing service and new service locations with City utility staff.

10.4.4 UNSATISFACTORY SUBGRADE

Removal and replacement of Unsatisfactory Subgrade material encountered within the pipe Foundation, Bedding, Haunching and Initial Backfill is included in pipe cost. Unsatisfactory Subgrade below the pipe bedding is paid by the Unsatisfactory Subgrade bid item under Water. Unsatisfactory Subgrade outside the pipe zone is paid by the Unsatisfactory Subgrade bid item under Streets. Remove and replace in accordance with Section 2.2.12 and 2.2.13. At the end of each workday when replacement material has been installed, deliver a load ticket to the Engineer for each load furnished and installed.

10.4.5 DENSITY TESTS

Utility Trenches – One density test for every 200 lineal feet of trench per two-foot depth of fill.

The Engineer will determine locations and depths for the tests. Excavate and backfill the holes at no additional cost to the Owner. Repair of failed tests are incidental to sewer installation. All costs for density testing of trench backfill shall be included in the unit price bid.

10.4.6 DEWATERING

All costs for dewatering are incidental.

10.4.7 TRACER WIRE

All cost for tracer wire is incidental to the installation of the Watermain.

A. Tracer Wire Locator/Access Boxes

Payment will be at contract unit price for each tracer wire locator/access box.

B. Magnesium Grounding Anodes

Payment will be at contract price for each magnesium grounding anode. The payment is full compensation for the supply of 20 feet of 14 red HDPE insulated copper clad steel wire, installing anode and connecting to tracer wire.

10.4.8 CONTINUOUS WATER SERVICE

The Contractor shall maintain continuous water service throughout the construction period, with all costs incidental to the watermain construction Bid Items. All new watermains must be pressure tested and disinfected, followed by two safe water sample tests, prior to connecting to the existing water distribution system. The Contractor shall review their proposed means of providing temporary water service with the Engineer prior to start of construction operations.

SECTION 10.5.0 – STREET RESTORATION

10.5.1 SPECIFICATIONS

The MnDOT Pavement Design Manual, current edition (and supplements thereto) shall be the basis for roadway construction except as modified herein.

10.5.2 MATERIALS

Aggregate Base shall be per MnDOT Standard Specifications for Construction Section 3138.

Hot Mix Asphalt (HMA) shall be PG 58S-28 per MnDOT PG Binder Guidelines-MSCR.
Prior to placing the next lift of HMA, a tack coat shall be applied at a rate of 0.05 gal/sy and applied per Minnesota Standard Specifications for Construction Section 2357 Bituminous Tack Coat.

10.5.3 DOCUMENTATION AND PAYMENT FOR MATERIALS DELIVERED

For materials being quantified by weight, each load ticket shall show the gross loaded carrier weight, the tare, and the net weight of the material being delivered. Load tickets shall be delivered to the Engineer at the end of each workday. The quantity of materials for pay estimates will be based on the load tickets received.

Load tickets will be required for the following materials:

Aggregate Base and Breaker Rock – scaled weight
Hot Mix Asphalt Pavement – scaled weight
Topsoil Borrow – Load ticket, loose truck volume
Unsatisfactory Subgrade – Load ticket, loose truck measure, removed

10.5.4 REMOVALS

Removal work associated with the Contract shall be in accordance with MnDOT Standard Specifications for Construction Section 2104, except as modified herein. All Items designated for removal on the project plans shall become property of the Contractor and shall be hauled away and disposed of off-site. Items designated for salvage shall be delivered to the City shop. Removals of asphalt pavement and concrete curb & gutter shall be initiated with a sawcut. All

costs for sawcuts to remove concrete curb & gutter shall be included in the unit price bid for the Remove Concrete Curb & Gutter Bid Item.

10.5.5 EXCAVATION

After the utility work and designated removals are completed, the street shall be excavated to the subgrade indicated on the typical section. Excavated granular material shall be salvaged & stockpiled for use as backfill behind curbs. Stockpile sites shall be within the City Limits. Unsuitable excavated materials shall be disposed off-site. The plan quantity shall be the basis of payment at the Contract Unit Price Bid for Excavation.

10.5.6 UNSATISFACTORY SUBGRADE

All removal and replacement of Unsatisfactory Subgrade outside the pipe zone is paid under the Watermain Unsatisfactory Subgrade bid item. Remove in accordance with Section 2.2.12 and 2.2.13.

Removal and replacement of the peat and overlying clay will be paid as Unsatisfactory Subgrade. At the end of each workday when replacement material has been installed, deliver a load ticket to the Engineer for each load furnished and installed.

10.5.7 AGGREGATE BASE AND COMPACTION

All costs for Aggregate Base shall be paid at the Contract Unit Price bid per ton.

A. Aggregate Base. Aggregate Base material shall be placed per MnDOT Standards Specifications for Construction Section 2211. Material shall be compacted to 98 percent of Standard Proctor density. The Contractor shall complete moisture testing of aggregate base material (delivered or placed) and when directed by the Engineer to verify aggregate is within 2% of optimum moisture. The Contractor shall scarify and water aggregate base as necessary to comply with optimum moisture requirement. Density testing is incidental.

The total aggregate base compacted thickness is 9”. The cost for placement and compaction of the aggregate base shall be paid at the Contract unit price per ton bid for Aggregate Base.

The Contractor shall water the aggregate base surface as necessary to control dust until HMA is placed.

B. Breaker Rock - Refer to Section 3.27.0

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10.5.8 CONCRETE PAVEMENT, CURB & GUTTER, SIDEWALK, AND DRIVEWAYS

Refer to Section 3.23.0 Ready-Mixed Concrete.

Concrete Pavement and Driveway shall conform to MnDOT Standards for Construction 2461.

Concrete curb and gutter work (Type B624) shall conform to MnDOT Standards for Construction 2461. The concrete curb and gutter may be placed with a curb and gutter machine or with hand forms. Concrete sidewalk shall conform to MnDOT Standards for Construction 2461. Removal and replacement of existing steps to adjoining property within the street right of way is incidental.

All concrete pavement, curb & gutter, sidewalk, and driveways shall be placed with approved mechanical vibration techniques.

Concrete pedestrian ramps with detectable warning panels shall be in compliance with plan details and current requirements of the American Disability Act (ADA), which is further clarified in the Public Rights of-Way Accessibility Guidelines (PROWAG).

The Contractor shall be solely responsible for protecting all new concrete from damage, including but not limited to vandalism, stormwater runoff erosion, settling, deicers and cracking. All damaged sections identified within eight months of Substantial Completion shall be removed and replaced at the Contractor’s expense.

10.5.9 HOT MIX ASPHALT PAVEMENT (HMA)

A. General. Place 4" HMA in 2 lifts, 2" and 2". Finished pavement shall have a ¼ inch lip above the concrete pavement surface, gutter, and manholes, inlets, and water valve castings.

B. Installation. The paving subcontractor shall perform the final shaping of the aggregate base course. Asphaltic pavement shall be installed using the two-pass method. Construction shall follow the requirements of MnDOT Standards for Construction 2360.

C. Sawcut full depth all pavement surfaces to be matched. A bid item for saw cutting is provided.

D. All costs for HMA pavement shall be at the unit price bid per ton.

10.5.10 ADJUSTING STRUCTURES**.**

Manhole castings and valve box covers shall be adjusted to finish surface grade after completion of the HMA base. It is the Contractor's responsibility to accurately record locations of manholes and valve boxes for subsequent surface adjustments. The removal of HMA pavement above the manhole opening shall be initiated with a sawcut. All costs for adjusting structures are incidental.

10.5.11 RESTORATION

A. Lawn Restoration. Reuse salvaged and stockpiled topsoil first. If necessary, furnish and install topsoil from an approved borrow source over all disturbed areas. Minimum finished thickness shall be four inches. A bid item for topsoil borrow is provided. Topsoil borrow shall be measured by the cubic yard, loose volume.

B. Lawn restoration shall be Type C per Section 2.5.4.

C. The Contractor shall maintain the lawn areas until a sustained catch of grass is achieved.

10.5.12 Storm Water Intake

The Storm Water Intake located on HWY 56 shall be removed and reinstalled. Pipe, grouting of pipe collar, and final adjustment to the structure are incidental and shall be included in the Remove and Reinstall Storm Sewer/Inlet price.

SECTION 10.6.0 - HORIZONTAL DIRECTIONAL DRILLING OF FUSIBLE PVC PIPE

10.6.1 SCOPE

This section specifies fusible polyvinyl chloride (PVC) pipe, including standards for dimensionality, testing, quality, acceptable fusion practice, safe handling, storage and installation of the pipe by horizontal directional drilling, directional boring, or guided boring.

10.6.2 REQUIREMENTS

Contractor shall provide fusible polyvinyl chloride (PVC) pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this Section for installation by horizontal directional drilling, directional boring, or guided boring.

Contractor shall be responsible for all installation processes and procedures associated with the installation by horizontal directional drilling, directional boring, or guided boring in accordance with this specification. Contractor will be paid for the directional drill by contract unit price from fitting to fitting. The Entry and Exist pipe will be incidental to the directional drill.

10.6.3 PIPE DESCRIPTION

Pipe Supplier shall furnish fusible polyvinyl chloride (PVC) pipe conforming to all standards and procedures, and meeting all testing and material properties as described in this specification.

Pipe shall conform to the following dimensions and designations:

- Nominal Diameter (in): 8
- Dimension Ratio: 18
- Pressure Rating (psi): 235
- Required Inside Diameter (in): 7.98

10.6.4 QUALITY ASSURANCE

A. MANUFACTURER REQUIREMENTS

All piping shall be made from PVC compound having a minimum cell classification of 12454 per ASTM D1784.

B. FUSION TECHNICIAN REQUIREMENTS

Fusion technician shall be qualified by the pipe supplier to install fusible polyvinyl chloride (PVC) pipe of the type(s) and size(s) being used. Qualification shall be current as of the actual date of fusion performance on the project.

C. SPECIFIED FUSION PROCESS AND PIPE SUPPLIERS

The pipe fusion joining process shall be that of Underground Solutions, Inc., Poway, CA, Patent No. 6,982,051 or Equal.

The pipe manufacturers shall be fully experienced, reputable, and qualified in the manufacture of fusible polyvinyl chloride (PVC) products for Underground Solutions, Inc., Poway, CA, or Equal. Fusible polyvinyl chloride (PVC) pipe marking shall include either Fusible PVC®, Fusible C-900®, or FPVC®.

D. WARRANTY

The pipe shall be warranted for one year per the pipe supplier's standard terms.

In addition to the standard pipe warranty, the fusion services shall be warranted for one year per the fusion service provider's standard terms.

E. PRE-CONSTRUCTION SUBMITTALS

The following PRODUCT DATA is required from the pipe supplier and/or fusion provider:

a. Pipe Size
b. Dimensionality
c. Pressure Class or Pressure Rating per applicable standard
d. Color
e. Recommended Minimum Bending Radius
f. Recommended Maximum Safe Pull Force
g. Fusion technician qualification indicating conformance with this specification

The following WORK PLAN AND INFORMATION is required from the contractor and/or horizontal directional drilling Contractor. This WORK PLAN AND INFORMATION shall also be supplied to the pipe supplier upon request:

a. Work plan shall include for each HDD installation any excavation locations and dimensions, interfering utilities, bore dimensions and locations including bend radii used, and traffic control schematics.
b. A project safety and contingency plan which shall include but shall not be limited to drilling fluid containment and cleanup procedures, equipment and plan for compromised utility installations including electrical and power lines, water, wastewater and any other subsurface utility in the area.
c. An HDD schedule identifying daily work hours and working dates for each installation.

F. POST CONSTRUCTION SUBMITTALS

The following is required from the contractor and/or fusion provider to the owner or pipe supplier upon request:

a. Approved datalogger device reports
b. Fusion joint documentation containing the following information:
c. Pipe Size (Diameter) and Wall Thickness
d. Fusion Machine Size (Make & Model Number)
e. Fusion Technician Identification
f. Job Identification (Name, location & project number)
g. Fusion Joint Number
h. Fusion, Heating, Cool Down and Drag Pressure Settings
i. Heat Plate Temperature
j. Time Stamp
k. Fusion Heating and Cool Down Time
l. Ambient Temperature and Weather Conditions

As-recorded Information

a. The as-recorded plan and profile will reflect the actual installed alignment, and reflect the horizontal offset from the baseline and depth of cover.
b. All fittings, valves, or other appurtenances will also be referenced and shown.
c. A daily project log, along with tracking log sheets, should they be used, shall be provided. Tracking log sheet data, should it be employed, shall include all that apply, including inclination, depth, azimuth, and hydraulic pull-back and rotational force measured.

10.6.5 PRODUCTS

A. FUSIBLE POLYVINYL CHLORIDE (PVC) PIPE FOR WASTEWATER

1) Fusible polyvinyl chloride (PVC) pipe shall conform to AWWA C900, ASTM D2241 or ASTM D1785, as applicable. Testing shall be in accordance with the test methods provided or referenced in the applicable pipe standard.

2) Fusible polyvinyl chloride (PVC) pipe shall be extruded with plain ends. The ends shall be square to the pipe and without any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe unless specified for connections with appurtenances or for connections at the fusible pipeline termination locations.

3) Fusible polyvinyl chloride (PVC) pipe shall be manufactured in a standard 40'or 45' nominal length, or custom lengths as specified.

4) Fusible polyvinyl chloride (PVC) pipe for potable water use shall be blue in color.

5) Marking on the pipe shall include:
   a. Pipe size (nominal diameter)
   b. PVC
   c. Pipe Dimension Ratio (DR), Standard Dimension Ratio (SDR), or Schedule (SCH)
   d. AWWA pressure class, or ASTM pressure rating, as applicable,
   e. Designation of the applicable AWWA or ASTM standard, (e.g., "AWWA C900")
   f. Extrusion production-record code
   g. Trademark or trade name
   h. Cell Classification 12454 and/or PVC material designation code 1120 may also be included

6) Pipe shall be homogeneous throughout and be free of visible cracks, holes, foreign material, blisters, or other visible deleterious faults.

B. FUSION JOINTS

1) Unless otherwise specified, fusible polyvinyl chloride (PVC) pipe lengths shall be assembled in the field with butt-fused joints. The Contractor shall follow the pipe supplier's written guidelines for this procedure. All fusion joints shall be completed as described in this specification.

C. CONNECTIONS AND FITTINGS

1) DUCTILE IRON MECHANICAL AND FLANGED FITTINGS

Acceptable fittings for use with fusible polyvinyl chloride (PVC) pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10, or AWWA/ANSI C153/A21.53 and AWWA/ANSI C111/A21.11.

a. Connections to fusible polyvinyl chloride (PVC) pipe may be made using a restrained or non-restrained retainer gland product for PVC pipe, as well as for MJ or flanged fittings.
b. Ductile iron fittings shall be restrained with the use of thrust blocking or other means as indicated in the construction documents.
c. Ductile iron fittings and glands must be installed per the manufacturer's guidelines.

2) PVC GASKETED, PUSH-ON FITTINGS

Fittings for use with fusible polyvinyl chloride (PVC) pipe shall include standard PVC pressure fittings conforming to AWWA C900 or AWWA C907.

a. Fittings for use joining fusible polyvinyl chloride (PVC) pipe with other sections of fusible polyvinyl chloride (PVC) pipe or other sections of PVC pipe shall include gasketed PVC, push-on type couplings and fittings, including bends, tees, and couplings as shown in the construction documents.
b. PVC gasketed, push-on fittings and mechanical restraints, if used, shall be installed per the manufacturer's guidelines.

3) FUSIBLE POLYVINYL CHLORIDE (PVC) SWEEPS OR BENDS

a. Fusible polyvinyl chloride (PVC) sweeps or bends shall be manufactured from the same fusible polyvinyl chloride (PVC) pipe being used for the installation and be of the same sizing convention, diameter, wall thickness and pressure class of the pipe being joined using the sweep or bend.
b. Fusible polyvinyl chloride (PVC) sweeps or bends shall have at least 2 feet of straight section on either end of the sweep or bend to allow for fusion of the sweep to the pipe installation. Unless otherwise specified, there shall be no gasketed connections utilized with a fusible polyvinyl chloride (PVC) sweep.
    c. Standard fusible polyvinyl chloride (PVC) sweep or bend angles shall not be greater than 22.5 degrees, and unless otherwise specified, shall be used in nominal diameters ranging from 4-inch through 16-inch.

4) SLEEVE-TYPE COUPLINGS

a. Sleeve-type mechanical couplings shall be manufactured for use with PVC pressure pipe.
b. Sleeve-type couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

5) EXPANSION AND FLEXIBLE COUPLINGS

a. Expansion-type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated in the construction documents.
b. Expansion-type mechanical couplings shall be rated at the same or greater pressure carrying capacity as the pipe itself.

6) CONNECTION HARDWARE

a. Bolts and nuts for buried service shall be made of non-corrosive, high-strength, low-alloy steel having the characteristics specified in ANSI/AWWA C111/A21.11, regardless of any other protective coating.

D. DRILLING SYSTEM EQUIPMENT

1) GENERAL

a. The directional drilling equipment, as a minimum, shall consist of a directional drilling rig of sufficient capacity to perform the bore(s) and pull-back of the pipe(s), a drilling fluid mixing & delivery system of sufficient capacity to successfully complete the crossing, a guidance system to accurately guide boring operations, and trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project. All required equipment shall be included in the emergency and contingency plan as submitted per these specifications.

2) DRILLING RIG
    a. The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull drill pipe while delivering a pressurized fluid mixture to a drill head. The machine shall be anchored to withstand the pulling, pushing and rotating forces required to complete the project.
    b. The drilling rig hydraulic system shall be of sufficient pressure and volume to power drilling operations. The hydraulic system shall be free from leaks.
    c. The drilling rig shall have a system to monitor pull-back hydraulic pressure during pull-back operations.

3) DRILL HEAD
    a. The horizontal directional drilling equipment shall produce a stable fluid lined tunnel with the use of a steer-able drill head and any subsequent pre-reaming heads.
    b. The system must be able to control the depth and direction of the drilling operation.
    c. Drill head shall contain all necessary cutters and fluid jets for the operation, and shall be of the appropriate design for the ground medium being drilled.

4) DRILLING FLUID SYSTEM

    a. DRILLING FLUID (DRILLING MUD)
        i. Drilling fluid shall be composed of clean water and the appropriate additive(s) for the fluid to be used. Water shall be from a clean source and shall meet the mixing requirements of the mixture manufacturer(s).
        ii. The water and additives shall be mixed thoroughly to assure the absence of any clumps or clods. No hazardous additives may be used.
        iii. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall(s).
        iv. Drilling fluid shall be disposed of off-site in accordance with local, state and federal requirements and/or permit conditions.
        v. No additional chemicals or polymer surfactants shall be allowed to be added to the drilling fluid unless they have been submitted per this specification.

    b. MIXING SYSTEM
        i. A drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid for the project.
        ii. The mixing system shall be able to ensure thorough mixing of the drilling fluid. The drilling fluid reservoir tank shall be sized for adequate storage of the fluid.
        iii. The mixing system shall continually agitate the drilling fluid during drilling operations.

    c. DRILLING FLUID DELIVERY AND RECOVERY SYSTEM
        i. The drilling fluid pumping system shall have a minimum capacity to supply drilling fluid in accordance with the drilling equipment pull-back rating at a constant required pressure.
        ii. The delivery system shall have filters or other appropriate in-line equipment to prevent solids from being pumped into the drill pipe.
        iii. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. The use of spill containment measures shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps, vacuum truck(s), and/or storage of sufficient size shall be in place to contain excess drilling fluid.
        iv. A closed-loop drilling fluid system and a drilling fluid cleaning system should be used to whatever extent practical, depending upon project size and conditions. Under no circumstances shall drilling fluid that has escaped containment be reused in the drilling system.

    d. DRILLING CONTROL SYSTEM
        i. Calibration of the electronic detection and control system shall be verified prior to the start of the bore.

ii. The drilling head shall be remotely steer-able by means of an electronic or magnetic detection system. The drilling head location shall be monitored in three dimensions:
    1. Offset from the baseline,
    2. Distance along the baseline, and
    3. Depth of cover.
iii. Point of rotation of the head shall also be monitored.
iv. For gravity application and on-grade drilling, sonde/beacon or approved equipment applicable for grade increments of 1/10th of one percent shall be used.

e. PIPE PULL HEADS
i. Pipe pull heads shall be utilized that employ a positive through-bolt design assuring a smooth wall against the pipe cross-section at all times.
ii. Pipe pull heads shall be specifically designed for use with fusible polyvinyl chloride (PVC) pipe, and shall be as recommended by the pipe supplier.

f. PIPE ROLLERS
i. Pipe rollers, if used, shall be of sufficient size to fully support the weight of the pipe during handling and pullback operations.
ii. A sufficient quantity of rollers and spacing, per the pipe supplier's guidelines shall be used to assure adequate support and excessive sagging of the product pipe.

10.6.6 EXECUTION

A. DELIVERY AND OFF-LOADING

1) All pipe shall be bundled or packaged in such a manner as to provide adequate protection of the ends during transportation to the site. Any pipe damaged in shipment shall be replaced as directed by the owner or engineer.

2) Each pipe shipment shall be inspected for damage and to determine if the load has shifted prior to unloading. The owner or engineer shall be notified immediately if more than immaterial damage is found. Each pipe shipment should be checked for quantity and proper pipe size, and type.

3) Pipe should be loaded, off-loaded, and otherwise handled following all of the pipe supplier's guidelines.

4) Off-loading devices such as chains, wire rope, chokers, or other pipe handling implements that may scratch, nick, cut, or gouge the pipe are strictly prohibited.

5) During off-loading and handling, care shall be taken to avoid the pipe striking hard objects. Significant impact could cause damage, particularly during cold weather.

6) If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to ensure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.

B. HANDLING AND STORAGE

1) Visibly damaged pipe sections, or sections with suspected damage shall be cut out and removed. Cutting shall be performed per the pipe supplier's recommendations.

2) Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by the owner or engineer.

3) Pipe lengths should be stored and placed on level ground. Pipe should be stored at the job site in the unit packaging provided by the manufacturer. Caution should be exercised to avoid compression, damage, or deformation to the ends of the pipe. The interior of the pipe, as well as all end surfaces, should be kept free from dirt and foreign matter.

4) Pipe shall be handled and supported with the use of woven fiber pipe slings or approved equal. Care shall be exercised when handling the pipe to not cut, gouge, scratch or otherwise abrade the piping in any way.

5) If pipe is to be stored for periods of 1 year or longer, the pipe should be shielded from direct sunlight. The pipe cover should be opaque and provide for adequate air circulation above and around the pipe to prevent excess heat accumulation.

6) Pipe shall be stored and stacked per the pipe supplier's guidelines.

C. FUSION PROCESS

1) Fusible polyvinyl chloride (PVC) pipe will be handled in a safe manner before, during, and after the fusion process and in accordance with this specification and pipe supplier's guidelines.

2) Fusible polyvinyl chloride (PVC) pipe will be fused by qualified fusion technicians, as documented by the pipe supplier.

3) Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine.

4) Only appropriately sized and outfitted fusion machines that have been approved by the pipe supplier shall be used for the fusion process. Fusion machines must incorporate the following elements:
   a. HEAT PLATE - Heat plates shall be in good condition with no deep gouges or scratches. Plates shall be clean and free of any debris or contamination. Heater controls shall function properly; cord and plug shall be in good condition. The appropriately sized heat plate shall be capable of maintaining a uniform and consistent heat profile and temperature for the size of pipe being fused, per the pipe supplier's guidelines.
   b. CARRIAGE – Carriage shall travel smoothly with no binding at low pressure. Jaws shall be in good condition with proper and clean inserts for the pipe size being fused. Insert pins shall be installed with no interference to carriage travel.
   c. GENERAL MACHINE - Overview of machine body shall yield no obvious defects, missing parts, hydraulic leaks or potential safety issues prior to fusion.
   d. DATA LOGGING DEVICE – An approved, fully functional datalogging device, with the current version of the pipe supplier's software shall be used. Datalogging device operations and maintenance manual shall be kept with the unit at all times. If fusing for extended periods of time, an independent 110V power source shall be available to extend battery life.

5) Other equipment specifically required for the fusion process shall include the following:
   a. Pipe rollers shall be used for support of pipe to either side of the machine
   b. An infrared (IR) pyrometer, with an accuracy of 1% or better, for checking pipe and heat plate temperatures.
   c. Fusion machine operations and maintenance manual shall be kept with the fusion machine at all times.
   d. Facing blades specifically designed for cutting fusible polyvinyl chloride (PVC) pipe shall be used.
   e. For fusion in inclement weather, and/or windy conditions; a weather protection canopy with sides that allow full machine motion of the heat plate, fusion assembly and carriage shall be provided per the pipe supplier's recommendations. When the pipe temperature is below 40°F, the pipe supplier's cold weather operating procedures shall be followed.

6) Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine hydraulic system. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of fusible polyvinyl chloride (PVC) pipe. The software shall register and/or record the parameters required by the pipe supplier and these specifications. Required data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

D. DRILLING OPERATIONS

1) The Contractor shall submit a drilling plan to the Engineer for review prior to starting any drilling operations.

2) Bore path and alignment are as indicated in the contract documents. The path of the bore may be modified based on field and equipment conditions. Entry and exit locations and control-point elevations shall be maintained as indicated in the contract documents.

3) Bend radii shown in the contract documents are minimum allowable radii and shall not be reduced.

4) LOCATION AND PROTECTION OF UNDERGROUND UTILITIES
   a. Correct location of all underground utilities that may impact the HDD installation is the responsibility of the Contractor, regardless of any locations shown on the drawings or previous surveys completed.
   b. Utility location and notification services shall be contacted by the Contractor prior to the start of construction.
   c. All existing lines and underground utilities shall be positively identified, including exposing those facilities that are located within an envelope of possible impact of HDD installation as determined for the project specific site conditions. It is the Contractor and HDD system operator's responsibility to determine this envelope of safe offset from existing utilities. This will include, but is not limited to, soil conditions and layering, utility proximity and material, HDD system and equipment, and foreign subsurface material.

5) SITE LOCATION PREPARATION
   a. Work site as indicated on drawings shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made
   b. Contractor shall confine all activities to designated work areas.

6) DRILLING LAYOUT AND TOLERANCES
   a. The drill path shall be accurately surveyed with entry and exit areas placed in the appropriate locations within the areas indicated on drawings. If using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.
   b. Instrumentation shall be provided and maintained at all times that accurately locates the pilot hole, measures drill-string axial and torsional loads and measures drilling fluid discharge rate and pressure.
   c. Entry and exit areas shall be drilled so as not to exceed the bending limitations of the pipe as recommended by the pipe supplier.

7) PILOT HOLE BORE
   a. Pilot hole shall be drilled along bore path. In the event that the pilot bore does deviate from the bore path, it may require contractor to pull-back and re-drill from the location along bore path before the deviation.
   b. The Contractor shall limit curvature in any direction to reduce force on the pipe during pull-back. The minimum radius of curvature shall be no less than that specified by the pipe supplier and as indicated on the drawings.

8) REAMING
   a. After successfully completing the pilot hole, the bore hole shall be reamed to a diameter which meets the requirements of the pipe being installed. The following table is offered as an estimated guide:

Nominal Pipe Diameter	**Bore Hole Diameter**
< 8 inches	Pipe Dia. + 4 inches
8 inches to 24 inches	Pipe Dia. X 1.5
> 24 inches	Pipe Dia. + 12 inches

   b. Multiple reaming passes shall be used at the discretion of the Contractor and shall conform to this specification.
   c. In the event of a drilling fluid fracture, returns loss or other loss of drilling fluid, the Contractor shall be responsible for restoring any damaged property to original condition and cleaning up the area in the vicinity of the damage or loss.

9) PIPE PULL-BACK AND INSERTION

a. Pipe shall be fused prior to insertion, if the site and conditions allow, into one continuous length.
b. Contractor shall handle the pipe in a manner that will not over-stress the pipe prior to insertion. Vertical and horizontal curves shall be limited so that the pipe does not bend past the pipe supplier's minimum allowable bend radius, buckle, or otherwise become damaged. Damaged portions of the pipe shall be removed and replaced.
c. The pipe entry area shall be graded as needed to provide support for the pipe and to allow free movement into the bore hole.
d. The pipe shall be guided into the bore hole to avoid deformation of, or damage to, the pipe.
e. The fusible polyvinyl chloride (PVC) pipe may be continuously or partially supported on rollers or other Owner and Engineer approved friction decreasing implement during joining and insertion, as long as the pipe is not over-stressed or critically abraded prior to, or during installation.
f. A swivel shall be used between the reaming head and the fusible polyvinyl chloride (PVC) pipe to minimize torsion stress on the pipe assembly.
g. Buoyancy modification shall be at the sole discretion of the Contractor, and shall not exceed the pipe supplier's guidelines in regards to maximum pull force or minimum bend radius of the pipe. Damage caused by buoyancy modifications shall be the responsibility of the Contractor.
h. Once pull-back operations have commenced, the operation shall continue without interruption until the pipe is completely pulled through the bore hole.
i. The pipe shall be installed in a manner that does not cause upheaval, settlement, cracking, or movement and distortion of surface features. Any damages caused by the Contractor's operations shall be corrected by the Contractor.
j. Pneumatic hammer shall not be used to dislodge a stuck pipe.

10) INSTALLATION CLEANUP

a. Following the installation, the project site shall be returned to a condition as required in the construction documents. All excavations will be backfilled and compacted per the construction documents and jurisdictional standards. All pavement and hardscape shall be repaired per applicable jurisdictional standards. All drilling fluid shall be properly disposed of per these specifications and all applicable jurisdictional laws.
b. Contractor shall verify that all utilities, structures, and surface features in the immediate project area are sound.

11) PREPARATION PRIOR TO MAKING CONNECTIONS INTO EXISTING PIPING SYSTEMS

a. Prior to making connections into existing piping systems, the contractor shall:
    i. Field verify location, size, piping material, and piping system of the existing pipe.
    ii. Obtain all required fittings, which may include saddles, sleeve type couplings, flanges, mechanical restraints, tees, or others as shown in the construction documents.
    iii. Have installed all temporary pumps and/or pipes in accordance with established connection plans.
b. Unless otherwise approved, new piping systems shall be completely assembled and successfully tested prior to making connections into existing pipe systems.

12) TESTING

a. Testing shall comply with all applicable jurisdictional building codes, statutes, standards, regulations, and laws.
b. Hydrostatic and leakage testing shall be conducted in accordance with the requirements of AWWA C605.
c. Unless agreed to or otherwise designated by the owner or engineer, for a simultaneous hydrostatic and leakage test following installation, a pressure equal to 150% of working pressure at point of test, but not less than 125% of normal working pressure at highest elevation shall be applied. Unless otherwise agreed to, the duration of the pressure test shall be for two (2) hours.
d. If hydrostatic testing and leakage testing are performed at separate times, follow procedures as outlined in AWWA C605.
e. In preparation for pressure testing the following parameters must be followed:

i. All air must be vented from the pipeline prior to pressurization. This may be accomplished with the use of the air relief valves or corporation stop valves, vent piping in the testing hardware or end caps, or any other method which adequately allows air to escape the pipeline at all high points. Venting may also be accomplished by 'flushing' the pipeline in accordance with the parameters and procedures as described in AWWA C605.
ii. The pipeline must be fully restrained prior to pressurization. This includes complete installation of all mechanical restraints per the restraint manufacturer's guidelines, whether permanent or temporary to the final installation. This also includes the installation and curing of all required thrust blocking. All appurtenances included in the pressure test, including valves, blow-offs, and air-relief valves shall be checked for proper installation and restraint prior to beginning the test.
iii. Temporary pipeline alignments that are being tested, such as those that are partially installed in their permanent location shall be configured to provide for the removal of trapped air in the pipeline.

10.6.7 PAYMENT

The horizontal directional drilling item shall be paid for at the contract unit price per linear foot. This item will be measured between the transitions to trenched C900 (11.25-degree fitting to fitting). The additional fused pipe between the 11.25-degree fittings and the entry/exit holes shall be considered incidental. All costs for delivery, handling, fusing of pipe, drilling mud, equipment costs and installation are incidental to the contract item for directionally drilled watermain.

END OF SECTION

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SECTION XI
SPECIAL PROVISIONS – ALL CONTRACTS
PUMPHOUSE #5 CONSTRUCTION & WATERMAIN IMPROVEMENTS
ADAMS, MINNESOTA

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SPECIAL PROVISIONS – ALL CONTRACTS

SECTION 11.1.0 - LOCATION AND SCOPE OF WORK

Preceding sections include general specifications for this Project. References in this Section supersede references in general sections. The work for this project will be performed at the site of the new City of Adams Well #5. Pumphouse #5 is located approximately 1,000 feet north of the intersection of STH '56' and 10th Street on the west side of the City of Adams, MN. Access to the site is from public streets. While the details on all the various Proposals are included throughout the plans and specifications, the general description of each follows:

PROPOSAL #1 – GENERAL / MECHANICAL

Furnishing and installing all labor, materials and equipment required for construction of Pumphouse #5 not specifically included in Proposal #2 or #3, including general and mechanical construction of the new building, site work, access drive, yard piping, chemical addition facilities, and all other appurtenances associated with work.

PROPOSAL #2 – ELECTRICAL & CONTROLS

Furnishing and installing all labor, materials and equipment required for electrical construction of Pumphouse #5 including electrical and controls, materials, engine generator and accessories, SCADA modifications for instrumentation control and monitoring, and all other appurtenances associated with the work.

PROPOSAL #3 – WELL PUMP WORK

All well pump work required for Pumphouse #5 including furnishing and installing the vertical turbine pump for Well #5 with accessories specified and modifications to the Well #5 wellhead.

PROPOSAL #4 – WATERMAIN EXTENSION & REPLACEMENT

Furnishing and installing all labor, materials, equipment and traffic control required for the replacement of watermain on 10th Street and the extension of watermain to the proposed Pumphouse #5 parcel. This work also includes the directional drilling of watermain under the Little Cedar River adjacent to State Highway 56.

PROPOSAL #5 – COMBINATION BID

A deduction offered if awarded more than one proposal.

11.1.1 WORK BY OTHERS. During construction of the work covered under this contract, the City will be retaining contractors under separate contracts to perform work adjacent to the pumphouse site for construction of watermain to the pump house. Each Contractor shall carry out his work so as to minimize interference with other Contractors.

SECTION 11.2.0 - SCHEDULE OF COMPLETION

11.2.1 SCHEDULE. The schedule for all Proposals follows:

MILESTONE:	DATE:
Proposal #1 – General & Mechanical	
Substantial Completion	June 1, 2027
Ready for Final Payment	June 30, 2027
Proposal #2 – Electrical & Controls	
Substantial Completion	March 31, 2027
Ready for Final Payment	April 30, 2027
Proposal #3 – Well Pump Work	
Substantial Completion	March 31, 2027
Ready for Final Payment	April 30, 2027
Proposal #4 – Watermain Improvements	
Substantial Completion	November 15, 2026
Ready for Final Payment	December 15, 2026

The Ready for Final Payment dates above shall be in accordance with Paragraph 15.08 of the General Conditions.

The General & Mechanical Contractor shall develop a construction schedule to coordinate critical items of work as well as the overall construction of the project. The General & Mechanical Contractor shall submit the schedule accompanied with a construction sequence to the Engineer within 10 working days after the Notice to Proceed.

The construction schedule shall include, but not be limited to the following items:

A. Shop drawing review and return to Contractor.
B. Well construction.
C. Material and equipment order, delivery, installation, and testing.
D. Installation of erosion control measures.
E. Excavation, pipeline, installation, backfilling, grading work, and paving.
F. Performance tests.
G. Piping installation.
H. Well Pump Work.
I. Electrical and instrumentation work activity.
J. Subcontractors items of work.
K. Final cleanup.

11.2.2 DELAYS IN MATERIALS OR EQUIPMENT. Significant delays in delivery time, or changes in the price of materials or equipment, that are outside the Contractor's control and occur after award, may be justification for a change in the Contract Time.

SECTION 11.3.0 – LIMITS OF CONTRACT

11.3.1 **General**

The work is divided into four (4) contracts. All contractors are responsible for being knowledgeable with and adhering to all applicable portions of the contract documents. All contractors are responsible for being knowledgeable of the requirements of Section I General Conditions, Section II General Requirements, and the General (G) Drawings.

11.3.2 Equipment Pads, Bases, and Grout

Concrete equipment pads and bases for mechanical, and electrical and instrumentation equipment shown on the architectural or structural drawings shall be provided by the Contractor performing the general construction work. Concrete equipment pads and bases not shown on the structural drawings shall be provided by the Contractor installing the equipment. The Contractor installing the equipment shall be responsible for grouting the equipment.

11.3.3 Proposal #1 – General / Mechanical

The work included in Proposal #1 consists of the General and Mechanical Construction for the Pumphouse #5. Included in this contract are sitework, general demolition work, earthwork, concrete, masonry, metal work, carpentry, thermal and moisture protection, doors and windows, painting and finishes, specialties, all mechanical equipment including motors, control devices and controls, process piping, plumbing piping, HVAC systems, and related work, as shown on the General (G), Civil (C), Architectural (A), Structural (S), and Mechanical (M) drawings, as well as what is described in these Specifications.

11.3.4 Proposal #2 – Electrical & Controls

The work included in Proposal #2 consists of the Electrical Work for the Pumphouse #5. Included in this contract is electrical equipment (except motor and control devices for mechanical equipment), electrical heating equipment, light fixtures, instrumentation equipment, power, control, alarm and instrumentation wiring, engine generator, and related work as shown on the General (G) and Electrical (E) drawings, as well as what is described in these Specifications.

11.3.5 Proposal #3 – Well Pump

The work included in Proposal #3 consists of furnishing the labor, equipment and materials to provide one (1) turbine pump and accessories and modifications to the wellhead for Well #5. Included in this contract are well pump work, and related work, as shown on the General (G), Electrical (E) and Well Pump (W) drawings, as well as what is described in these Specifications.

11.3.6 Proposal #4 – Watermain Improvements

The work included in Proposal #4 consists of the Watermain Improvements in the City of Adams, MN. Included in this contract is construction of the watermain and related work as shown on the General (G) and Pipeline (P) drawings, as well as what is described in these Specifications.

SECTION 11.4.0 - WAGE SCALE

Federal (Davis Bacon Act) and State wage rates apply. The Contractor shall comply with the scale for each craft or category and pay the higher of the two wage scales. The Contractor shall maintain each craft or category and submit payroll report compliance forms to the City and Engineer once per month.

SECTION 11.5.0 - HOUSING FOR ENGINEER

The General/Mechanical Contractor (Proposal #1) shall provide the housing specified in Section 2.1.9.

SECTION 11.6.0 – WELLHEAD PROTECTION DURING CONSTRUCTION

The Well Pump Contractor shall be responsible for securing the well. The well casing shall be sealed by the Contractor at all times that no one is on-site so access to the well is not possible.

SECTION 11.7.0 - EROSION CONTROL

Refer to Section 2.8.0 of the General Requirements. The General/Mechanical Contractor is responsible for installing erosion control devices before the start of construction and during construction, as needed and maintaining them throughout the construction period. The Contractor is also responsible for completing the inspections, both weekly and following precipitation events.

The inspections by the Contractor are required until the project is complete, and all restoration work is in-place. At the point of Substantial Completion, the Owner shall take over monitoring the site.

SECTION 11.8.0 – NOISE CONTROL

Pumphouse #5 is located about 500-ft north of a Senior Living Facility. The watermain work on 10th Street will be located adjacent to the Senior Living Facility and the watermain work along State Hwy. 56 will be adjacent to residential homes. Noise control techniques approved by the Engineer shall be employed, especially outside of normal working hours.

SECTION 11.9.0 – PROPERTY AND WORK LIMITS

Prior to the start of construction, the Contractor shall familiarize themself and comply with all temporary and permanent easements. If a question arises consult the Engineering Representative on site. Many property corners are monumented with iron pipe. The Contractor will be responsible for knowing the location of all such monumentation and preserving it. If disturbed or removed, replacement and re-establishment shall be at the Contractor's expense. If there is a question, the Contractor shall notify the Engineer immediately for clarification.

Where no easement or work limit line is shown, the Contractor shall limit his work to within the limits of the property owned by the Owner and public right of way.

SECTION 11.10.0 – UTILITY LOCATIONS

The utilities shown on the plans have been obtained from the best information available. The Contractor shall have all utilities located and marked prior to the start of construction. All Contractors shall pay all costs associated with damage and/or relocation of telephone, fiber optic, power cable, overhead power lines, and poles, natural gas or other utility locations, and/or repairs required.

SECTION 11.11.0 – PERMITS

The Contractor shall obtain and pay for all construction permits as specified in Section 7.09 of the General Conditions.

The Contractor shall be responsible for obtaining a *Temporary Projects General Permit 1997-0005* from the Minnesota Department of Natural Resources for a well that will be utilizes for construction dewatering. A copy of the dewatering permit shall be submitted to the Engineer. Permit fees are incidental to the project.

SECTION 11.12.0 – USE OF AMERICAN IRON AND STEEL (UAIS)

The Contractor is responsible for maintaining and documenting full compliance with the Use of American Iron and Steel requirements for the construction of this project. Refer to the March 20, 2014, AIS Final Guidance EPA memorandum included with these specifications. In general terms, all items made primarily of iron or steel that are permanently incorporated into the project must be produced in the United States. There is a de minimus waiver that excludes incidental components that cumulatively comprise no more than 5% of the total cost of materials incorporated with no one item exceeding 1%. Lists of items that are specifically included or excluded are included in the UAIS Guidance memo. UAIS compliance shall include the following actions:

1. When requesting bids or ordering materials or equipment, notify the suppliers that AIS regulations apply.
2. Execute and submit the AIS Bid Certification form with the bid. That certification will be incorporated in the construction Contract.
3. All Shop Drawing submittals shall include an AIS certification letter from the manufacturer. An example letter is included in the AIS Guidance memo.
4. All items included on the specific lists in sections 11, 19, 20 and 21 of the AIS Guidance memo shall include a manufacturer's certification letter when delivered to the job site if no Shop Drawing submittal is required.
5. A step certification process similar to what is used by the Federal Highway Administration is recommended. Step certification ensures that producers adhere to AIS requirements and allows assistance recipients to verify that compliance. Under a step certification process, each handler of the iron and steel (supplier, fabricator, manufacturer, processer, etc.) certifies that their step in the process was performed in the United States. These certifications shall be collected by the Contractor and provided to the Owner. Items which should be included in each certification include:
    a. the name of the manufacturer;
    b. the location of the manufacturing facility (not its headquarters);
    c. a description of the product; and
    d. a signature from a responsible party representing the manufacturer.
6. If non-compliant iron or steel are utilized in the project the Contractor shall be solely responsible for the cost of removal and replacement, obtaining waivers or otherwise meeting AIS regulations. Providing manufacturer compliance certification letters does not relieve the Contractor from their contractual obligation to maintain full compliance.
7. The Owner's intent is to fully comply with AIS requirements without use of waivers.
8. At project completion and before submittal of the Final Pay Application, execute and submit the AIS Project Completion Certification using the form included with the specifications.

Failure to comply with AIS requirements by the Contractor shall permit the Owner or Funding Authority to recover as damages against the Contractor any loss, expense, or cost (including without limitation attorney's fees) incurred by the Owner or Funding Authority resulting from any such failure (including without limitation any impairment or loss of funding, whether in whole or in part, from the Funding Authority or any damages owed to the Funding Authority by the Owner). The Owner and the Contractor agree that the Funding Authority 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 Funding Authority.

END OF SECTION

Chosen Valley Testing, Inc.

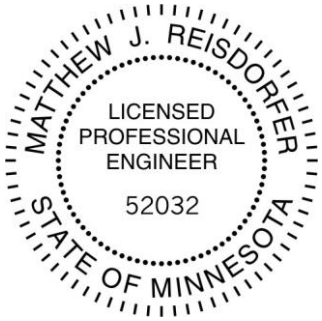
Design Phase Geotechnical Evaluation:

Proposed Water System Improvements
Highway 56 and 10th St NW
Adams, Minnesota
CVT# 24486.24.IAM

Prepared for:

City of Adams
c/o: Davy Engineering, Co.
Attn: Mr. Alex Jaromin, PE

Certification:



I hereby certify that this report was prepared by me or under my direct supervision, and that I am a duly Licensed Professional Engineer under the laws of the State of Minnesota.

Matthew J. Reisdorfer, PE
Geotechnical Engineer
License Number 52032
Date: December 2, 2024

Chosen Valley Testing, Inc.

Geotechnical Engineering and Testing • 421 N. Georgia Ave. • Mason City, Iowa 50401 • Telephone (641) 201-1050 • masoncity@cvtesting.com

City of Adams
c/o: Davy Engineering, Co.
Attn: Mr. Alex Jaromin, PE
115 6th Street South
La Crosse, Wisconsin 54601
ajaromin@davyinc.com

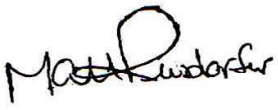
December 2, 2024

Re: Design Phase Geotechnical Evaluation
Proposed Water System Improvements
Adams, Minnesota
CVT Project Number: 24486.24.IAM

Dear Mr. Jaromin,

As authorized, we have completed the geotechnical evaluation for the proposed water system improvements in Adams, Minnesota. The attached report provides details of our geotechnical recommendations for the proposed project. CVT appreciates the opportunity to serve you. If there are any questions about our report, please feel free to contact us at (641) 201-1050.

Sincerely,
Chosen Valley Testing, Inc.



Matthew J. Reisdorfer, PE
General Manager / Geotechnical Engineer

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Design Phase Geotechnical Evaluation
Proposed Water System Improvements
Highway 56 and 10th St NW
Adams, Minnesota

CVT Project Number: 24486.24.IAM
Date: December 2, 2024

A. Introduction

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

A.1. Purpose

This report was prepared to assist planning and design for the proposed water system improvements in Adams, Minnesota. Our services were authorized by Mr. Alex Jaromin, PE of Davy Engineering Co. on behalf of the City of Adams.

A.2. Scope

To obtain data for analysis, four penetration test borings were authorized. The borings were drilled to depths of about 14 ½ to 24 ½ feet. Our engineering scope consisted of providing geotechnical recommendations for the proposed utility improvements.

A.3. Boring Locations and Elevation

The desired boring locations were indicated to Chosen Valley Testing based on on-site staking by Davy Engineering, Co. The Boring Location Sketch in the Appendix shows the approximate boring locations.

Ground surface elevations were provided by Davy Engineering, Co.

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 of the area indicate that the dominant soils in the area consists of glacial till consisting of clay and sand mixtures. Bedrock is typically within 100 feet of the surface. The uppermost bedrock is commonly limestone, dolomite, and shale of the Lithograph City Formation and the Little Cedar Formation.

B. Subsurface Data

Methods: All of 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 specimen 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 is classified and logged by the driller and a representative portion is then sealed in a jar and delivered to the soils engineer for review.

B.1. Stratification

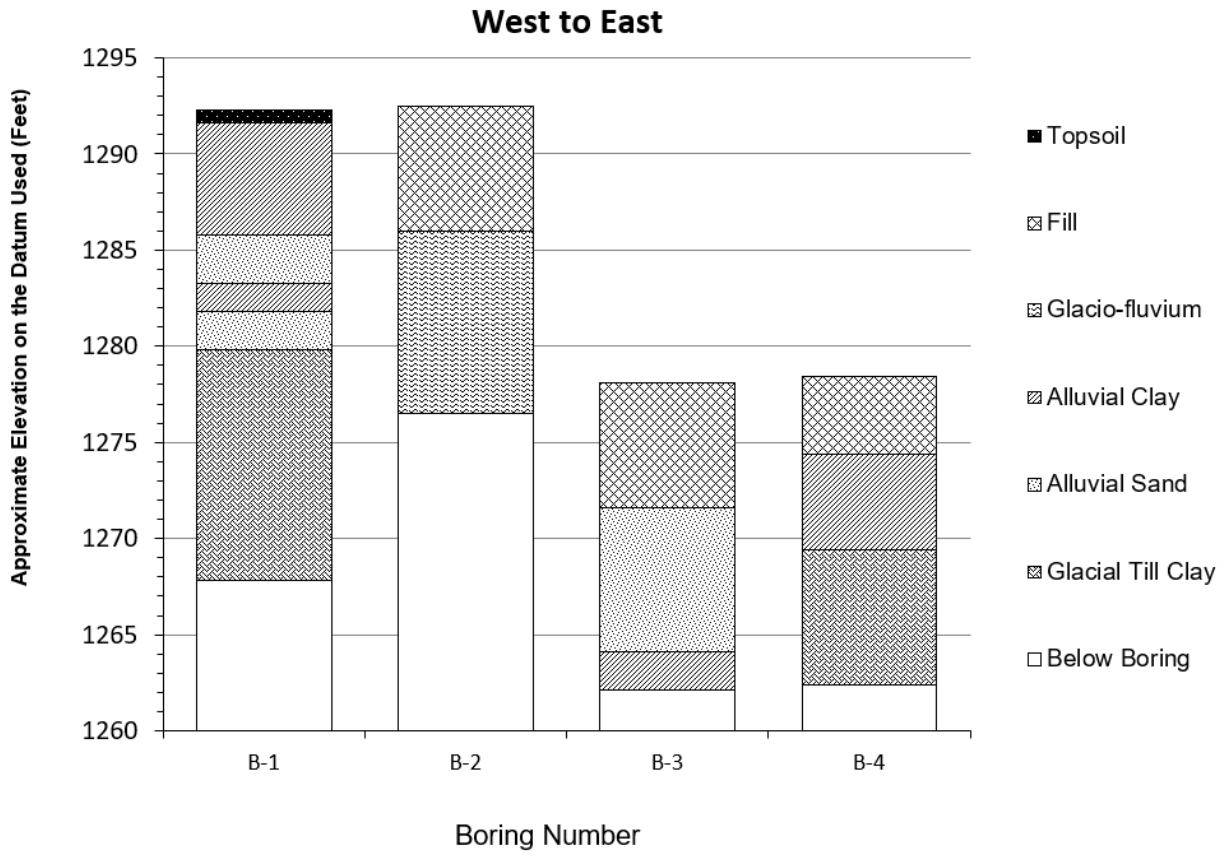
At the surface, Boring B-1 met about 8 inches of topsoil. Borings B-2 through B-4 met fill at the surface, consisting of mostly of sandy lean clay, sand, and clayey sand to depths of about 4 to 6 ½ feet below the surface.

Below the fill, Boring B-2 met glacio-fluvium consisting of lean clay with this boring terminating in fluvial clay at about 14 ½ feet below the surface.

Alluvial clay was met below the fill in Borings B-1 and B-4 to depths of about 6 ½ to 9 feet. Alluvial sand was met below the alluvial clay in Boring B-1 and below the fill in Boring B-3 to depths of about 12 ½ to 14 feet. An alluvial clay layer approximately 1 ½ feet thick was met within the alluvial sand in Boring B-1 at a depth of about 9 feet below the surface.

Alluvial clayey sand to sandy clay was met below the alluvial sand in Boring B-3. Boring B-3 terminated in alluvial clayey sand to sandy clay at a depth of about 14 ½ feet below the surface. Glacial till clay was met below the alluvial sand in Boring B-1 and below the alluvial clay in Boring B-4. Borings B-1 and B-4 terminated in glacial till sandy clay at depths of about 14 ½ to 24 ½ feet below the surface.

The soil boring data has been summarized in the following cross-section. Please refer to the individual log of boring sheets for more detailed information.



B.2. Penetration Test Results

The number of blows needed for the hammer to advance the penetration test sampler is an indicator of soil characteristics. The number of blows to advance the sampler 1 foot is called the penetration resistance or "N"-value. 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) of 2 to 11 Blows per Foot (BPF) were returned in the alluvial and glacio-fluvial clays, indicating they were soft to rather stiff. The alluvial sands returned N-Values of 3 to 18 BPF, indicating they were very loose to medium dense.

N-Values of 11 to 33 BPF were returned in the fill sand, indicating it was medium dense to dense. The fill clay returned N-Values of 4 to 16 BPF, indicating it was rather soft to stiff. The glacial till clay returned N-Values of 5 BPF to 50 blows for two inches of sampler advancement, indicating it was rather soft to hard.

A pocket penetrometer was used to provide additional data on the compressive strength of cohesive soils. The glacial till clays returned values of 2 ½ to greater than 4 ½ tons per square foot (tsf). The alluvial clay returned values of 1 to 2 ¼ tsf. Values of 1 ½ to 2 tsf were returned in the glacio-fluvial clay. The fill clay returned values of 1 ¾ to 2 tsf.

A key to the 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 the drilling operation, the drillers may note the presence of moisture on the sampling instrument, in the cuttings, or within the borehole. These observations are recorded on the boring logs. The water level may vary with weather; time of year and other factors and the presence or absence of water during the drilling is subject to interpretation and is not always conclusive.

Water was encountered in Boring B-1 during drilling at about 11 feet below the surface. The observed water levels correspond to an elevation of about 1281 ½ feet on the datum used to locate the borings. Water bearing sands were observed in Boring B-3 during drilling, at about 10 feet below the surface. Elevated moisture contents were recorded in some of the clay samples as well. Groundwater levels at the site are expected to fluctuate seasonally with nearby creeks and rivers, as well as with local weather patterns.

C. Project Design Data

Each structure has a different loading configuration and intensity, different grades, and different structural and performance tolerances. Therefore, the geotechnical exploration will be construed differently from one structure to another. If the initial structure should change design, we should be engaged to review these conditions with respect to the prevailing soil conditions. Without the opportunity to review any such changes, the recommendations may no longer be valid or appropriate.

The proposed project consists of installing a new water main utility along State Highway 56 and 10th Street in Adams. The utilities are understood to be installed at depths of approximately 7 feet below the surface and would likely be installed using either open cut excavation or horizontal direction drilling (HDD) techniques. In addition, a new pumphouse building is planned near Boring B-1. The pumphouse is expected to consist of below grade walls with a single-story superstructure, likely consisting of CMU and wood framing.

D. Building Recommendations

D.1. Earthwork Recommendations

D.1.a. Excavation: The topsoil is not suitable for supporting the structure and should be completely stripped from the building and oversize areas. The topsoil was about 8 inches thick.

After removals, and after basement level excavations have been made, the footings and slabs are expected to bear upon either clean sand or sandy clay. We recommend installing at least 6 inches of clean granular fill below foundations and slab to aid in removing any moisture that accumulates below the structure and also to improve the bearing surface.

D.1.b. Geotechnical Review of Bearing Soils: We recommend geotechnical personnel from Chosen Valley Testing be retained to further evaluate the bearing conditions and to provide direction for further corrections, if deemed necessary.

D.1.c. Oversizing: Any stripping or corrective excavations should be oversized at least 1 foot beyond the foundations 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.

D.1.d. Fill Placement and Compaction: For ease on construction, we recommend using sand or gravel having less than 10% particles passing a #200 sieve where fill is needed below the building footings and slabs. We recommend at least 2 feet of this sand or gravel fill be placed against below-grade walls prior to using on-site soils as engineered fill.

All materials below the building, in the oversized areas, or used as backfill for walls should be compacted to a minimum of 95% of its maximum standard Proctor density (ASTM D 698). We recommend fill be placed with a moisture tolerance of -2% to +3% from the materials optimum moisture content as determined form the standard Proctor test.

D.2. Building Design

D.2.a. Foundation Depth: Based on the boring data, the structure can likely be supported on shallow, frost-depth foundations. We recommend placing foundations at least 42 inches below the exposed ground surface for frost protection. Interior foundations in heated areas may be placed directly below slabs. Footings for unheated structures should be placed 60 inches below the surface.

D.2.b. Bearing Capacity: With the assumed foundation loads and implementation of the earthwork recommendations, we are of the opinion design these foundations using a reduced bearing pressure of up to 2,000 psf. This allowable bearing pressure includes a safety factor of at least 3 against shear failure.

D.2.c. Settlement: Based on these design bearing pressures; total post-construction settlements are expected to be on the order of 1 inch or less. Differential settlement between similarly loaded footings is expected to be on the order of ½ inch or less.

D.2.d. Vapor Barrier: If the slab will receive coverings that are less permeable than concrete, a vapor barrier should be placed below the slab. Some contractors prefer to place this barrier below the sand, to limit the potential for curling.

D.2.e. Slab Design: The completed slab subgrade is expected to consist of at least 6 inches granular engineered fill overlying native soils. We recommend using a modulus of subgrade reaction of no more than 150 pounds per cubic inch (pci). A thicker granular base section be used below heavily loaded slabs.

D.2.f. Drainage: Water was met in the boring at a depth of about 11 feet below the surface. In addition to clean granular fill being placed below and against below grade walls, we recommend a perimeter draintile daylighted into a sump pump be installed. Water proofing should also be applied to below grade walls.

At the ground surface, the area should be capped with at least 2 feet of clay or pavement, and should be sloped in a manner to allow for positive drainage away from the building.

D.3. Lateral Earth Pressures

Lateral support values are provided for the design of below-grade 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 sands, having less than 10% fines, as fill against below-grade walls. The following table provides support values for the recommended clean sands. These values do not include a safety factor.

Poorly Graded Sands (SP) 95% standard Proctor density	
Internal Friction Angle (degrees)	34
Cohesion (psf)	0
Coefficient of Friction between Concrete and Soil	0.50
Moist Unit Weight (pcf)	120
Saturated Unit Weight (pcf)	130
At-Rest Coefficient (K_o)	0.44
Active Coefficient (K_a)	0.28
Passive Coefficient (K_p)	3.54
Active Earth Pressure	35 (psf/ft)
Passive Earth Pressure	400 (psf/ft)
At-Rest Earth Pressure	55 (psf/ft)

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.

D.4. Seismic Design

In accordance with the 2018 International Building Code (IBC), the site profile is considered to rate as Site Classification D.

E. Utilities

E.1. Groundwater/De-watering

Water was encountered in Boring B-1 during drilling at about 11 feet below the surface, with water bearing sands met in Boring B-3 at about 10 feet. We anticipate sump pumps and sump pits to be capable of removing any moisture that accumulates within the excavations above the observed water levels. More aggressive dewatering techniques such as well points may be required below the observed water levels.

E.2. Trench Sidewalls

The contractor will be required to slope or shore the excavations as needed to meet OSHA requirements for safety. Sands and any saturated clays will likely classify as Type C soils as defined by OSHA. The stiffer clays would likely classify as Type B soils. Due to the presence of existing roadways, utilities, and structures, trench boxes or other stabilization methods will likely be necessary.

E.3. Trench Bottom Stability

Utilities are expected to bear on mostly sands and clays. These soils are expected to be generally suitable for support of utilities.

We recommend that oversize materials be removed from at least 6 to 8 inches below and around pipes, and replaced with sand or gravel bedding (to prevent point loads from developing and rupturing utilities). This type of condition is considered more likely in those areas areas dominated by gravels, cobbles or boulders.

E.4. Fill Placement and Compaction

Soils placed as backfill below paved areas should be compacted to at least 95% of their standard Proctor density (ASTM D 698), and to 98% within three feet of pavement subgrade elevation. In green areas, 90% compaction is normally adequate. Again, cobbles and boulders should be kept at least 6 to 8 inches away from pipes, to limit potential for point loads.

The on-site soils available as fill are expected to consist of primarily clays and sands. These materials are expected to be generally suitable for reuse as backfill above the pipes and for supporting the pavements. To promote uniformity, we suggest using such clay materials in the upper portion of the trench where the near-surface soils outside the trench are dominated by clays and using granular soils in those areas where granular soils dominate outside the trench.

E.5. Horizontal Directional Drilling

Based on the boring data, horizontal directional drilling is expected to sand and clay. All borings were drilled to their planned depths and cobbles and boulders were not encountered within the glacial and alluvial clay soils.

F. Construction Testing and Documentation

F.1. Excavation

The soils expected to be encountered may be excavated by a variety of equipment provided conditions are dry. A backhoe is recommended for deep excavations. A smooth-lipped bucket is recommended to limit disturbance to underlying soil layers. A large backhoe with a toothed bucket should be capable of removing most of the weathered dolomitic bedrock. A backhoe equipped with a chisel will likely be required for removing the more intact bedrock.

F.2. Compaction

Fill should be placed in lifts adjusted to the compactor being used and the material being compacted. We recommend limiting lifts to no more than 2 feet for clean sands or gravels, and no more than 1 foot for clayey materials – assuming large, self-propelled or tow-behind compactors are used.

If the earthwork occurs during freezing temperatures, good winter construction practices should be used. No frozen fill should be used nor should structural filling take place on frozen ground.

F.3. Construction Phase Testing and Documentation

Excavations should be evaluated and documented by qualified personnel. Samples of any fill materials and/or alternative gradations of materials proposed for use should be submitted for approval before use. The City may wish to have, or may be obligated to have, tests performed regarding the other various components, especially if pavements require replacement. Specification of such requirements is normally the responsibility of the City and their design consultant.

G. 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 # 1-4

Legend to Soil Description

Chosen Valley Testing, Inc.

N

Legend

Boring Location

Boring Location Sketch

Proposed Water System Improvements
Highway 56 and 10th St NW
Adams, Minnesota
24486.24.IAM

LOG OF BORING

CHOSEN VALLEY TESTING

Chosen Valley Testing, Inc.

PROJECT: 24486.24.IAM
Design Phase Geotechnical Evaluation
Proposed Water System Improvements
Highway 56 and 10th St NW
Adams, Minnesota

BORING: **B-01**

LOCATION:
See attached sketch

DATE: 11/20/2024

SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
1292.3	0.0					
1291.6	0.7		**8" TOPSOIL**			Elevations provided by Davy Engineering, Co.
		CL	**SANDY LEAN CLAY** trace of gravel, trace of iron staining, slightly mottled to about 4 feet, brown, wet, medium to rather stiff. (Alluvium)	8		PP = 2.25 tsf
				10		PP = 1.25 tsf, MC = 15.7%
1285.8	6.5	SP	**POORLY-GRADED SAND** mostly medium grained, trace of gravel, trace of clay, brown, moist, medium dense. (Alluvium)	17		
1283.3	9.0	CL	**SANDY LEAN CLAY** trace of gravel, trace of iron staining, brown, wet, rather stiff. (Alluvium)	11		PP = 1.0 tsf, MC = 20.4%
1281.8	10.5	SP	**POORLY-GRADED SAND** mostly medium grained, trace of gravel, brown, moist, medium dense. (Alluvium)		▽	Water encountered at about 11 feet during drilling.
1279.8	12.5	CL	**SANDY LEAN CLAY** trace of gravel, grey to dark grey, wet, very stiff to hard. (Glacial Till)	18		PP = 4.25 tsf
				33		PP > 4.5 tsf, MC = 14.0%
				64		PP > 4.5 tsf, MC = 15.0%
1267.8	24.5			*		* 50 = 6"
			End of boring. Boring sealed upon completion.			PP > 4.5 tsf, MC = 13.2%

CVT STANDARD 24486.24.IAM (ADAMS WATER SYSTEM IMPROVEMENTS).GPJ LOG A GNNN06.GDT 12/2/24

LOG OF BORING

CHOSEN VALLEY TESTING

Chosen Valley Testing, Inc.

PROJECT: 24486.24.IAM Design Phase Geotechnical Evaluation Proposed Water System Improvements Highway 56 and 10th St NW Adams, Minnesota	BORING: **B-02** LOCATION: See attached sketch DATE: 11/20/2024 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
1292.5	0.0	CL	**SANDY LEAN CLAY** trace of gravel, brown to dark brown, wet, medium to stiff. (Fill)	16		Elevations provided by Davy Engineering, Co.
				6		PP = 2.0 tsf, MC = 16.4%
1286.0	6.5	CL	**LEAN CLAY** trace of iron staining to about 14 feet, trace of sand, brown to dark brown to dark grey, wet, rather soft to rather stiff. (Glacio-fluvium)	4		PP = 1.75 tsf
				6		PP = 2.0 tsf, MC = 23.4%
				8		PP = 1.5 tsf
1277.6	14.9			9		PP = 1.5 tsf, MC = 24.3%
			End of boring. Boring sealed upon completion.			

CVT STANDARD 24486.24.IAM (ADAMS WATER SYSTEM IMPROVEMENTS).GPJ LOG A GNNN06.GDT 12/2/24

LOG OF BORING

CHOSEN VALLEY TESTING

Chosen Valley Testing, Inc.

PROJECT: 24486.24.IAM Design Phase Geotechnical Evaluation Proposed Water System Improvements Highway 56 and 10th St NW Adams, Minnesota	BORING: **B-03** LOCATION: See attached sketch DATE: 11/20/2024 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
1278.1	0.0					
1277.6	0.5	CL	**SANDY LEAN CLAY** trace of gravel, brown to dark brown, wet.			Elevations provided by Davy Engineering, Co.
1276.6	1.5	SP	(Fill)			
		SP	**1' SAND FILL**			
		SC	**POORLY-GRADED SAND to CLAYEY SAND** mostly coarse grained, brown, moist, dense.	33		
1274.1	4.0		(Fill)			
		SP	**POORLY-GRADED SAND with LEAN CLAY**			
		CL	mostly medium grained, trace of gravel, brown, moist, medium dense.	11		
1271.6	6.5		(Fill)			
		SP	**POORLY-GRADED SAND** mostly medium to coarse grained, trace of gravel, trace of clay to about 9 feet, brown, moist to waterbearing, very loose to loose.	8		
			(Alluvium)	3		
				3		
1264.1	14.0					
		SC	**CLAYEY SAND to SANDY LEAN CLAY**	9		
1263.2	14.9	CL	mostly medium grained, trace of gravel, brown, moist to waterbearing, loose.			
			(Alluvium)			
			End of boring. Boring sealed upon completion.			

CVT STANDARD 24486.24.IAM (ADAMS WATER SYSTEM IMPROVEMENTS).GPJ LOG A GNNN06.GDT 12/2/24

LOG OF BORING

CHOSEN VALLEY TESTING

Chosen Valley Testing, Inc.

PROJECT: 24486.24.IAM Design Phase Geotechnical Evaluation Proposed Water System Improvements Highway 56 and 10th St NW Adams, Minnesota	BORING: **B-04** LOCATION: See attached sketch DATE: 11/20/2024 SCALE: 1" = 3'

Elev.	Depth	USCS Symbol	Description of Materials (ASTM D 2487/2488)	BPF	WL	Tests and Notes
1278.4	0.0	CL	**SANDY LEAN CLAY** trace of gravel, brown to black, wet, rather soft. (Fill)			Elevations provided by Davy Engineering, Co.
				4		PP = 1.75 tsf, MC = 20.0%
1274.4	4.0	CL	**SANDY LEAN CLAY** trace of gravel, dark grey to black to brown, wet, soft to rather soft. (Alluvium)			
				4		PP = 1.75 tsf, MC = 22.0%
				2		PP = 1.5 tsf, MC = 23.6%
1269.4	9.0	CL	**SANDY LEAN CLAY** trace of gravel, dark grey, wet, rather soft to rather stiff. (Glacial Till)			
				5		PP = 2.5 tsf, MC = 18.9%
				10		PP = 3.5 tsf
				11		PP > 4.5 tsf, MC = 14.1%
1263.5	14.9		End of boring. Boring sealed upon completion.			

CVT STANDARD 24486.24.IAM (ADAMS WATER SYSTEM IMPROVEMENTS).GPJ LOG A GNNN06.GDT 12/2/24

UNIFIED SOIL CLASSIFICATION (ASTM D-2487/2488)

MATERIAL TYPES	CRITERIA FOR ASSIGNING SOIL GROUP NAMES			GROUP SYMBOL	SOIL GROUP NAMES & LEGEND
COARSE-GRAINED SOILS >50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% OF COARSE FRACTION RETAINED ON NO 4. SIEVE	CLEAN GRAVELS <5% FINES	Cu>4 AND 1<Cc<3	GW	WELL-GRADED GRAVEL
			Cu>4 AND 1>Cc>3	GP	POORLY-GRADED GRAVEL
		GRAVELS WITH FINES >12% FINES	FINES CLASSIFY AS ML OR CL	GM	SILTY GRAVEL
			FINES CLASSIFY AS CL OR CH	GC	CLAYEY GRAVEL
	SANDS >50% OF COARSE FRACTION PASSES ON NO 4. SIEVE	CLEAN SANDS <5% FINES	Cu>6 AND 1<Cc<3	SW	WELL-GRADED SAND
			Cu>6 AND 1>Cc>3	SP	POORLY-GRADED SAND
		SANDS AND FINES >12% FINES	FINES CLASSIFY AS ML OR CL	SM	SILTY SAND
			FINES CLASSIFY AS CL OR CH	SC	CLAYEY SAND
FINE-GRAINED SOILS >50% PASSES NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT<50	INORGANIC	PI>7 AND PLOTS>"A" LINE	CL	LEAN CLAY
			PI>4 AND PLOTS<"A" LINE	ML	SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OL	ORGANIC CLAY OR SILT
	SILTS AND CLAYS LIQUID LIMIT>50	INORGANIC	PI PLOTS >"A" LINE	CH	FAT CLAY
			PI PLOTS <"A" LINE	MH	ELASTIC SILT
		ORGANIC	LL (oven dried)/LL (not dried)<0.75	OH	ORGANIC CLAY OR SILT
HIGHLY ORGANIC SOILS		PRIMARILY ORGANIC MATTER, DARK IN COLOR, AND ORGANIC ODOR		PT	PEAT

Relative Proportions of Sand and Gravel

TERM	PERCENT
Trace	< 15
With	15 - 29
Modifier	> 30

Relative Proportions of Fines

TERM	PERCENT
Trace	< 5
With	5 - 12
Modifier	> 12

Grain Size Terminology

TERM	SIZE
Boulder	< 12 in.
Cobble	3 in. - 12 in.
Gravel	#4 sieve to 3 in.
Sand	#200 sieve to #4 sieve
Silt or Clay	Passing #200 sieve

SAMPLE TYPES

Hollow Stem

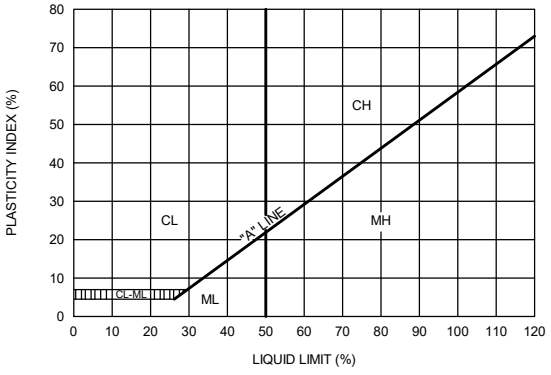
Standard Penetration Test

TEST SYMBOLS

MC	-	MOISTURE CONTENT	LL	-	LIQUID LIMIT
OC	-	ORGANIC CONTENT	PI	-	PLASTISITY INDEX
CN	-	CONSOLIDATION	SW	-	SWELL TEST
DD	-	DRY DENSITY	UU		Unconsolidated Undrained triaxial
PP	-	POCKET PENETROMETER			
RV	-	R-VALUE			
SA	-	SIEVE ANALYSIS			
P200	-	% PASSING #200 SIEVE			

- WATER LEVEL (WITH TIME OF) MEASUREMENT

PLASTICITY CHART



PENETRATION RESISTANCE
(RECORDED AS BLOWS / 0.5 FT)

SAND & GRAVEL		SILT & CLAY		
RELATIVE DENSITY	BLOWS/FOOT*	CONSISTENCY	BLOWS/FOOT*	COMPRESSIVE STRENGTH (TSF)
VERY LOOSE	0 - 4	VERY SOFT	0 - 1	0 - 0.25
LOOSE	4 - 10	SOFT	2 - 3	0.25 - 0.50
MEDIUM DENSE	10 - 30	RATHER SOFT	4 - 5	0.50 - 1.0
DENSE	30 - 50	MEDIUM	6 - 8	
VERY DENSE	OVER 50	RATHER STIFF	9 - 12	1.0 - 2.0
		STIFF	13 - 16	
		VERY STIFF	17 - 30	2.0 - 4.0
		HARD	OVER 30	OVER 4.0

* NUMBER OF BLOWS OF 140 LB HAMMER FALLING 30 INCHES TO DRIVE A 2 INCH O.D. (1-3/8 INCH I.D.) SPLIT-BARREL SAMPLER THE LAST 12 INCHES OF AN 18-INCH DRIVE (ASTM-1586 STANDARD PENETRATION TEST).

Chosen Valley Testing

Job No. 24486.24.IAM

LEGEND TO SOIL DESCRIPTIONS

CVT

Chosen Valley Testing, Inc.

CVT 24486.24.IAM (ADAMS WATER SYSTEM IMPROVEMENTS).GPJ 12/2/24