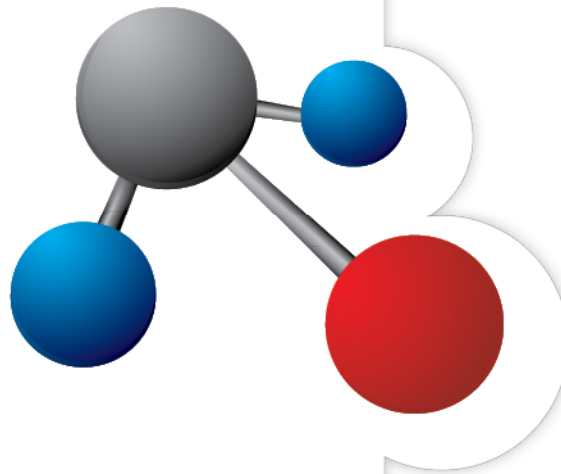


FARGO WWTP FLOOD PROTECTION IMPROVEMENTS



PREPARED FOR:



February 2024

City Project No. WW1707

FEMA Project No. PDM-PJ-08-ND-2018-023

AE2S Project No. P00803-2016-070

Bidding Documents

PROJECT MANUAL



Advanced Engineering and Environmental Services, LLC
4170 28th Ave S, Fargo, ND 58104
Ph: 701-364-9111 Fax: 701-364-9979 Web: www.AE2S.com

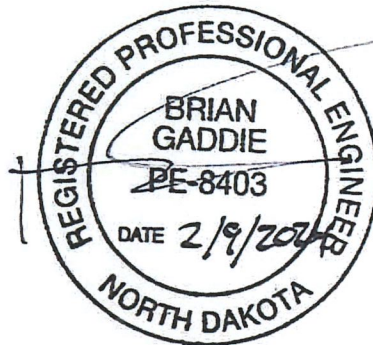
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**PLANS AND SPECIFICATIONS
FOR
Fargo WWTP Flood Protection Improvements
Fargo, North Dakota**

February 2024

CIVIL ENGINEER

I hereby certify that these Plans and Specifications were prepared by me or under my direct supervision and I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Brian Gaddie, PE

Date: February 9, 2024

Reg. No. PE-8403

STRUCTURAL ENGINEER

I hereby certify that these Plans and Specifications were prepared by me or under my direct supervision and I am a duly Registered Professional Engineer under the laws of the State of North Dakota.



Jay R. Kleven, PE

Date: February 9, 2024

Reg. No. PE-4685

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PROCUREMENT AND CONTRACTING REQUIREMENTS

SECTION 00 11 13 - ADVERTISEMENT FOR BIDS

CITY OF FARGO — BIDS WANTED

FARGO WWTP FLOOD PROTECTION IMPROVEMENTS FEMA PROJECT NO.: PDMC-PJ-08-ND-2018-023 CITY OF FARGO PROJECT NO. WW1707

NOTICE IS HEREBY GIVEN, that the City of Fargo, North Dakota, City Auditor will receive Bids via the Quest CDN vBid platform until **Wednesday, February 28, 2024 at the hour of 11:30 AM** local time, for the purpose of furnishing all materials, labor, equipment, and skill required for the construction of, Project No. WW1707 Fargo WWTP Flood Protection Improvements, and incidental items, for said City, as is more fully described and set forth in the Bidding Documents. Bids will then be opened and read aloud at approximately 11:45 AM in the Engineering Conference Room in Fargo City Hall. The public is encouraged to view the bid opening from their computer, tablet, or smartphone by using the following link: www.fargobidopenings.com.

The Work is comprised of a single Contract: Contract No. 1 – General Construction. The Work for Contract No. 1 is generally described as follows:

Work generally consists of construction associated with the furnishing and installation of Topsoil Stripping, Topsoil Import and Spread; Excavation; Fill Import; Levee Embankment; Levee Inspection Trench; Subgrade Preparation; Sheet Pile Floodwall; Cladding at Sheet Pile; Stone Cap for Sheet Pile; Paint and Prep of Sheet Pile, Water Main Installation, Ornamental Fence; Chain-link Fence; Sluice Gate Well Structures; Concrete Driveway Paving; and other miscellaneous items.

The work for each contract must be completed no later than the following:

Milestone #1 Completion:	28 calendar days
Substantial Completion:	October 15, 2024
Final Completion:	December 15, 2024

Bid Submissions:

Bidders shall submit their bids online via the Quest CDN vBid platform. All Bids shall be prepared according to Section 00 21 13 - Instructions to Bidders contained within the Project Manual and must include:

- 1) Acknowledgement by the Bidder of Receipt of all Project Addenda.
 - a) Prospective Bidders will be required to download all addenda in order to submit an online bid. Submittal of an online bid will be taken as acknowledgement of all addendums.
- 2) **Bid security:** must be in a sum equal to five percent (5%) of the full amount of the bid and must be in the form of a bidder's bond. A bidder's bond must be executed by the bidder as principal and by a surety, conditioned that if the principal's bid is accepted and the contract awarded to the principal, the principal, within ten (10) days after notice of the award, shall execute a contract in accordance with the terms of the bid and the bid bond and any condition of the governing body. A countersignature of a bid bond is not required under this section. If a successful bidder does not execute a contract within the ten (10) days allowed, the bidder's bond must be forfeited to the governing body and the project awarded to the next lowest responsible bidder.
- 3) **Copy of Contractor's License or Renewal Certificate:** All bidders, except a bidder on a municipal, rural, and industrial water supply project using funds provided under Public Law No. 99-294 [100 Stat. 426; 43 U.S.C. 390a], must be licensed for the full amount of the bid as

required by section 43-07-12. Bidder must be the holder of a Contractor's License at least ten days before the date set for receiving bids to be a qualified bidder and a copy of the Contractor's License issued by the Secretary of State **must be** included in the bid submission as required under N. D. Cent. Code Section 43-07-12.

No Bid will be read or considered that does not fully comply with the above provisions and other provisions contained within the Bidding Documents, and any deficient Bid submitted will be unopened.

Complete digital project Bidding Documents are available at www.questcdn.com. You may download the digital plan documents for Forty-Two Dollars (\$42.00) by inputting Quest project #8954626 on the website's Project Search page. Please contact QuestCDN at 952-233-1632 or info@questcdn.com for assistance in free membership registration, downloading, and working with this digital project information. Alternatively, paper bid documents may be acquired from the office of the Engineer, **Advanced Engineering and Environmental Services, LLC**, 4170 28th Avenue South, Fargo, ND 58104 for One Hundred Twenty-Five Dollars (\$125.00).

All Bids will be made on the basis of cash payment for such work. The Board of City Commissioners of the City of Fargo, North Dakota, reserves the right to hold all bids for a period of forty-five (45) days after the first day fixed for the opening of the bids, and the right to reject any or all bids and to waive any formalities.

City Auditor's Office
(February 7, 14 and 21, 2024)

END OF SECTION

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

ARTICLE 1 - DEFINED TERMS

- 1.01 Terms used in these Instructions to Bidders will have the meanings indicated in the General Conditions and Supplementary Conditions. Additional terms used in these Instructions to Bidders have the meanings indicated below which are applicable to both the singular and plural thereof:
- A. *Bidder* - The individual or entity who submits a Bid directly to OWNER.
 - B. *Successful Bidder* - The lowest responsible Bidder submitting a responsive Bid to whom OWNER (on the basis of OWNER's evaluation as provided herein) makes an award.

ARTICLE 2 - COPIES OF BIDDING DOCUMENTS

- 2.01 Complete sets of the Bidding Documents may be obtained from the Engineer. The cost, as stated in the Advertisement for Bids, is **NON-REFUNDABLE**.
- 2.02 Complete sets of Bidding Documents must be used in preparing Bids; neither OWNER nor ENGINEER assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.
- 2.03 OWNER and ENGINEER in making copies of Bidding Documents available on the above terms do so only for the purpose of obtaining Bids for the Work and do not confer a license or grant for any other use.

ARTICLE 3 - QUALIFICATIONS OF BIDDERS

- 3.01 To demonstrate Bidder's qualifications to perform the Work, Bidder shall submit written evidence such as previous experience, present commitments, and such other data as may be called for below.
- A. Bidders shall have qualifications performing work of similar type and size as this Project. Bidder shall have successfully completed a minimum of two (2) projects of similar complexity as this Project. All bidders shall submit, upon request, a thoroughly completed Bidder Qualifications Form. Failure to submit the above information on the provided form may be cause for rejection of the Bid.
 - B. The OWNER reserves the right to reject any Bid, if the experience qualifications submitted by, or investigation of, such Bidder fails to satisfy the OWNER that such Bidder is properly qualified to carry out the obligations of the agreement and to complete the work contemplated therein.
 - C. The Owner reserves the right to disqualify a superintendent based on past work history.

- D. The Owner reserves the right to disqualify a bidder based on work history or any other factors impacting the bidder's status as a responsible bidder.
- E. A contractor's license or renewal form must be submitted with the Bid.

ARTICLE 4 - EXAMINATION OF BIDDING DOCUMENTS, OTHER RELATED DATA, AND SITE

4.01 Subsurface and Physical Conditions

- A. The Supplementary Conditions identify:
 - 1. Those reports of explorations and tests of subsurface conditions at or contiguous to the Site that Engineer has used in preparing the Bidding Documents.
 - 2. Those drawings of physical conditions in or relating to existing surface and subsurface structures at or contiguous to the Site (except Underground Facilities) that ENGINEER has used in preparing the Bidding Documents.

4.02 Underground Facilities

- A. The Supplementary Conditions identify those reports and drawings relating to existing Underground Facilities at or contiguous to the Site, if any, that the Engineer has used in preparing the Bidding Documents.

4.03 Hazardous Environmental Condition

- A. The Supplementary Conditions identify those reports and drawings relating to a Hazardous Environmental Condition identified at the Site, if any, that ENGINEER has used in preparing the Bidding Documents.
- B. Copies of referenced reports and drawings will be made available by Owner to any Bidder on request. Those reports and drawings are not part of the Contract Documents, but the "technical data" contained therein upon which Bidder is entitled to rely as provided in paragraph 5.03.C of the General Conditions has been identified and established in 5.03.E of the Supplementary Conditions. Bidder is responsible for any interpretation or conclusion Bidder draws from any "technical data" or any other data, interpretations, opinions, or information contained in such reports or indicated in such drawings.

4.04 Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to subsurface conditions, other physical conditions and Underground Facilities, and possible changes in the Bidding Documents due to differing or unanticipated conditions appear in paragraphs 5.03, 5.04 and 5.05 of the General Conditions. Provisions concerning responsibilities for the adequacy of data furnished to prospective Bidders with respect to a Hazardous Environmental Condition at the Site, if any, and possible changes in the Contract Documents due to any Hazardous

Environmental Condition uncovered or revealed at the Site which was not shown or indicated in the Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work appear in paragraph 5.06 of the General Conditions.

- 4.05 On request, OWNER will provide Bidder access to the Site to conduct such examinations, investigations, explorations, test, and studies as Bidder deems necessary for submission of a Bid. Bidder shall fill all holes and clean up and restore the Site to its former condition upon completion of such explorations, investigations, tests, and studies.
- 4.06 Reference is made to Article 8 of the Supplementary Conditions for the identification of the general nature of other Work that is to be performed at the Site by OWNER or others (such as utilities and other prime contractors) that relates to the Work for which a Bid is to be submitted. On request, OWNER will provide to each Bidder for examination access to or copies of Contract Documents (other than portions thereof related to price) for such other Work.
- 4.07 It is the responsibility of each Bidder before submitting a Bid to:
- A. examine and carefully study the Bidding Documents, including any Addenda and the other related data identified in the Bidding Documents;
 - B. visit the Site and become familiar with and satisfy Bidder as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work;
 - C. become familiar with and satisfy Bidder as to all federal, state, and local Laws and Regulations that may affect cost, progress, or performance of the Work;
 - D. carefully study all reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 5.03 of the General Conditions, and carefully study all reports and drawings of a Hazardous Environmental Condition, if any, at the Site which have been identified in the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions;
 - E. obtain and carefully study (or assume responsibility for doing so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including any specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents, and safety precautions and programs incident thereto;
 - F. agree at the time of submitting its Bid that no further examinations, investigations, explorations, tests, studies, or data are necessary for the

determination of its Bid for performance of the Work at the price bid and within the times and in accordance with the other terms and conditions of the Bidding Documents;

- G. become aware of the general nature of the Work to be performed by OWNER and others at the Site that relates to the Work as indicated in the Bidding Documents;
- H. correlate the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents;
- I. promptly give ENGINEER written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder discovers in the Bidding Documents and confirm that the written resolution thereof by ENGINEER is acceptable to Bidder; and
- J. determine that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work.

4.08 The submission of a Bid will constitute an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article 4, that without exception the Bid is premised upon performing and furnishing the Work required by the Bidding Documents and applying any specific means, methods, techniques, sequences, and procedures of construction that may be shown or indicated or expressly required by the Bidding Documents, that Bidder has given ENGINEER written notice of all conflicts, errors, ambiguities, and discrepancies that Bidder has discovered in the Bidding Documents and the written resolutions thereof by ENGINEER are acceptable to Bidder, and that the Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for performing and furnishing the Work.

ARTICLE 5 - PRE-BID CONFERENCE

5.01 A Pre-Bid conference will not be held for this Project.

ARTICLE 6 - SITE AND OTHER AREAS

6.01 The Site is identified in the Bidding Documents. All additional lands and access thereto required for temporary construction facilities, construction equipment, or storage of materials and equipment to be incorporated in the Work are to be obtained and paid for by the CONTRACTOR. Easements for permanent structures or permanent changes in existing facilities are to be obtained and paid for by OWNER unless otherwise provided in the Bidding Documents.

ARTICLE 7 - INTERPRETATIONS AND ADDENDA

7.01 All questions about the meaning or intent of the Bidding Documents are to be submitted to ENGINEER in writing. Interpretations or clarifications considered necessary by

ENGINEER in response to such questions will be issued by Addenda mailed or delivered to all parties recorded by ENGINEER as having received the Bidding Documents. Questions received less than ten (10) days prior to the date for opening of Bids may not be answered. Only questions answered by Addenda will be binding. Oral and other interpretations or clarifications will be without legal effect.

- 7.02 Addenda may be issued to clarify, correct, or change the Bidding Documents as deemed advisable by OWNER or ENGINEER.

ARTICLE 8 - BID SECURITY

- 8.01 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 and in the form of a Bid Bond on the form attached, **or one substantially similar**, and issued by a surety meeting the requirements of paragraph 6.01 of the General Conditions. **Failure to do so shall be cause for classifying the Bid as non-responsive and the Bid not being opened.**
- 8.02 The Bid security of the Successful Bidder will be retained until such Bidder has executed the Contract Documents, furnished the required contract security and met the other conditions of the Notice of Award, whereupon the Bid security will be returned. If the Successful Bidder fails to execute and deliver the Contract Documents and furnish the required contract security within fifteen (15) days after Notice of Award, OWNER may annul the Notice of Award and the Bid security of that Bidder will be forfeited. The Bid security of all Bidders shall be retained by OWNER until the earlier of seven (7) days after the Effective Date of Agreement or sixty (60) days after the Bid opening, whereupon Bid security furnished by such Bidders will be returned.

ARTICLE 9 - CONTRACT TIMES

- 9.01 The number of days within which, or the dates by which, the Work is to be Substantially Completed and also completed and ready for final payment are set forth in the Agreement.

ARTICLE 10 - LIQUIDATED DAMAGES

- 10.01 Provisions for liquidated damages are set forth in the Agreement.

ARTICLE 11 - SUBSTITUTE AND "OR-EQUAL" ITEMS

- 11.01 The Contract, if awarded, will be on the basis of materials and equipment specified or described in the Bidding Documents without consideration of possible substitute, "or-equal", "approved equivalent", or "prior approved equivalent" items. Whenever it is specified or described in the Bidding Documents that a substitute, "or-equal", or "approved equivalent", or "prior approved equivalent" item of material or equipment may be furnished or used by CONTRACTOR if acceptable to ENGINEER, Bidder may make application to Engineer for approval of the substitute, "or-equal", or "approved equivalent" material or equipment. Engineer will consider request for approval ONLY if submitted at least ten (10) days prior to the date for receipt of Bids. Each such request

shall include the name of the material or equipment for which it is to be considered as a substitute, "or-equal", or "approved equivalent" and a complete description of the proposed item including drawings, cuts, performance, and test data and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment or Work that incorporation of the proposed item would require shall be included. The burden of proof of the merit of the proposed item is upon the Bidder. Engineer's decision of approval or disapproval of a proposed item will be final. If Engineer approves any proposed item, such approval will be set forth in an Addendum issued to all prospective Bidders. Bidders shall not rely upon approvals made in any other manner.

ARTICLE 12 - SUBCONTRACTORS, SUPPLIERS, AND OTHERS

- 12.01 If the Supplementary Conditions require the identity of certain Subcontractors, Suppliers, individuals, or entities to be submitted to OWNER in advance of specified date prior to the Effective Date of the Agreement, the apparent Successful Bidder, and any other Bidder so requested, shall within five (5) days after Bid opening, submit to OWNER a list of all such Subcontractors, Suppliers, individuals, or entities proposed for those portions of the Work for which such identification is required. Such lists shall be accompanied by an experience statement with pertinent information regarding similar projects and other evidence of qualification for each such Subcontractor, Supplier, individual, or entity if requested by OWNER. If OWNER or ENGINEER after due investigation, has reasonable objection to any proposed Subcontractor, Supplier, individual, or entity, OWNER may, before the Notice of Award is given, request apparent Successful Bidder to submit a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in the cost occasioned by such substitution, and OWNER may consider such price adjustment in evaluating Bids and making the contract award.
- 12.02 If apparent Successful Bidder declines to make any such substitution, OWNER may award the contract to the next lowest Bidder that proposes to use acceptable Subcontractors, Suppliers, individuals, or entities. Declining to make requested substitutions will not constitute grounds for forfeiture of the Bid security of any Bidder. Any Subcontractor, Supplier, individual or entity so listed and against which OWNER or ENGINEER makes no written objection prior to the giving of the Notice of Award will be deemed acceptable to OWNER and ENGINEER subject to revocation of such acceptance after the Effective Date of the Agreement as provided in paragraph 7.06 of the General Conditions.
- 12.03 CONTRACTOR shall not be required to employ any Subcontractor, Supplier, individual, or entity against whom CONTRACTOR has reasonable objection.

ARTICLE 13 - PREPARATION OF BID

- 13.01 The Bid form is included with the Bidding Documents.

- A. Bid prices shall NOT be indicated on the Bid Form and only entered online into the QuestCDN vBid system. A submitted online bid will be taken as a signed bid form, acknowledgment of all addendums, and acknowledgement of Section 00 41 00 Bid Form by the Bidder.

ARTICLE 14 - BASIS OF BID; EVALUATION OF BIDS

14.01 General

- A. Bidders shall submit a Bid on individual Contracts or any combination of Contracts as set forth in the Bid Form.
 - 1. Bidders may submit a Bid for any of the separate Contracts or any combination of Contracts as provided in the Bid Form. Submission of a Bid on any Contract signifies Bidder's willingness to enter into a Contract for that section alone at the price offered.
 - 2. Bidders offering a Bid on one or more contracts must be capable of completing the Work within the time period stated in the Agreement.

14.02 Unit Price

- A. Bidders shall submit a Bid on a unit price basis for contracts established as unit price contracts as set forth in the Bid Form.
- B. The total of all estimated prices will be determined as the sum of the products of the estimated quantity of each item and the unit price Bid for the item. 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.

14.03 Lump Sum

- A. Bidders shall submit a Bid, on a lump sum basis, on individual Contracts, any combination of Contracts, or the Combined Contract as set forth in the Bid Form.
 - 1. Submission of a Bid on any Contract signifies Bidder's willingness to enter into a Contract for the Contract(s) indicated by the Bidder on the Bid Form at the price(s) offered.
 - 2. Bidders offering a Bid on one or more Contracts must be capable of completing the Work with the time period stated in the Agreement.
- B. Discrepancies between words and figures will be resolved in favor of the words.

- C. Bidders shall 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.
- 14.04 The Bid price shall include such amounts as the Bidder deems proper for overhead and profit on account of cash allowances, if any, named in the Contract Documents as provided in paragraph 13.02 of the General Conditions.

ARTICLE 15 - SUBMITTAL OF BID

- 15.01 Each Prospective Bidder is to complete a bid submittal online using the project specific Quest CDN link. A submitted online bid will be taken as a signed bid form, acknowledgement of all addenda, and acknowledgement of Section 00 41 00 by the Bidder.
- 15.02 Bid shall be submitted no later than the date and time prescribed in the Advertisement for Bids. Bids received after the date and time prescribed for the receiving of bids, or not submitted with all documentation as listed in article 15.03 of this Instructions to Bidders, will not be accepted.
- 15.03 Bidder shall prepare the Electronic Bid Submittal as indicated in the QuestCDN Online Bidding User Guide and must include the following: Bidder shall prepare his Bid as follows:
- A. Online Bid Form
 - B. Bid Bond / Bid Security
 - C. Contractor's License or Certificate of Renewal
 - D. **Note: Any Bidder who fails to include all forms indicated above will be considered non-responsive and the Bid will not be opened.**

ARTICLE 16 - MODIFICATION AND WITHDRAWAL OF BID

- 16.01 A Bid may be modified or withdrawn by an appropriate document duly executed in the 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.
- 16.02 If within 24 hours after Bids are opened any Bidder files a duly signed written notice with OWNER and promptly thereafter demonstrates to the reasonable satisfaction of OWNER that there was a material and substantial mistake in the preparation of its Bid, that Bidder may withdraw the Bid, and the Bid Bond will be returned. Thereafter, if the Work is re-bid, that Bidder will be disqualified from further bidding on the Work.

ARTICLE 17 - OPENING OF BIDS

- 17.01 Bids will be opened at the time and place indicated in the Advertisement for Bids and, unless obviously non-responsive, read aloud publicly. An abstract of the amounts of the Bids will be made available to Bidders after the opening of Bids.

ARTICLE 18 - BIDS TO REMAIN SUBJECT TO ACCEPTANCE

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

ARTICLE 19 - AWARD OF CONTRACT

- 19.01 OWNER reserves the right to reject any or all Bids **for any reason**. OWNER also reserves the right to waive all informalities and to negotiate contract terms with the Successful Bidder. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum. Discrepancies between words and figures will be resolved in favor of the words.
- 19.02 More than one Bid for the same Work from an individual or entity under the same or different names will not be considered. Reasonable grounds for believing that a Bidder has an interest in more than one Bid for the Work may be cause for disqualification of that Bidder and the rejection of all Bids in which that Bidder has an interest.
- 19.03 In evaluating Bids, OWNER will consider whether or not the Bids comply with the prescribed requirements, and such alternates, unit prices and other data, as may be requested in the Bid Form or prior to the Notice of Award.
- 19.04 In evaluating Bidders, OWNER will consider the qualifications of Bidders and may consider the qualifications and experience of Subcontractors, Suppliers, and other individuals or entities proposed for those portions of the Work for which the identity of Subcontractors, Suppliers, and other individuals or entities must be submitted as provided in the Supplementary Conditions.
- 19.05 OWNER may conduct such investigations as OWNER deems necessary to establish the responsibility, qualifications, and financial ability of Bidders, proposed Subcontractors, Suppliers, individuals, or entities to perform the Work in accordance with the Contract Documents.
- 19.06 **OWNER will request a Certificate Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion (See Attachment C to Section 00 73 40) from the responsible and responsive Bidder. The signed Certificate Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion, must be received by the OWNER from the Bidder no later than 11:00 am the following calendar day following the bid opening. The Certificate must be received prior to OWNER's issuance of the Notice of Award.**
- 19.07 Contracts shall be awarded on the basis of the low Bid submitted by a responsible and responsive Bidder deemed most favorable to the Owner's interest.

ARTICLE 20 - CONTRACT SECURITY AND INSURANCE

- 20.01 Article 6 of the General Conditions, as may be modified by the Supplementary Conditions, sets forth OWNER's requirements as to Performance and Payment Bonds and insurance. When the Successful Bidder delivers the executed Agreement to OWNER, it must be accompanied by such Bonds and insurance.

ARTICLE 21 - EXECUTION OF AGREEMENT

- 21.01 When OWNER gives a Notice of Award to the Successful Bidder, it shall be accompanied by the required number of unsigned counterparts of the Agreement with the other Contract Documents which are identified in the Agreement as attached thereto. Within ten (10) days thereafter, Successful Bidder shall sign and deliver the required number of counterparts of the Agreement and attached documents to OWNER. Within ten (10) days thereafter, OWNER shall deliver one (1) fully signed counterpart to Successful Bidder with a complete set of the Drawings with appropriate identification.
- 21.02 A performance bond and payment bond, each in the amount of 100 percent of the contract price, with a corporate surety approved by the OWNER, will be required as security for the faithful performance and payment of obligation under the Agreement. Attorneys-in-fact who sign the performance and payment bonds must file with each bond a certified and effective dated copy of their power of attorney.
- 21.03 In the event of the Bidder failing to execute the Agreement, the OWNER may at their option consider the Bidder in default, in which case the certified check, bank check, or Bid Bond accompanying the Bid shall become property of the OWNER.
- 21.04 Within ten (10) days after receipt of acceptable performance and payment bonds and the Agreement signed by the Successful Bidder, OWNER shall sign the Agreement and return to the Successful Bidder an executed duplicate of the Agreement.
- 21.05 The Notice to Proceed shall be issued within ten (10) days of the execution of the Agreement by the OWNER. A preconstruction conference will be held prior to the issuance of the Notice to Proceed. Should there be any reason why the Notice to Proceed cannot be issued within such period, the time may be extended by mutual agreement between the OWNER and CONTRACTOR. If the Notice to Proceed has not been issued within ten (10) days of the execution of the Agreement or within the period mutually agreed upon, the CONTRACTOR may terminate the Agreement without further liability on the part of either party.

ARTICLE 22 - SALES AND USE TAXES

- 22.01 OWNER is not exempt from State of North Dakota state sales and use taxes on materials and equipment to be incorporated in the Work. Said taxes shall be included in the Bid.

ARTICLE 23 - RETAINAGE

- 23.01 Retention of CONTRACTOR's securities in lieu of retainage is not acceptable; provisions concerning retainage are set forth in the Agreement.

ARTICLE 24 - EXECUTIVE ORDER

- 24.01 The Successful Bidder shall comply with all requirements of Executive Order No. 11246 regarding non-discrimination in employment and shall incorporate the same in all subcontractors over \$10,000. An excerpt from Executive Order No. 11246 has been provided for reference in the Project Manual.

ARTICLE 25 - EQUAL OPPORTUNITY REQUIREMENTS

- 25.01 The Bidder will not discriminate against any employee or applicant for employment because of race, color, religion, sex, or national origin. The Bidder will take affirmative action to ensure that applicants are employed and that employees are treated during employment, without regard to race, color, religion, sex, or national origin. Such action shall include, but not be limited to the following: Employment, upgrading, demotion, or transfer, recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Bidder agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the contracting officer setting forth the provisions of this nondiscrimination clause.
- 25.02 The Bidder will, in all solicitation or advertisements for employees placed by or on behalf of the Bidder, state that all qualified applicants will receive consideration for employment without regard to race, color, religion, sex, or national origin.
- 25.03 The Bidder will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice to be provided by the agency contracting officer, advising the labor union or workers' representative of the Bidder's commitments under section 202 of Executive Order 11246 of September 24, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.
- 25.04 The Bidder will comply with all provisions of Executive Order 11246 of September 24, 1965, and of the rules, regulations, and relevant orders of the Secretary of Labor.
- 25.05 The Bidder will furnish all information and reports required by Executive Order 11246 of September 24, 1965, and by the rules, regulations, and orders of the Secretary of Labor, or pursuant thereto, and will permit access to his books, records, and accounts by the contracting agency and the Secretary of Labor for purposes of investigation to ascertain compliance with such rules, regulations, and orders.
- 25.06 In the event of the Bidder's non-compliance with the nondiscrimination clauses of this contract or with any of such rules, regulations or orders, this contract may be cancelled, terminated or suspended in whole or in part and the Bidder may be declared ineligible for further Government contracts in accordance with procedures authorized in Executive Order 11246 of September 24, 1965, and such other sanctions may be imposed and

remedies invoked as provided in Executive Order 11246 of September 24, 1965 or by rule, regulation or order of the Secretary of Labor, or as otherwise provided by law.

- 25.07 The Bidder will include the provisions of paragraphs as above stated in every subcontract or purchase order unless exempted by rules, regulations or orders of the Secretary of Labor issued pursuant to section 204 of Executive Order 11246 of September 24, 1965, so that such provisions will be binding upon each subcontractor or vendor. The Bidder will take such action with respect to any subcontract or purchase order as the contracting agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, That in the event the Bidder becomes involved in or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the contracting agency, the Bidder may request the United States to enter into such litigation to protect the interests of the United States.

END OF SECTION

SECTION 00 41 00 - BID FORM
FARGO WWTP FLOOD PROTECTION IMPROVEMENTS
ENGINEER'S PROJECT NUMBER: P00803-2016-070
FEMA PROJECT NUMBER: PDMC-PJ-08-ND-2018-023
WASTEWATER UTILITY PROJECT NUMBER: WW1707

ARTICLE 1 - BID RECIPIENT:

1.01. This Bid is submitted to:

City of Fargo
Attn: City Auditor
225 4th Street North
Fargo, North Dakota 58102

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

ARTICLE 2 - BIDDER'S ACKNOWLEDGEMENTS

2.01. Bidder accepts all of the terms and conditions of the Advertisement for Bids and Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. The Bid will remain subject to acceptance for forty-five (45) days after the day of Bid opening. BIDDER will sign and deliver the required number of counterparts of the Agreement with the Bonds and other documents required by the Bidding Requirements within fifteen (15) days after the date of OWNER's Notice of Award.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01. In submitting this Bid, Bidder represents, as set forth in the Agreement, that:

- A. Bidder examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of all Addenda.
- B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
- C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

- D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.
- E. 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 any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.
- F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.
- G. 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.
- H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.
- I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.
- J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 - BIDDER'S CERTIFICATION

4.01. Bidder certifies that:

- 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; and
- D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of the Paragraph 4.01D:
 - 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 the 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; and
 - 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 - BASIS OF BID

5.01. Bidder will complete the Work, whether specifically listed on the BID FORM on the vBid Worksheet within QuestCDN (see Section 00 41 00.01 for Unit Price Bid Items and Units), shown on the Drawings, or described in the Specifications, in accordance with the Contract Documents for the following price(s):

- A. (P) Indicates item that will be measured and paid based upon "Planned" quantity.
- B. Bidder acknowledges that (1) each Bid Unit Price includes an amount considered by Bidder to be adequate to cover Contractor's overhead and profit for each separately identified item, and (2) estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all unit price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 - TIME OF COMPLETION

6.01. Bidder agrees that the Work will be substantially complete by the calendar dates indicated below, and have all Work completed and ready for final payment in accordance with the General Conditions by the below-indicated calendar dates.

6.02. Applicable to All Contracts:

Milestone Completion	28 Days After Project Commencement
Substantial Completion	October 15, 2024
Final Completion	December 15, 2024

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

- | | | |
|----|------------------------------------|--------------------------|
| A. | Milestone #1 | \$1,000 per calendar day |
| B. | Substantial Completion of All Work | \$2,500 per calendar day |
| C. | Final Completion | \$750 per calendar day |

ARTICLE 7 - ATTACHMENTS TO THIS BID

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

- A. Required Bid Security in the form of a Bid Bond.
- B. A copy of Bidder's ND Contractor's License or Certificate of Renewal with Contractor License Number.
- C. Online vBid Worksheet in QuestCDN.

ARTICLE 8 - DEFINED TERMS

8.01. 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.

ARTICLE 9 - BID SUBMITTAL

9.01. **Each prospective bidder is to complete their bid submittal online using the QuestCDN vBid worksheet form. By submitting an online bid within QuestCDN, a bidder hereby submits the bid as set forth above.**

9.02. The Bidder hereby expressly acknowledges his or her understanding of and his or her agreement to comply during the performance of any work under any contract resulting from this bid with all equal opportunity obligations.

END OF SECTION

SECTION 00 41 00.01
BID FORM ATTACHMENT

SEE ATTACHED SECTION.

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Bid Form

**City of Fargo WWTP Flood Protection Plan
FEMA Project ID: PDMC-PJ-08-ND-2018-023
AE2S Project Number P00803-2016-070**

Line	Item Description	Quantity	Unit
Miscellaneous, Fences & Removals			
	A Mobilization, Bonding & Insurance	1.00	LS
	B Temporary Chain-link Fence	1.00	LS
	C Remove Fence (All Types)	620.00	LF
	D Remove Pipe (All Sizes All Types)	108.00	LF
	E Remove Concrete Pavement (All Depths)	548.00	SY
	F Remove Tree	3.00	EA
	H F&I Chain-link Fence	901.00	LF
	I Encase Pipe with CLSM (All Sizes All Types)	30.00	CY
Sanitary Sewer and Storm Manholes			
	J Raise Manhole	4.00	EA
Water Mains			
	K F&I Water Main Pipe - 4" Dia	10.00	LF
	K F&I Water Main Pipe - 6" Dia	335.00	LF
	K F&I Water Main Pipe - 10" Dia	5.00	LF
	L F&I Gate Valve 6" Dia	1.00	EA
	M F&I DI Fitting - MJ Coupling 4" Dia	1.00	EA
	M F&I DI Fitting - MJ Coupling 10" Dia	1.00	EA
	M F&I DI Fitting - MJ Red 6" x 4"	1.00	EA
	M F&I DI Fitting - MJ Tee 4" x 4"	1.00	EA
	M F&I DI Fitting - MJ Tee 10" x 6"	1.00	EA
	M F&I DI Fitting - MJ 45 Degree Bend Dia 6"	6.00	EA
	N Connect Pipe to Exist Pipe	2.00	EA
Gate Well Structures			
	O F&I Gate Well (SD-200)	1.00	EA
	O F&I Gate Well (SD-201)	1.00	EA
	O F&I Gate Well (SD-202)	1.00	EA
	P F&I Sluice Gate 24" Dia Stainless Steel	1.00	EA
	P F&I Sluice Gate 30" Dia Stainless Steel	1.00	EA
	P F&I Sluice Gate 86" Dia Stainless Steel	1.00	EA

Flood Mitigation - Earthen Levee & Earthwork

Q Topsoil - Strip, Stockpile and Spread (Levee and Floodwall Area) (P)	1,725.00	CY
R Topsoil - Haul (Levee and Floodwall Area)	1,000.00	CY
S Topsoil - Import (Levee and Floodwall Area)	1,000.00	CY
T Topsoil - Strip, Stockpile & Spread (Laydown Site) (P)	6,400.00	CY
U Excavation - Levee Inspection Trench	3,175.00	CY
V Excavation - Haul	1,600.00	CY
W Impervious Fill - Import From Offsite	1,100.00	CY
X Impervious Fill - Import From Onsite Stockpiles	8,325.00	CY
Y Levee Inspection Trench	4,000.00	CY
Z Embankment - Levee	6,900.00	CY
AA Subgrade Preparation - Levee (P)	5,425.00	SY
BB Embankment - Floodwall	525.00	CY

Geotextiles and Geogrids

CC F&I Woven Geotextile Fabric (P)	1,300.00	SY
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Aggregate and Concrete Pavement

DD F&I Temporary Access Road for Laydown Yard	1.00	LS
EE Subgrade Preparation - Pavement (P)	1,200.00	SY
FF F&I Aggregate Crushed Conc - 12" Thick (P)	1,200.00	SY
GG F&I Concrete Pavement - 10" Thick Reinforced (P)	1,100.00	SY

Flood Protection - Flood Wall

HH F&I Sheet Pile	7,560.00	SF
II F&I Sheet Pile Fabricated Transitions (greater than 100)	4.00	EA
JJ F&I Tank wall vertical extension	135.00	LF
KK F&I Fence Brackets	90.00	EA
MM F&I Fence - modular decorative, 8' tall	360.00	LF
MM F&I Fence - modular decorative, 8' tall, curved	135.00	LF
NN F&I Tank tie-in concrete pier, decorative, clad to match	2.00	EA
OO F&I Cladding ledger - sheet pile	360.00	LF
PP F&I Cladding ledger - rolled at tank	135.00	LF
QQ F&I Cladding at sheet pile	970.00	SF
RR F&I Cladding at tank, curved	360.00	SF
SS F&I Sheet pile cap steel fabrication (1/4" bent plate)	360.00	LF
TT F&I Stone cap	135.00	LF
UU F&I Stone cap transition pieces	6.00	EA
VV Sheet Pile painting	2,200.00	SFC
WW Sheet Pile dry side rock mulch and edging strip	30.00	CY
XX F&I utility crossing walers	2.00	EA
YY Sheet Pile trimming	100.00	HR
ZZ Pile driver set up and mobilization	1.00	EA

Erosion and Sediment Control and Turf Establishment

AAA Stormwater Management	1.00	LS
BBB Sediment Control Log 6" to 8" Dia	500.00	LF
CCC Inlet Protection - Existing Inlet	10.00	EA
DDD Silt Fence - Standard	7,170.00	LF
EEE Temp Construction Entrance	4.00	EA
FFF Concrete Washout Area	1.00	EA
GGG Mulching Type 1 - Hydro	21,200.00	SY
HHH Mulching Type 2 - Straw Mulch	15,000.00	SY
III Erosion Control Blanket Type 1	6,000.00	SY
JJJ Seeding Type B	27,200.00	SY
JJJ Temporary Cover Crop	3.00	AC

Traffic Control

LLL Traffic Control - Major	1.00	LS
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SECTION 00 43 13 - BID SECURITY FORM

Any singular reference to Bidder, Surety, Owner or other party shall be considered plural where applicable.

BIDDER (Name and Address):			
SURETY (Name, and Address of Principal Place of Business):			
OWNER (Name and Address):			
BID			
Bid Due Date:			
Description (Project Name— Include Location):			
BOND			
Bond Number:			
Date:			
Penal sum		\$	
	(Words)		(Figures)
Surety and Bidder, intending to be legally bound hereby, subject to the terms set forth below, do each cause this Bid Bond to be duly executed by an authorized officer, agent, or representative.			
BIDDER		SURETY	
	(Seal)		(Seal)
Bidder's Name and Corporate Seal		Surety's Name and Corporate Seal	
By:		By:	
	Signature		Signature (Attach Power of Attorney)
	Print Name		Print Name
	Title		Title
Attest:		Attest:	

	Signature		Signature
	Title		Title
Note: Addresses are to be used for giving any required notice. Provide execution by any additional parties, such as joint venturers, if necessary.			

- 1.01 Bidder and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors, and assigns to pay to Owner upon default of Bidder the penal sum set forth on the face of this Bond. Payment of the penal sum is the extent of Bidder's and Surety's liability. Recovery of such penal sum under the terms of this Bond shall be Owner's sole and exclusive remedy upon default of Bidder.
- 1.02 Default of Bidder shall occur upon the failure of Bidder to deliver within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents.
- 1.03 This obligation shall be null and void if:
 - A. Owner accepts Bidder's Bid and Bidder delivers within the time required by the Bidding Documents (or any extension thereof agreed to in writing by Owner) the executed Agreement required by the Bidding Documents and any performance and payment bonds required by the Bidding Documents, or
 - B. All Bids are rejected by Owner, or
 - C. Owner fails to issue a Notice of Award to Bidder within the time specified in the Bidding Documents (or any extension thereof agreed to in writing by Bidder and, if applicable, consented to by Surety when required by Paragraph 5 hereof).
- 1.04 Payment under this Bond will be due and payable upon default of Bidder and within 30 calendar days after receipt by Bidder and Surety of written notice of default from Owner, which notice will be given with reasonable promptness, identifying this Bond and the Project and including a statement of the amount due.
- 1.05 Surety waives notice of any and all defenses based on or arising out of any time extension to issue Notice of Award agreed to in writing by Owner and Bidder, provided that the total time for issuing Notice of Award including extensions shall not in the aggregate exceed 120 days from the Bid due date without Surety's written consent.
- 1.06 No suit or action shall be commenced under this Bond prior to 30 calendar days after the notice of default required in Paragraph 4 above is received by Bidder and Surety and in no case later than one year after the Bid due date.
- 1.07 Any suit or action under this Bond shall be commenced only in a court of competent jurisdiction located in the state in which the Project is located.
- 1.08 Notices required hereunder shall be in writing and sent to Bidder and Surety at their respective addresses shown on the face of this Bond. Such notices may be sent by

personal delivery, commercial courier, or by United States Registered or Certified Mail, return receipt requested, postage pre-paid, and shall be deemed to be effective upon receipt by the party concerned.

- 1.09 Surety shall cause to be attached to this Bond a current and effective Power of Attorney evidencing the authority of the officer, agent, or representative who executed this Bond on behalf of Surety to execute, seal, and deliver such Bond and bind the Surety thereby.
- 1.10 This Bond is intended to conform to all applicable statutory requirements. Any applicable requirement of any applicable statute that has been omitted from this Bond shall be deemed to be included herein as if set forth at length. If any provision of this Bond conflicts with any applicable statute, then the provision of said statute shall govern and the remainder of this Bond that is not in conflict therewith shall continue in full force and effect.
- 1.11 The term "Bid" as used herein includes a Bid, offer, or proposal as applicable.

END OF SECTION

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SECTION 00 43 29 - BIDDER QUALIFICATIONS FORM

The following information is to be submitted to demonstrate that the Bidder meets the experience requirements as indicated in paragraph 3.01.A of the Instruction to Bidders.

Bidder's Name:	
Relevant Project Experience	
Project Name	
Year Constructed	
Contract Amount (\$)	
Project Description	
Project Owner Contact Name and Number	
Project Engineer Contact Name and Number	
Relevant Project Experience	
Project Name	
Year Constructed	
Contract Amount (\$)	
Project Description	
Project Owner Contact Name and Number	
Project Engineer Contact Name and Number	

END OF SECTION

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SECTION 00 45 12 - CONTRACTOR DISPUTE HISTORY CERTIFICATION

Name, Location and Description of Project	Owner	Engineer	Reference/Contact Include address & Phone	Describe the nature of the Dispute	Describe Dispute Outcome

I hereby certify that the information submitted herewith, including any attachment is true to the best of my knowledge and belief:

By:

Title:

Dated:

END OF SECTION

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SECTION 00 51 00 - NOTICE OF AWARD

DATE: _____

TO: _____

(Contractor)

ADDRESS: _____

Project: Fargo WWTP Flood Protection Improvements

CONTRACT FOR: _____

You are notified that your Bid dated _____, 2024 for the above Contract has been considered. You are the apparent Successful Bidder and have been awarded a contract for all work under the above referenced project.

The Contract Price of your contract is _____.

Four (4) copies of the proposed Agreement accompany this Notice of Award.

You must comply with the following conditions precedent within fifteen (15) days of the date of this Notice of Award, that is by _____, 2024.

You must, immediately, deliver to the ENGINEER four (4) signed copies of this Notice acknowledging its receipt.

You must deliver to the ENGINEER four (4) fully executed counterparts of the Agreement including all the Contract Documents.

You must deliver with each executed Agreement, Performance and Payment Bonds as specified in the Instructions to Bidders (Paragraph 20), and General Conditions (Paragraph 6.01).

You must deliver with each executed Agreement, Certificates of Insurance as specified in the General Conditions (Paragraph 6.03) and Supplementary Conditions (Paragraph SC-6.03).

You must deliver with each executed Agreement, Current Workmen's Compensation Certificate of Premium Paid.

You must deliver with each executed Agreement, Contractor's Certificate of North Dakota Income and Sales Tax Clearance.

After execution of the Agreement, please send all copies of the Contract, along with the above items to the Engineer, **Advanced Engineering and Environmental Services, LLC (AE2S)**, 4170 28th Ave S, Fargo, ND 58104.

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

Within fifteen (15) days after you comply with the above conditions, OWNER will return to you one fully signed counterpart of the Agreement with the Contract Documents attached.

City of Fargo

Owner

By: _____

Authorized Signature

ACCEPTANCE OF AWARD

Contractor

By: _____

Title: _____

Date: _____

END OF SECTION

SECTION 00 52 00
AGREEMENT

THIS AGREEMENT is dated as of the _____ day of _____ in the year 2024 by and between City of Fargo, 225 4th Street North, Fargo, ND 58102 (hereinafter called OWNER) and _____ (hereinafter called CONTRACTOR).

1.01 CONTRACTOR shall complete all Work as specified or indicated in the Contract Documents. The Work is generally described as follows:

- A. Work generally consists of general construction associated with the furnishing and installation of Topsoil Strip, Topsoil Import and Spread; Excavation; Fill Import; Levee Embankment; Levee Inspection Trench; Subgrade Preparation; Sheet Pile; Cladding at Sheet Pile; Stone Cap for Sheet Pile; Paint and Prep of Sheet Pile, Water Main Installation, Ornamental Fence; Chain-link Fence; Sluice Gate Structures; Concrete Driveway Paving; and other miscellaneous items with estimated quantities shown in the Bid Form.

ARTICLE 2 - THE PROJECT

2.01 The Project for which the Work under the Contract Documents may be the whole or only a part is generally described as follows:

Fargo WWTP Flood Protection Improvements
Fargo , North Dakota
FEMA Project No. PDMC-PJ-08-ND-2018-023
Water Utility Project No. WW1707

ARTICLE 3 - THE ENGINEER

3.01 The Project has been designed by Advanced Engineering and Environmental Services, LLC who is hereinafter called ENGINEER and who is to act as OWNER'S representative, assume all duties and responsibilities, and have the rights and authority assigned to ENGINEER in the Contract Documents in connection with the completion of the Work in accordance with the Contract Documents.

ARTICLE 4 - CONTRACT TIMES

4.01 Time of Essence

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

4.02 Days to Achieve Substantial Completion and Final Payment

- A. The Work associated with Milestone #1 shall be substantially complete within 28 calendar days, all work associated with the Contract shall be substantially completed on or before October 15, 2024 and completed and ready for final payment in accordance with paragraph 15.06 of the General Conditions on or before December 15, 2024.

4.03 Liquidated Damages

- A. CONTRACTOR and OWNER recognize that time is of essence of the Agreement and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 4.02 above, plus any extensions thereof allowed in accordance with Article 11 of the General Conditions. 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), CONTRACTOR shall pay OWNER \$1,000.00 for each day that expires after the time specified in paragraph 4.02 for Milestone #1 until the Work is substantially complete, \$2,500.00 for each day that expires after the time specified in paragraph 4.02 for Substantial Completion until the Work is substantially complete. After Substantial Completion, if CONTRACTOR shall neglect, refuse, or fail to complete the remaining of the Work within the Contract Time or any proper extension thereof granted

by OWNER, CONTRACTOR shall pay OWNER \$750.00 for each day that expires after the time specified in paragraph 4.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

- B. CONTRACTOR and OWNER recognize that time is of essence and that OWNER will suffer financial loss if the Work is not completed within the times specified in paragraph 4.03 above.

ARTICLE 5 - CONTRACT PRICE

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

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

ARTICLE 6 - PAYMENT PROCEDURES

6.01 Submittal and Processing of Payments

- A. CONTRACTOR shall submit Applications for Payment in accordance with Article 15 of the General Conditions. Applications for Payment will be processed by ENGINEER as provided in the General Conditions.

6.02 Progress Payments; Retainage

- A. OWNER shall make progress payments in accordance with paragraph 1.03.B in Section 01 29 00 on account of the Contract Price on the basis of CONTRACTOR'S Applications for Payments on or about the 15th day of each month during performance of the Work as provided in Paragraph 6.02.A.1 below, provided that such Applications for Payment have been submitted in a timely manner and otherwise meet the requirements of the Contract. All such payments will be measured by the Schedule of Values established as provided in the General Conditions (and in the case of Unit Price Work based on the number of units completed) or, in the event there is no Schedule of Values, as provided elsewhere in the Contract.

1. Prior to Substantial Completion, progress payments will be made in an amount equal to the percentage indicated below but, in each case, less the aggregate of payments previously made and less such amounts as OWNER may withhold, including but not limited to liquidated damages, in accordance with the Contract:
 - a. 90 percent of Work completed (with the balance being retainage); If the Work has been 50 percent completed as determined by ENGINEER, and if the character and progress of the Work have been satisfactory to OWNER and ENGINEER, then as long as the character and progress of the Work remain satisfactory to OWNER and ENGINEER, there will be no additional retainage; and
 - b. 90 percent of cost of materials and equipment not incorporated in the Work (with the balance being retainage).
2. Upon Substantial Completion **of the entire construction to be provided under the Contract Documents**, OWNER shall pay an amount sufficient to increase total payments to CONTRACTOR to 95 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.

6.03 Final Payment

- A. Upon final completion and acceptance of the Work in accordance with paragraph 15.06 of the General Conditions, OWNER shall pay the remainder of the Contract Price as recommended by ENGINEER as provided in said paragraph 15.06.

ARTICLE 7 - INTEREST

7.01 All moneys not paid when due as provided in Article 15 of the General Conditions shall bear interest at the maximum rate allowed by law at the place of the Project.

ARTICLE 8 - CONTRACTOR'S REPRESENTATIONS

- 8.01 In order to induce OWNER to enter into this Agreement CONTRACTOR makes the following representations:
- A. CONTRACTOR has examined and carefully studied the Contract Documents and the other related data identified in the Bidding Documents.
 - B. CONTRACTOR has visited the Site and become familiar with and is satisfied to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.
 - C. CONTRACTOR is familiar with and is satisfied as to all federal, state, and local Laws and Regulations that may affect cost, progress, and performance of the Work.
 - D. CONTRACTOR has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities) which have been identified in the Supplementary Conditions as provided in paragraph 5.03 of the General Conditions and (2) reports and drawings of a Hazardous Environmental Condition, if any, at the Site which has been identified in the Supplementary Conditions as provided in paragraph 5.06 of the General Conditions.
 - E. CONTRACTOR has obtained and carefully studied (or assumes responsibility for having done so) all additional or supplementary examinations, investigations, explorations, tests, studies, and data concerning conditions (surface, subsurface, and Underground Facilities) at or contiguous to the Site which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of the construction to be employed by CONTRACTOR, including applying the specific means, methods, techniques, sequences, and procedures of construction, if any, expressly required by the Contract Documents to be employed by CONTRACTOR, and safety precautions and programs incident thereto.
 - F. CONTRACTOR does not consider that any 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 Documents.
 - G. 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.
 - H. CONTRACTOR has correlated the information known to CONTRACTOR, information and observations obtained from visits to the Site, reports and drawings identified in the Contract Documents, and all additional examinations, investigations, explorations, tests, studies, and data with 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 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.

ARTICLE 9 - CONTRACT DOCUMENTS

9.01 Contents

- A. The Contract Documents consist of the following:
 - 1. This Agreement;
 - 2. Performance Bond;
 - 3. Payment Bond;
 - 4. General Conditions;
 - 5. Supplementary Conditions;
 - 6. Certificate of Insurance;
 - 7. City of Fargo Standard Specifications for Construction, Latest Edition;
 - 8. These Specifications and the Project Manual;

9. Drawings consisting of a cover sheet titled FEMA PROJECT PDMC-PJ-08-ND-2018-023, FARGO WWTP FLOOD PROTECTION IMPROVEMENTS, FARGO, NORTH DAKOTA, with each sheet bearing the following general title: FARGO WWTP FLOOD PROTECTION PROJECT;
 10. Addenda (numbers _____ to _____, inclusive);
 11. Certificate Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion. See Section 00 73 40, Attachment C.
 12. Notice of Award;
 13. The following which may be delivered or issued on or after the Effective Date of the Agreement and are not attached hereto:
 - a. Notice to Proceed;
 - b. Work Change Directives;
 - c. Change Order(s);
 - d. Field Orders
- B. The documents listed in paragraphs 9.01.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 9.
- D. The Contract Documents may only be amended, modified, or supplemented as provided in paragraph 11.01 of the General Conditions.

ARTICLE 10 - MISCELLANEOUS

10.01 Terms

- A. Terms used in this Agreement will have the meanings indicated in the General Conditions and Supplementary Conditions.

10.02 Assignment of Contract

- A. No assignment by a party hereto of any rights under or interests in the Contract will be binding on another party hereto without the written consent of the party sought to be bound; and, specifically but without limitation, moneys that may become due and moneys that are 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 Documents.

10.03 Successors and Assigns

- A. OWNER and CONTRACTOR each binds itself, its partners, successors, assigns, and legal representatives to the other party hereto, its partners, successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

10.04 Severability

- A. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation shall be deemed stricken, and all remaining provisions shall continue to be valid and binding upon OWNER and CONTRACTOR, who agree that the Contract Documents shall 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 position.

10.05 Contractor's Certifications

- A. Contractor certifies that it has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for or in executing the Contract. For the purposes of this Paragraph 10.05:
1. "corrupt practice" means the offering, giving, receiving, or soliciting of anything of value likely to influence the action of a public official in the bidding process or in the Contract execution;
 2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process or the execution of the Contract to the detriment of

- Owner, (b) to establish Bid or Contract prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;
3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish Bid prices at artificial, non-competitive levels; and
 4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

IN WITNESS WHEREOF, OWNER AND CONTRACTOR have signed this Agreement in duplicate. One (1) counterpart each has been delivered to OWNER and CONTRACTOR. All portions of the Contract Documents have been signed or identified by OWNER and CONTRACTOR or on their behalf.

This agreement will be effective on _____ which is the Effective Date of the Agreement.

OWNER:	CONTRACTOR:
By:	By:
Attest:	Attest:
Address for giving notices:	Address for giving notices:
Designated Representative:	Designated Representative:
Name:	Name:
Title:	Title:
Address:	Address:
Phone:	Phone:
Facsimile:	Facsimile:
E-mail:	E-mail:

END OF SECTION

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SECTION 00 55 00
NOTICE TO PROCEED

DATE: _____

TO: _____

(Contractor)

ADDRESS: _____

PROJECT: Fargo WWTP Flood Protection Improvements

CONTRACT FOR: _____

You are hereby notified to commence **WORK** in accordance with the Agreement dated
_____. You are to have all **WORK** completed and ready for final payment per the
agreement.

City of Fargo

(Owner)

By: _____

(Authorized Signature)

(Title)

ACCEPTANCE OF NOTICE:

Receipt of the above NOTICE TO PROCEED
is hereby acknowledged by:

(Contractor)

(Authorized Signature)

(Title)

Date: _____

Copy to ENGINEER

FRM (Use Certified Mail, Return Receipt Requested)

END OF SECTION

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SECTION 00 61 13.13
PERFORMANCE BOND FORM

CONTRACTOR: *(name and address):*

SURETY *(name and address
and principal place of business):*

OWNER *(name and address):*

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bid Form:

See Paragraph 16

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

CONTRACTOR AS PRINCIPAL

(seal)

Contractor's Name and Corporate Seal

By: _____

Signature

Print Name

Title

Attest: _____

Signature

Title

SURETY

(seal)

Surety's Name and Corporate Seal

By: _____

Signature *(attach power of attorney)*

Print Name

Title

Attest: _____

Signature

Title

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

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 shall 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 shall 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 shall 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 shall 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 shall 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. Deny liability in whole or in part and notify the Owner, citing the reasons for denial. 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 shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall 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;

40.01 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 shall not be reduced or set off on account of any such unrelated obligations. No right of action shall 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 may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall 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 shall be applicable.

12. Notice to the Surety, the Owner, or the Contractor shall 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 shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall 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.

47.01 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 shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

16. Modifications to this Bond are as follows:

END OF SECTION

SECTION 00 61 13.16
PAYMENT BOND FORM

CONTRACTOR: *(name and address):*

SURETY *(name and address
and principal place of business):*

OWNER *(name and address):*

CONSTRUCTION CONTRACT

Effective Date of the Agreement:

Amount:

Description *(name and location):*

BOND

Bond Number:

Date *(not earlier than the Effective Date of the Agreement of the Construction Contract):*

Amount:

Modifications to this Bid Form:

See Paragraph 16

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

CONTRACTOR AS PRINCIPAL

(seal)

Contractor's Name and Corporate Seal

By: _____
Signature

Print Name

Title

Attest: _____

Signature

Title

SURETY

(seal)

Surety's Name and Corporate Seal

By: _____
Signature *(attach power of attorney)*

Print Name

Title

Attest: _____

Signature

Title

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

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 shall 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 shall 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 shall 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 shall 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 shall 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 shall 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 satisfy 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 shall 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 shall be applicable.

13. Notice and Claims to the Surety, the Owner, or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall 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 shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall 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:

1. The name of the Claimant;
2. The name of the person for whom the labor was done, or materials or equipment furnished;
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;
4. A brief description of the labor, materials, or equipment furnished;
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;
6. The total amount earned by the Claimant for labor, materials, or equipment furnished as of the date of the Claim;
7. The total amount of previous payments received by the Claimant; and
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 shall be 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.

END OF SECTION

SECTION 00 62 76
APPLICATION FOR PAYMENT FORM

SEE ATTACHED FORM

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Contractor's Application for Payment

Owner: <u>City of Fargo</u>	Owner's Project No.: _____
Engineer: _____	Engineer's Project No.: <u>P00803-2016-070</u>
Contractor: _____	Contractor's Project No.: _____
Project: <u>Fargo WWTP Flood Protection Improvements</u>	
Contract: _____	
Application No.: _____ Application Date: _____	
Application Period: From _____ to _____	

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

Contractor's Certification

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

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

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

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

Contractor: _____	
Signature: _____	Date: _____

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

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner: <u>City of Fargo</u>		Owner's Project No.: _____	
Engineer: _____		Engineer's Project No.: <u>P00803-2016-070</u>	
Contractor: _____		Contractor's Project No.: _____	
Project: <u>Fargo WWTP Flood Protection Improvements</u>			
Contract: _____			

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

Progress Estimate - Lump Sum Work

Contractor's Application for Payment

Owner:	City of Fargo					Owner's Project No.:		
Engineer:						Engineer's Project No.:	P00803-2016-070	
Contractor:						Contractor's Project No.:		
Project:	Fargo WWTP Flood Protection Improvements							
Contract:								

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

Progress Estimate - Unit Price Work

Contractor's Application for Payment

Owner:	City of Fargo	Owner's Project No.:	
Engineer:		Engineer's Project No.:	P00803-2016-070
Contractor:		Contractor's Project No.:	
Project:	Fargo WWTP Flood Protection Improvements		
Contract:			

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

Contractor's Application for Payment

Owner:	City of Fargo	Owner's Project No.:	
Engineer:		Engineer's Project No.:	P00803-2016-070
Contractor:		Contractor's Project No.:	
Project:	Fargo WWTP Flood Protection Improvements		
Contract:			

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

Owner:	City of Fargo	Owner's Project No.:	
Engineer:		Engineer's Project No.:	P00803-2016-070
Contractor:		Contractor's Project No.:	
Project:	Fargo WWTP Flood Protection Improvements		
Contract:			

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

[illegible]

SECTION 00 63 13
REQUEST FOR INFORMATION FORM

SEE ATTACHED FORM

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REQUEST FOR INFORMATION

Submitted to: Advanced Engineering and Environmental Services, Inc.

Date: _____

From: _____

Attention To: _____

Tel/Fax: _____

CC: _____

RFI #: _____

RFI Subject: _____

Spec. Referenced: _____

Project: Fargo WWTP Flood Protection Improvements
AE2S Project #: P00803-2016-070

Information Requested:

Response:

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SECTION 00 63 49
WORK CHANGE DIRECTIVE FORM

SEE ATTACHED FORM

This page intentionally left blank

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

Owner: City of Fargo

Owner's Project No.:

Engineer:

Engineer's Project No.: P00803-2016-070

Contractor:

Contractor's Project No.:

Project: Fargo WWTP Flood Protection Improvements

Contract Name:

Date Issued:

Effective Date of Work Change Directive:

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

Description:

[Description of the change to the Work]

Attachments:

[List documents related to the change to the Work]

Purpose for the Work Change Directive:

[Describe the purpose for the change to the Work]

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

Notes to User—Check one or both of the following

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

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

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

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

Basis of estimated change in Contract Price:

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

Recommended by Engineer

Authorized by Owner

By:

Title:

Date:

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SECTION 00 63 63
CHANGE ORDER FORM

SEE ATTACHED FORM

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CHANGE ORDER NO.: [Number of Change Order]

Owner: City of Fargo

Owner's Project No.:

Engineer:

Engineer's Project No.: P00803-2016-070

Contractor:

Contractor's Project No.:

Project: Fargo WWTP Flood Protection Improvements

Contract Name:

Date Issued:

Effective Date of Change Order:

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

Description:

[Description of the change]

Attachments:

[List documents related to the change]

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

Recommended by Engineer (if required)

Accepted by Contractor

By: _____

Title: _____

Date: _____

Authorized by Owner

Approved by Funding Agency (if applicable)

By: _____

Title: _____

Date: _____

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SECTION 00 65 16
CERTIFICATE OF SUBSTANTIAL COMPLETION

DATE OF ISSUANCE _____

OWNER _____

CONTRACTOR _____

Contract: _____

Project: _____

OWNER's Contract No. _____ ENGINEER's Project No. _____

This Certificate of Substantial Completion applies to all Work under the Contract Documents or to the following specified parts thereof:

To _____

OWNER

And To _____

CONTRACTOR

The Work to which this Certificate applies has been inspected by authorized representatives of OWNER, CONTRACTOR and ENGINEER, and that Work is hereby declared to be substantially complete in accordance with the Contract Documents on

DATE OF SUBSTANTIAL COMPLETION

A tentative list of items to be completed or corrected is attached hereto. This list may not be all-inclusive, and the failure to include an item in it does not alter the responsibility of CONTRACTOR to complete all the Work in accordance with the Contract Documents. The items in the tentative list shall be completed or corrected by CONTRACTOR within _____ days of the above date of Substantial Completion.

The responsibilities between OWNER and CONTRACTOR for security, operation, safety, maintenance, heat, utilities, insurance and warranties and guarantees shall be as follows:

OWNER: _____

CONTRACTOR: _____

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

[For items to be attached see definition of Substantial Completion as supplemented and other specifically noted conditions precedent to achieving Substantial Completion as required by Contract Documents.]

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

Executed by ENGINEER on _____

Date

ENGINEER

By: _____

(Authorized Signature)

CONTRACTOR accepts this Certificate of Substantial Completion on _____
Date

CONTRACTOR

By: _____

(Authorized Signature)

OWNER accepts this Certificate of Substantial Completion on _____
Date

OWNER

By: _____

(Authorized Signature)

END OF SECTION

SECTION 00 72 00
GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

THE GENERAL CONDITIONS APPLICABLE TO THIS CONTRACT IS ATTACHED
FOLLOWING THIS PAGE.

END OF SECTION

This page intentionally left blank

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

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

Prepared By



Endorsed By



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National Society of Professional Engineers
1420 King Street, Alexandria, VA 22314-2794
(703) 684-2882
www.nspe.org

American Council of Engineering Companies
1015 15th Street N.W., Washington, DC 20005
(202) 347-7474
www.acec.org

American Society of Civil Engineers
1801 Alexander Bell Drive, Reston, VA 20191-4400
(800) 548-2723
www.asce.org

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GUIDELINES FOR USE OF EJCDC® C-700, STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

1.0 PURPOSE AND INTENDED USE OF THE DOCUMENT

EJCDC® C-700, Standard General Conditions of the Construction Contract (2018), is the foundation document for the EJCDC Construction Series. The General Conditions define the basic rights, responsibilities, risk allocations, and contractual relationship of the Owner and Contractor, and establish how the Contract is to be administered.

2.0 OTHER DOCUMENTS

EJCDC documents are intended to be used as a system and changes in one EJCDC document may require a corresponding change in other documents. Other EJCDC documents may also serve as a reference to provide insight or guidance for the preparation of this document.

These General Conditions have been prepared for use with either EJCDC® C-520, Agreement Between Owner and Contractor for Construction Contract (Stipulated Price), or EJCDC® C-525, Agreement Between Owner and Contractor for Construction Contract (Cost-Plus-Fee) (2018 Editions). The provisions of the General Conditions and the Agreement are interrelated, and a change in one may necessitate a change in the other.

To prepare supplementary conditions that are coordinated with the General Conditions, use EJCDC® C-800, Supplementary Conditions of the Construction Contract (2018).

The full EJCDC Construction series of documents is discussed in the EJCDC® C-001, Commentary on the 2018 EJCDC Construction Documents (2018).

3.0 ORGANIZATION OF INFORMATION

All parties involved in a construction project benefit significantly from a standardized approach in the location of subject matter throughout the documents. Experience confirms the danger of addressing the same subject matter in more than one location; doing so frequently leads to confusion and unanticipated legal consequences. Careful attention should be given to the guidance provided in EJCDC® N-122/AIA® A521, Uniform Location of Subject Matter (2012 Edition) when preparing documents. EJCDC® N-122/AIA® A521 is available at no charge from the EJCDC website, www.ejcdc.org, and from the websites of EJCDC's sponsoring organizations.

If CSI MasterFormat™ is used for organizing the Project Manual, consult CSI MasterFormat™ for the appropriate document number (e.g., under 00 11 00, Advertisements and Invitations), and accordingly number the document and its pages.

4.0 EDITING THIS DOCUMENT

Remove these Guidelines for Use. Some users may also prefer to remove the two cover pages.

Although it is permissible to revise the Standard EJCDC Text of C-700 (the content beginning at page 1 and continuing to the end), it is common practice to leave the Standard EJCDC Text of C-700 intact and unaltered, with modifications and supplementation of C-700's provisions set forth in EJCDC® C-800, Supplementary Conditions of the Construction Contract (2018). If the Standard Text itself is revised, the

user must comply with the terms of the License Agreement, Paragraph 4.0, Document-Specific Provisions, concerning the tracking or highlighting of revisions. The following is a summary of the relevant License Agreement provisions:

1. The term “Standard EJCDC Text” for C-700 refers to all text prepared by EJCDC in the main body of the document. Document covers, logos, footers, instructions, or copyright notices are not Standard EJCDC Text for this purpose.
2. During the drafting or negotiating process for C-700, it is important that the two contracting parties are both aware of any changes that have been made to the Standard EJCDC Text. Thus, if a draft or version of C-700 purports to be or appears to be an EJCDC document, the user must plainly show all changes to the Standard EJCDC Text, using “Track Changes” (redline/strikeout), highlighting, or other means of clearly indicating additions and deletions.
3. If C-700 has been revised or altered and is subsequently presented to third parties (such as potential bidders, grant agencies, lenders, or sureties) as an EJCDC document, then the changes to the Standard EJCDC Text must be shown, or the third parties must receive access to a version that shows the changes.
4. Once the document is ready to be finalized (and if applicable executed by the contracting parties), it is no longer necessary to continue to show changes to the Standard EJCDC Text. The user may produce a final version of the document in a format in which all changes are accepted, and the document at that point does not need to include any “Track Changes,” redline/strikeout, highlighting, or other indication of additions and deletions to the Standard EJCDC Text.

5.0 LICENSE AGREEMENT

This document is subject to the terms and conditions of the **License Agreement, 2018 EJCDC® Construction Series Documents**. A copy of the License Agreement was furnished at the time of purchase of this document, and is available for review at www.ejcdc.org and the websites of EJCDC’s sponsoring organizations.

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

ARTICLE 1—DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in the Bidding Requirements or Contract Documents, a term printed with initial capital letters, including the term's singular and plural forms, will have the meaning indicated in the definitions below. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument, executed by Owner and Contractor, that sets forth the Contract Price and Contract Times, identifies the parties and the Engineer, and designates the specific items that are Contract Documents.
 3. *Application for Payment*—The document prepared by Contractor, in a form acceptable to Engineer, to request progress or final payments, and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Bid*—The offer of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 5. *Bidder*—An individual or entity that submits a Bid to Owner.
 6. *Bidding Documents*—The Bidding Requirements, the proposed Contract Documents, and all Addenda.
 7. *Bidding Requirements*—The Advertisement or invitation to bid, Instructions to Bidders, Bid Bond or other Bid security, if any, the Bid Form, and the Bid with any attachments.
 8. *Change Order*—A document which is signed by Contractor and Owner and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Times, or other revision to the Contract, issued on or after the Effective Date of the Contract.
 9. *Change Proposal*—A written request by Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment in Contract Price or Contract Times; contesting an initial decision by Engineer concerning the requirements of the Contract Documents or the acceptability of Work under the Contract Documents; challenging a set-off against payments due; or seeking other relief with respect to the terms of the Contract.
 10. *Claim*
 - a. A demand or assertion by Owner directly to Contractor, duly submitted in compliance with the procedural requirements set forth herein, seeking an adjustment of Contract Price or Contract Times; contesting an initial decision by Engineer concerning the

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

- b. A demand or assertion by Contractor directly to Owner, duly submitted in compliance with the procedural requirements set forth herein, contesting Engineer's decision regarding a Change Proposal, or seeking resolution of a contractual issue that Engineer has declined to address.
 - c. A demand or assertion by Owner or Contractor, duly submitted in compliance with the procedural requirements set forth herein, made pursuant to Paragraph 12.01.A.4, concerning disputes arising after Engineer has issued a recommendation of final payment.
 - d. A demand for money or services by a third party is not a Claim.
- 11. *Constituent of Concern*—Asbestos, petroleum, radioactive materials, polychlorinated biphenyls (PCBs), lead-based paint (as defined by the HUD/EPA standard), hazardous waste, and any substance, product, waste, or other material of any nature whatsoever that is or becomes listed, regulated, or addressed pursuant to Laws and Regulations regulating, relating to, or imposing liability or standards of conduct concerning, any hazardous, toxic, or dangerous waste, substance, or material.
 - 12. *Contract*—The entire and integrated written contract between Owner and Contractor concerning the Work.
 - 13. *Contract Documents*—Those items so designated in the Agreement, and which together comprise the Contract.
 - 14. *Contract Price*—The money that Owner has agreed to pay Contractor for completion of the Work in accordance with the Contract Documents.
 - 15. *Contract Times*—The number of days or the dates by which Contractor shall: (a) achieve Milestones, if any; (b) achieve Substantial Completion; and (c) complete the Work.
 - 16. *Contractor*—The individual or entity with which Owner has contracted for performance of the Work.
 - 17. *Cost of the Work*—See Paragraph 13.01 for definition.
 - 18. *Drawings*—The part of the Contract that graphically shows the scope, extent, and character of the Work to be performed by Contractor.
 - 19. *Effective Date of the Contract*—The date, indicated in the Agreement, on which the Contract becomes effective.
 - 20. *Electronic Document*—Any Project-related correspondence, attachments to correspondence, data, documents, drawings, information, or graphics, including but not limited to Shop Drawings and other Submittals, that are in an electronic or digital format.
 - 21. *Electronic Means*—Electronic mail (email), upload/download from a secure Project website, or other communications methods that allow: (a) the transmission or communication of Electronic Documents; (b) the documentation of transmissions, including sending and receipt; (c) printing of the transmitted Electronic Document by the

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

22. *Engineer*—The individual or entity named as such in the Agreement.
23. *Field Order*—A written order issued by Engineer which requires minor changes in the Work but does not change the Contract Price or the Contract Times.
24. *Hazardous Environmental Condition*—The presence at the Site of Constituents of Concern in such quantities or circumstances that may present a danger to persons or property exposed thereto.
 - a. The presence at the Site of materials that are necessary for the execution of the Work, or that are to be incorporated into the Work, and that are controlled and contained pursuant to industry practices, Laws and Regulations, and the requirements of the Contract, is not a Hazardous Environmental Condition.
 - b. The presence of Constituents of Concern that are to be removed or remediated as part of the Work is not a Hazardous Environmental Condition.
 - c. The presence of Constituents of Concern as part of the routine, anticipated, and obvious working conditions at the Site, is not a Hazardous Environmental Condition.
25. *Laws and Regulations; Laws or Regulations*—Any and all applicable laws, statutes, rules, regulations, ordinances, codes, and binding decrees, resolutions, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
26. *Liens*—Charges, security interests, or encumbrances upon Contract-related funds, real property, or personal property.
27. *Milestone*—A principal event in the performance of the Work that the Contract requires Contractor to achieve by an intermediate completion date, or by a time prior to Substantial Completion of all the Work.
28. *Notice of Award*—The written notice by Owner to a Bidder of Owner's acceptance of the Bid.
29. *Notice to Proceed*—A written notice by Owner to Contractor fixing the date on which the Contract Times will commence to run and on which Contractor shall start to perform the Work.
30. *Owner*—The individual or entity with which Contractor has contracted regarding the Work, and which has agreed to pay Contractor for the performance of the Work, pursuant to the terms of the Contract.
31. *Progress Schedule*—A schedule, prepared and maintained by Contractor, describing the sequence and duration of the activities comprising Contractor's plan to accomplish the Work within the Contract Times.
32. *Project*—The total undertaking to be accomplished for Owner by engineers, contractors, and others, including planning, study, design, construction, testing, commissioning, and start-up, and of which the Work to be performed under the Contract Documents is a part.

33. *Resident Project Representative*—The authorized representative of Engineer assigned to assist Engineer at the Site. As used herein, the term Resident Project Representative (RPR) includes any assistants or field staff of Resident Project Representative.
34. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and that establish the standards by which such portion of the Work will be judged.
35. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements for Engineer’s review of the submittals.
36. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor’s Applications for Payment.
37. *Shop Drawings*—All drawings, diagrams, illustrations, schedules, and other data or information that are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work. Shop Drawings, whether approved or not, are not Drawings and are not Contract Documents.
38. *Site*—Lands or areas indicated in the Contract Documents as being furnished by Owner upon which the Work is to be performed, including rights-of-way and easements, and such other lands or areas furnished by Owner which are designated for the use of Contractor.
39. *Specifications*—The part of the Contract that consists of written requirements for materials, equipment, systems, standards, and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable to the Work.
40. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work.
41. *Submittal*—A written or graphic document, prepared by or for Contractor, which the Contract Documents require Contractor to submit to Engineer, or that is indicated as a Submittal in the Schedule of Submittals accepted by Engineer. Submittals may include Shop Drawings and Samples; schedules; product data; Owner-delegated designs; sustainable design information; information on special procedures; testing plans; results of tests and evaluations, source quality-control testing and inspections, and field or Site quality-control testing and inspections; warranties and certifications; Suppliers’ instructions and reports; records of delivery of spare parts and tools; operations and maintenance data; Project photographic documentation; record documents; and other such documents required by the Contract Documents. Submittals, whether or not approved or accepted by Engineer, are not Contract Documents. Change Proposals, Change Orders, Claims, notices, Applications for Payment, and requests for interpretation or clarification are not Submittals.
42. *Substantial Completion*—The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. The terms “substantially complete” and “substantially completed” as applied to all or part of the Work refer to Substantial Completion of such Work.

43. *Successful Bidder*—The Bidder to which the Owner makes an award of contract.
44. *Supplementary Conditions*—The part of the Contract that amends or supplements these General Conditions.
45. *Supplier*—A manufacturer, fabricator, supplier, distributor, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or a Subcontractor.
46. *Technical Data*
- a. Those items expressly identified as Technical Data in the Supplementary Conditions, with respect to either (1) existing subsurface conditions at or adjacent to the Site, or existing physical conditions at or adjacent to the Site including existing surface or subsurface structures (except Underground Facilities) or (2) Hazardous Environmental Conditions at the Site.
 - b. If no such express identifications of Technical Data have been made with respect to conditions at the Site, then Technical Data is defined, with respect to conditions at the Site under Paragraphs 5.03, 5.04, and 5.06, as the data contained in boring logs, recorded measurements of subsurface water levels, assessments of the condition of subsurface facilities, laboratory test results, and other factual, objective information regarding conditions at the Site that are set forth in any geotechnical, environmental, or other Site or facilities conditions report prepared for the Project and made available to Contractor.
 - c. Information and data regarding the presence or location of Underground Facilities are not intended to be categorized, identified, or defined as Technical Data, and instead Underground Facilities are shown or indicated on the Drawings.
47. *Underground Facilities*—All active or not-in-service underground lines, pipelines, conduits, ducts, encasements, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or systems at the Site, including but not limited to those facilities or systems that produce, transmit, distribute, or convey telephone or other communications, cable television, fiber optic transmissions, power, electricity, light, heat, gases, oil, crude oil products, liquid petroleum products, water, steam, waste, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. An abandoned facility or system is not an Underground Facility.
48. *Unit Price Work*—Work to be paid for on the basis of unit prices.
49. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction; furnishing, installing, and incorporating all materials and equipment into such construction; and may include related services such as testing, start-up, and commissioning, all as required by the Contract Documents.
50. *Work Change Directive*—A written directive to Contractor issued on or after the Effective Date of the Contract, signed by Owner and recommended by Engineer, ordering an addition, deletion, or revision in the Work.

1.02 Terminology

- A. The words and terms discussed in Paragraphs 1.02.B, C, D, and E are not defined terms that require initial capital letters, but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:* The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of professional judgment by Engineer. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of Engineer as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise). The use of any such term or adjective is not intended to and shall not be effective to assign to Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility contrary to the provisions of Article 10 or any other provision of the Contract Documents.
- C. *Day:* The word “day” means a calendar day of 24 hours measured from midnight to the next midnight.
- D. *Defective:* The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - 1. does not conform to the Contract Documents;
 - 2. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - 3. has been damaged prior to Engineer’s recommendation of final payment (unless responsibility for the protection thereof has been assumed by Owner at Substantial Completion in accordance with Paragraph 15.03 or Paragraph 15.04).
- E. *Furnish, Install, Perform, Provide*
 - 1. The word “furnish,” when used in connection with services, materials, or equipment, means to supply and deliver said services, materials, or equipment to the Site (or some other specified location) ready for use or installation and in usable or operable condition.
 - 2. The word “install,” when used in connection with services, materials, or equipment, means to put into use or place in final position said services, materials, or equipment complete and ready for intended use.
 - 3. The words “perform” or “provide,” when used in connection with services, materials, or equipment, means to furnish and install said services, materials, or equipment complete and ready for intended use.
 - 4. If the Contract Documents establish an obligation of Contractor with respect to specific services, materials, or equipment, but do not expressly use any of the four words “furnish,” “install,” “perform,” or “provide,” then Contractor shall furnish and install said services, materials, or equipment complete and ready for intended use.

- F. *Contract Price or Contract Times*: References to a change in “Contract Price or Contract Times” or “Contract Times or Contract Price” or similar, indicate that such change applies to (1) Contract Price, (2) Contract Times, or (3) both Contract Price and Contract Times, as warranted, even if the term “or both” is not expressed.
- G. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2—PRELIMINARY MATTERS

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

- A. *Performance and Payment Bonds*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner the performance bond and payment bond (if the Contract requires Contractor to furnish such bonds).
- B. *Evidence of Contractor’s Insurance*: When Contractor delivers the signed counterparts of the Agreement to Owner, Contractor shall also deliver to Owner, with copies to each additional insured (as identified in the Contract), the certificates, endorsements, and other evidence of insurance required to be provided by Contractor in accordance with Article 6, except to the extent the Supplementary Conditions expressly establish other dates for delivery of specific insurance policies.
- C. *Evidence of Owner’s Insurance*: After receipt of the signed counterparts of the Agreement and all required bonds and insurance documentation, Owner shall promptly deliver to Contractor, with copies to each additional insured (as identified in the Contract), the certificates and other evidence of insurance required to be provided by Owner under Article 6.

2.02 *Copies of Documents*

- A. Owner shall furnish to Contractor four printed copies of the Contract (including one fully signed counterpart of the Agreement), and one copy in electronic portable document format (PDF). Additional printed copies will be furnished upon request at the cost of reproduction.
- B. Owner shall maintain and safeguard at least one original printed record version of the Contract, including Drawings and Specifications signed and sealed by Engineer and other design professionals. Owner shall make such original printed record version of the Contract available to Contractor for review. Owner may delegate the responsibilities under this provision to Engineer.

2.03 *Before Starting Construction*

- A. *Preliminary Schedules*: Within 10 days after the Effective Date of the Contract (or as otherwise required by the Contract Documents), Contractor shall submit to Engineer for timely review:
 - 1. a preliminary Progress Schedule indicating the times (numbers of days or dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract;
 - 2. a preliminary Schedule of Submittals; and
 - 3. a preliminary Schedule of Values for all of the Work which includes quantities and prices of items which when added together equal the Contract Price and subdivides the Work

into component parts in sufficient detail to serve as the basis for progress payments during performance of the Work. Such prices will include an appropriate amount of overhead and profit applicable to each item of Work.

2.04 *Preconstruction Conference; Designation of Authorized Representatives*

- A. Before any Work at the Site is started, a conference attended by Owner, Contractor, Engineer, and others as appropriate will be held to establish a working understanding among the parties as to the Work, and to discuss the schedules referred to in Paragraph 2.03.A, procedures for handling Shop Drawings, Samples, and other Submittals, processing Applications for Payment, electronic or digital transmittals, and maintaining required records.
- B. At this conference Owner and Contractor each shall designate, in writing, a specific individual to act as its authorized representative with respect to the services and responsibilities under the Contract. Such individuals shall have the authority to transmit and receive information, render decisions relative to the Contract, and otherwise act on behalf of each respective party.

2.05 *Acceptance of Schedules*

- A. At least 10 days before submission of the first Application for Payment a conference, attended by Contractor, Engineer, and others as appropriate, will be held to review the schedules submitted in accordance with Paragraph 2.03.A. No progress payment will be made to Contractor until acceptable schedules are submitted to Engineer.
 - 1. The Progress Schedule will be acceptable to Engineer if it provides an orderly progression of the Work to completion within the Contract Times. Such acceptance will not impose on Engineer responsibility for the Progress Schedule, for sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 2. Contractor's Schedule of Submittals will be acceptable to Engineer if it provides a workable arrangement for reviewing and processing the required submittals.
 - 3. Contractor's Schedule of Values will be acceptable to Engineer as to form and substance if it provides a reasonable allocation of the Contract Price to the component parts of the Work.
 - 4. If a schedule is not acceptable, Contractor will have an additional 10 days to revise and resubmit the schedule.

2.06 *Electronic Transmittals*

- A. Except as otherwise stated elsewhere in the Contract, the Owner, Engineer, and Contractor may send, and shall accept, Electronic Documents transmitted by Electronic Means.
- B. If the Contract does not establish protocols for Electronic Means, then Owner, Engineer, and Contractor shall jointly develop such protocols.
- C. Subject to any governing protocols for Electronic Means, when transmitting Electronic Documents by Electronic Means, the transmitting party makes no representations as to long-term compatibility, usability, or readability of the Electronic Documents resulting from the recipient's use of software application packages, operating systems, or computer hardware differing from those used in the drafting or transmittal of the Electronic Documents.

ARTICLE 3—CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one Contract Document is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete Project (or part thereof) to be constructed in accordance with the Contract Documents.
- C. Unless otherwise stated in the Contract Documents, if there is a discrepancy between the electronic versions of the Contract Documents (including any printed copies derived from such electronic versions) and the printed record version, the printed record version will govern.
- D. The Contract supersedes prior negotiations, representations, and agreements, whether written or oral.
- E. Engineer will issue clarifications and interpretations of the Contract Documents as provided herein.
- F. Any provision or part of the Contract Documents held to be void or unenforceable under any Law or Regulation will be deemed stricken, and all remaining provisions will continue to be valid and binding upon Owner and Contractor, which agree that the Contract Documents will be reformed to replace such stricken provision or part thereof with a valid and enforceable provision that comes as close as possible to expressing the intention of the stricken provision.
- G. Nothing in the Contract Documents creates:
 - 1. any contractual relationship between Owner or Engineer and any Subcontractor, Supplier, or other individual or entity performing or furnishing any of the Work, for the benefit of such Subcontractor, Supplier, or other individual or entity; or
 - 2. any obligation on the part of Owner or Engineer to pay or to see to the payment of any money due any such Subcontractor, Supplier, or other individual or entity, except as may otherwise be required by Laws and Regulations.

3.02 *Reference Standards*

- A. *Standards Specifications, Codes, Laws and Regulations*
 - 1. Reference in the Contract Documents to standard specifications, manuals, reference standards, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, means the standard specification, manual, reference standard, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Contract if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
 - 2. No provision of any such standard specification, manual, reference standard, or code, and no instruction of a Supplier, will be effective to change the duties or responsibilities of Owner, Contractor, or Engineer from those set forth in the part of the Contract Documents prepared by or for Engineer. No such provision or instruction shall be effective to assign to Owner or Engineer any duty or authority to supervise or direct the performance of the Work, or any duty or authority to undertake responsibility

inconsistent with the provisions of the part of the Contract Documents prepared by or for Engineer.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies*

1. *Contractor's Verification of Figures and Field Measurements:* Before undertaking each part of the Work, Contractor shall carefully study the Contract Documents, and check and verify pertinent figures and dimensions therein, particularly with respect to applicable field measurements. Contractor shall promptly report in writing to Engineer any conflict, error, ambiguity, or discrepancy that Contractor discovers, or has actual knowledge of, and shall not proceed with any Work affected thereby until the conflict, error, ambiguity, or discrepancy is resolved by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
2. *Contractor's Review of Contract Documents:* If, before or during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation, (b) actual field conditions, (c) any standard specification, manual, reference standard, or code, or (d) any instruction of any Supplier, then Contractor shall promptly report it to Engineer in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph 7.15) until the conflict, error, ambiguity, or discrepancy is resolved, by a clarification or interpretation by Engineer, or by an amendment or supplement to the Contract issued pursuant to Paragraph 11.01.
3. Contractor shall not be liable to Owner or Engineer for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the part of the Contract Documents prepared by or for Engineer take precedence in resolving any conflict, error, ambiguity, or discrepancy between such provisions of the Contract Documents and:
 - a. the provisions of any standard specification, manual, reference standard, or code, or the instruction of any Supplier (whether or not specifically incorporated by reference as a Contract Document); or
 - b. the provisions of any Laws or Regulations applicable to the performance of the Work (unless such an interpretation of the provisions of the Contract Documents would result in violation of such Law or Regulation).

3.04 *Requirements of the Contract Documents*

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

- B. Engineer will, with reasonable promptness, render a written clarification, interpretation, or decision on the issue submitted, or initiate an amendment or supplement to the Contract Documents. Engineer's written clarification, interpretation, or decision will be final and binding on Contractor, unless it appeals by submitting a Change Proposal, and on Owner, unless it appeals by filing a Claim.
- C. If a submitted matter in question concerns terms and conditions of the Contract Documents that do not involve (1) the performance or acceptability of the Work under the Contract Documents, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, then Engineer will promptly notify Owner and Contractor in writing that Engineer is unable to provide a decision or interpretation. If Owner and Contractor are unable to agree on resolution of such a matter in question, either party may pursue resolution as provided in Article 12.

3.05 *Reuse of Documents*

- A. Contractor and its Subcontractors and Suppliers shall not:
 - 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer or its consultants, including electronic media versions, or reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of Owner and Engineer and specific written verification or adaptation by Engineer; or
 - 2. have or acquire any title or ownership rights in any other Contract Documents, reuse any such Contract Documents for any purpose without Owner's express written consent, or violate any copyrights pertaining to such Contract Documents.
- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein precludes Contractor from retaining copies of the Contract Documents for record purposes.

ARTICLE 4—COMMENCEMENT AND PROGRESS OF THE WORK

4.01 *Commencement of Contract Times; Notice to Proceed*

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

4.02 *Starting the Work*

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

4.03 *Reference Points*

- A. Owner shall provide engineering surveys to establish reference points for construction which in Engineer's judgment are necessary to enable Contractor to proceed with the Work. Contractor shall be responsible for laying out the Work, shall protect and preserve the

established reference points and property monuments, and shall make no changes or relocations without the prior written approval of Owner. Contractor shall report to Engineer whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations, and shall be responsible for the accurate replacement or relocation of such reference points or property monuments by professionally qualified personnel.

4.04 *Progress Schedule*

- A. Contractor shall adhere to the Progress Schedule established in accordance with Paragraph 2.05 as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to Engineer for acceptance (to the extent indicated in Paragraph 2.05) proposed adjustments in the Progress Schedule that will not result in changing the Contract Times.
 - 2. Proposed adjustments in the Progress Schedule that will change the Contract Times must be submitted in accordance with the requirements of Article 11.
- B. Contractor shall carry on the Work and adhere to the Progress Schedule during all disputes or disagreements with Owner. No Work will be delayed or postponed pending resolution of any disputes or disagreements, or during any appeal process, except as permitted by Paragraph 16.04, or as Owner and Contractor may otherwise agree in writing.

4.05 *Delays in Contractor's Progress*

- A. If Owner, Engineer, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times.
- B. Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delay, disruption, or interference caused by or within the control of Contractor. Delay, disruption, 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.

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

5.01 *Availability of Lands*

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

- B. Upon reasonable written request, Owner shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which permanent improvements are to be made and Owner's interest therein as necessary for giving notice of or filing a mechanic's or construction lien against such lands in accordance with applicable Laws and Regulations.
- C. Contractor shall provide for all additional lands and access thereto that may be required for temporary construction facilities or storage of materials and equipment.

5.02 *Use of Site and Other Areas*

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

1. Contractor shall confine construction equipment, temporary construction facilities, the storage of materials and equipment, and the operations of workers to the Site, adjacent areas that Contractor has arranged to use through construction easements or otherwise, and other adjacent areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and such other adjacent areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for (a) damage to the Site; (b) damage to any such other adjacent areas used for Contractor's operations; (c) damage to any other adjacent land or areas, or to improvements, structures, utilities, or similar facilities located at such adjacent lands or areas; and (d) for injuries and losses sustained by the owners or occupants of any such land or areas; provided that such damage or injuries result from the performance of the Work or from other actions or conduct of the Contractor or those for which Contractor is responsible.
 2. If a damage or injury claim is made by the owner or occupant of any such land or area because of the performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible, Contractor shall (a) take immediate corrective or remedial action as required by Paragraph 7.13, or otherwise; (b) promptly attempt to settle the claim as to all parties through negotiations with such owner or occupant, or otherwise resolve the claim by arbitration or other dispute resolution proceeding, or in a court of competent jurisdiction; and (c) to the fullest extent permitted by Laws and Regulations, indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against any such claim, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against Owner, Engineer, or any other party indemnified hereunder to the extent caused directly or indirectly, in whole or in part by, or based upon, Contractor's performance of the Work, or because of other actions or conduct of the Contractor or those for which Contractor is responsible.
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work the Contractor shall keep the Site and other adjacent areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris will conform to applicable Laws and Regulations.
 - C. *Cleaning:* Prior to Substantial Completion of the Work Contractor shall clean the Site and the Work and make it ready for utilization by Owner. At the completion of the Work Contractor shall remove from the Site and adjacent areas all tools, appliances, construction equipment

and machinery, and surplus materials and shall restore to original condition all property not designated for alteration by the Contract Documents.

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

5.03 *Subsurface and Physical Conditions*

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

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

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

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

- 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*
1. Contractor shall be entitled to an equitable adjustment in Contract Price or Contract Times, to the extent that the existence of a differing subsurface or physical condition, or any related delay, disruption, or interference, causes an increase or decrease in

Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. Such condition must fall within any one or more of the categories described in Paragraph 5.04.A;
 - b. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03; and,
 - c. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E.
2. Contractor shall not be entitled to any adjustment in the Contract Price or Contract Times with respect to a subsurface or physical condition if:
 - a. Contractor knew of the existence of such condition at the time Contractor made a commitment to Owner with respect to Contract Price and Contract Times by the submission of a Bid or becoming bound under a negotiated contract, or otherwise;
 - b. The existence of such condition reasonably could have been discovered or revealed as a result of any examination, investigation, exploration, test, or study of the Site and contiguous areas expressly required by the Bidding Requirements or Contract Documents to be conducted by or for Contractor prior to Contractor's making such commitment; or
 - c. Contractor failed to give the written notice required by Paragraph 5.04.A.
 3. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 4. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the subsurface or physical condition in question.
- F. *Underground Facilities; Hazardous Environmental Conditions:* Paragraph 5.05 governs rights and responsibilities regarding the presence or location of Underground Facilities. Paragraph 5.06 governs rights and responsibilities regarding Hazardous Environmental Conditions. The provisions of Paragraphs 5.03 and 5.04 are not applicable to the presence or location of Underground Facilities, or to Hazardous Environmental Conditions.

5.05 *Underground Facilities*

- A. *Contractor's Responsibilities:* Unless it is otherwise expressly provided in the Supplementary Conditions, the cost of all of the following are included in the Contract Price, and Contractor shall have full responsibility for:
1. reviewing and checking all information and data regarding existing Underground Facilities at the Site;
 2. complying with applicable state and local utility damage prevention Laws and Regulations;

3. verifying the actual location of those Underground Facilities shown or indicated in the Contract Documents as being within the area affected by the Work, by exposing such Underground Facilities during the course of construction;
 4. coordination of the Work with the owners (including Owner) of such Underground Facilities, during construction; and
 5. the safety and protection of all existing Underground Facilities at the Site, and repairing any damage thereto resulting from the Work.
- B. *Notice by Contractor:* If Contractor believes that an Underground Facility that is uncovered or revealed at the Site was not shown or indicated on the Drawings, or was not shown or indicated on the Drawings with reasonable accuracy, then Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any Work in connection therewith (except in an emergency as required by Paragraph 7.15), notify Owner and Engineer in writing regarding such Underground Facility.
- C. *Engineer's Review:* Engineer will:
1. promptly review the Underground Facility and conclude whether such Underground Facility was not shown or indicated on the Drawings, or was not shown or indicated with reasonable accuracy;
 2. identify and communicate with the owner of the Underground Facility; prepare recommendations to Owner (and if necessary issue any preliminary instructions to Contractor) regarding the Contractor's resumption of Work in connection with the Underground Facility in question;
 3. obtain any pertinent cost or schedule information from Contractor; determine the extent, if any, to which a change is required in the Drawings or Specifications to reflect and document the consequences of the existence or location of the Underground Facility; and
 4. advise Owner in writing of Engineer's findings, conclusions, and recommendations.
- During such time, Contractor shall be responsible for the safety and protection of such Underground Facility.
- D. *Owner's Statement to Contractor Regarding Underground Facility:* After receipt of Engineer's written findings, conclusions, and recommendations, Owner shall issue a written statement to Contractor (with a copy to Engineer) regarding the Underground Facility in question addressing the resumption of Work in connection with such Underground Facility, indicating whether any change in the Drawings or Specifications will be made, and adopting or rejecting Engineer's written findings, conclusions, and recommendations in whole or in part.
- E. *Early Resumption of Work:* If at any time Engineer determines that Work in connection with the Underground Facility may resume prior to completion of Engineer's review or Owner's issuance of its statement to Contractor, because the Underground Facility in question and conditions affected by its presence have been adequately documented, and analyzed on a preliminary basis, then the Engineer may at its discretion instruct Contractor to resume such Work.
- F. *Possible Price and Times Adjustments*
1. Contractor shall be entitled to an equitable adjustment in the Contract Price or Contract Times, to the extent that any existing Underground Facility at the Site that was not shown

or indicated on the Drawings, or was not shown or indicated with reasonable accuracy, or any related delay, disruption, or interference, causes an increase or decrease in Contractor's cost of, or time required for, performance of the Work; subject, however, to the following:

- a. With respect to Work that is paid for on a unit price basis, any adjustment in Contract Price will be subject to the provisions of Paragraph 13.03;
 - b. Contractor's entitlement to an adjustment of the Contract Times is subject to the provisions of Paragraphs 4.05.D and 4.05.E; and
 - c. Contractor gave the notice required in Paragraph 5.05.B.
2. If Owner and Contractor agree regarding Contractor's entitlement to and the amount or extent of any adjustment in the Contract Price or Contract Times, then any such adjustment will be set forth in a Change Order.
 3. Contractor may submit a Change Proposal regarding its entitlement to or the amount or extent of any adjustment in the Contract Price or Contract Times, no later than 30 days after Owner's issuance of the Owner's written statement to Contractor regarding the Underground Facility in question.
 4. The information and data shown or indicated on the Drawings with respect to existing Underground Facilities at the Site is based on information and data (a) furnished by the owners of such Underground Facilities, or by others, (b) obtained from available records, or (c) gathered in an investigation conducted in accordance with the current edition of ASCE 38, Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, by the American Society of Civil Engineers. If such information or data is incorrect or incomplete, Contractor's remedies are limited to those set forth in this Paragraph 5.05.F.

5.06 *Hazardous Environmental Conditions at Site*

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

1. those reports known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site;
2. drawings known to Owner relating to Hazardous Environmental Conditions that have been identified at or adjacent to the Site; and
3. Technical Data contained in such reports and drawings.

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

1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures

- of construction to be employed by Contractor, and safety precautions and programs incident thereto;
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any Technical Data or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for removing or remediating any Hazardous Environmental Condition encountered, uncovered, or revealed at the Site unless such removal or remediation is expressly identified in the Contract Documents to be within the scope of the Work.
- D. Contractor shall be responsible for controlling, containing, and duly removing all Constituents of Concern brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible, and for any associated costs; and for the costs of removing and remediating any Hazardous Environmental Condition created by the presence of any such Constituents of Concern.
- E. If Contractor encounters, uncovers, or reveals a Hazardous Environmental Condition whose removal or remediation is not expressly identified in the Contract Documents as being within the scope of the Work, or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, then Contractor shall immediately: (1) secure or otherwise isolate such condition; (2) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 7.15); and (3) notify Owner and Engineer (and promptly thereafter confirm such notice in writing). Owner shall promptly consult with Engineer concerning the necessity for Owner to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Owner shall take such actions as are necessary to permit Owner to timely obtain required permits and provide Contractor the written notice required by Paragraph 5.06.F. If Contractor or anyone for whom Contractor is responsible created the Hazardous Environmental Condition in question, then Owner may remove and remediate the Hazardous Environmental Condition, and impose a set-off against payments to account for the associated costs.
- F. Contractor shall not resume Work in connection with such Hazardous Environmental Condition or in any affected area until after Owner has obtained any required permits related thereto, and delivered written notice to Contractor either (1) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work, or (2) specifying any special conditions under which such Work may be resumed safely.
- G. If Owner and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, as a result of such Work stoppage, such special conditions under which Work is agreed to be resumed by Contractor, or any costs or expenses incurred in response to the Hazardous Environmental Condition, then within 30 days of Owner's written notice regarding the resumption of Work, Contractor may submit a Change Proposal, or Owner may impose a set-off. Entitlement to any such adjustment is subject to the provisions of Paragraphs 4.05.D, 4.05.E, 11.07, and 11.08.
- H. If, after receipt of such written notice, Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special

conditions, then Owner may order the portion of the Work that is in the area affected by such condition to be deleted from the Work, following the contractual change procedures in Article 11. Owner may have such deleted portion of the Work performed by Owner's own forces or others in accordance with Article 8.

- I. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court, arbitration, or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition, provided that such Hazardous Environmental Condition (1) was not shown or indicated in the Drawings, Specifications, or other Contract Documents, identified as Technical Data entitled to limited reliance pursuant to Paragraph 5.06.B, or identified in the Contract Documents to be included within the scope of the Work, and (2) was not created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.I obligates Owner to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- J. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the failure to control, contain, or remove a Constituent of Concern brought to the Site by Contractor or by anyone for whom Contractor is responsible, or to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 5.06.J obligates Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- K. The provisions of Paragraphs 5.03, 5.04, and 5.05 do not apply to the presence of Constituents of Concern or to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 6—BONDS AND INSURANCE

6.01 *Performance, Payment, and Other Bonds*

- A. Contractor shall furnish a performance bond and a payment bond, each in an amount at least equal to the Contract Price, as security for the faithful performance and payment of Contractor's obligations under the Contract. These bonds must remain in effect until one year after the date when final payment becomes due or until completion of the correction period specified in Paragraph 15.08, whichever is later, except as provided otherwise by Laws or Regulations, the terms of a prescribed bond form, the Supplementary Conditions, or other provisions of the Contract.
- B. Contractor shall also furnish such other bonds (if any) as are required by the Supplementary Conditions or other provisions of the Contract.
- C. All bonds must be in the form included in the Bidding Documents or otherwise specified by Owner prior to execution of the Contract, except as provided otherwise by Laws or

Regulations, and must be issued and signed by a surety named in “Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies” as published in Department Circular 570 (as amended and supplemented) by the Bureau of the Fiscal Service, U.S. Department of the Treasury. A bond signed by an agent or attorney-in-fact must be accompanied by a certified copy of that individual’s authority to bind the surety. The evidence of authority must show that it is effective on the date the agent or attorney-in-fact signed the accompanying bond.

- D. Contractor shall obtain the required bonds from surety companies that are duly licensed or authorized, in the state or jurisdiction in which the Project is located, to issue bonds in the required amounts.
- E. If the surety on a bond furnished by Contractor is declared bankrupt or becomes insolvent, or the surety ceases to meet the requirements above, then Contractor shall promptly notify Owner and Engineer in writing and shall, within 20 days after the event giving rise to such notification, provide another bond and surety, both of which must comply with the bond and surety requirements above.
- F. If Contractor has failed to obtain a required bond, Owner may exclude the Contractor from the Site and exercise Owner’s termination rights under Article 16.
- G. Upon request to Owner from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Owner shall provide a copy of the payment bond to such person or entity.
- H. Upon request to Contractor from any Subcontractor, Supplier, or other person or entity claiming to have furnished labor, services, materials, or equipment used in the performance of the Work, Contractor shall provide a copy of the payment bond to such person or entity.

6.02 *Insurance—General Provisions*

- A. Owner and Contractor shall obtain and maintain insurance as required in this article and in the Supplementary Conditions.
- B. All insurance required by the Contract to be purchased and maintained by Owner or Contractor shall be obtained from insurance companies that are duly licensed or authorized in the state or jurisdiction in which the Project is located to issue insurance policies for the required limits and coverages. Unless a different standard is indicated in the Supplementary Conditions, all companies that provide insurance policies required under this Contract shall have an A.M. Best rating of A-VII or better.
- C. Alternative forms of insurance coverage, including but not limited to self-insurance and “Occupational Accident and Excess Employer’s Indemnity Policies,” are not sufficient to meet the insurance requirements of this Contract, unless expressly allowed in the Supplementary Conditions.
- D. Contractor shall deliver to Owner, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Contractor has obtained and is maintaining the policies and coverages required by the Contract. Upon request by Owner or any other insured, Contractor shall also furnish other evidence of such required insurance, including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, full disclosure of all relevant exclusions, and evidence of insurance required to be purchased and maintained by

Subcontractors or Suppliers. In any documentation furnished under this provision, Contractor, Subcontractors, and Suppliers may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those applicable to this Contract.

- E. Owner shall deliver to Contractor, with copies to each additional insured identified in the Contract, certificates of insurance and endorsements establishing that Owner has obtained and is maintaining the policies and coverages required of Owner by the Contract (if any). Upon request by Contractor or any other insured, Owner shall also provide other evidence of such required insurance (if any), including but not limited to copies of policies, documentation of applicable self-insured retentions (if allowed) and deductibles, and full disclosure of all relevant exclusions. In any documentation furnished under this provision, Owner may block out (redact) (1) any confidential premium or pricing information and (2) any wording specific to a project or jurisdiction other than those relevant to this Contract.
- F. Failure of Owner or Contractor to demand such certificates or other evidence of the other party's full compliance with these insurance requirements, or failure of Owner or Contractor to identify a deficiency in compliance from the evidence provided, will not be construed as a waiver of the other party's obligation to obtain and maintain such insurance.
- G. In addition to the liability insurance required to be provided by Contractor, the Owner, at Owner's option, may purchase and maintain Owner's own liability insurance. Owner's liability policies, if any, operate separately and independently from policies required to be provided by Contractor, and Contractor cannot rely upon Owner's liability policies for any of Contractor's obligations to the Owner, Engineer, or third parties.
- H. Contractor shall require:
 - 1. Subcontractors to purchase and maintain worker's compensation, commercial general liability, and other insurance that is appropriate for their participation in the Project, and to name as additional insureds Owner and Engineer (and any other individuals or entities identified in the Supplementary Conditions as additional insureds on Contractor's liability policies) on each Subcontractor's commercial general liability insurance policy; and
 - 2. Suppliers to purchase and maintain insurance that is appropriate for their participation in the Project.
- I. If either party does not purchase or maintain the insurance required of such party by the Contract, such party shall notify the other party in writing of such failure to purchase prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.
- J. If Contractor has failed to obtain and maintain required insurance, Contractor's entitlement to enter or remain at the Site will end immediately, and Owner may impose an appropriate set-off against payment for any associated costs (including but not limited to the cost of purchasing necessary insurance coverage), and exercise Owner's termination rights under Article 16.
- K. Without prejudice to any other right or remedy, if a party has failed to obtain required insurance, the other party may elect (but is in no way obligated) to obtain equivalent insurance to protect such other party's interests at the expense of the party who was required to provide such coverage, and the Contract Price will be adjusted accordingly.

- L. Owner does not represent that insurance coverage and limits established in this Contract necessarily will be adequate to protect Contractor or Contractor's interests. Contractor is responsible for determining whether such coverage and limits are adequate to protect its interests, and for obtaining and maintaining any additional insurance that Contractor deems necessary.
- M. The insurance and insurance limits required herein will not be deemed as a limitation on Contractor's liability, or that of its Subcontractors or Suppliers, under the indemnities granted to Owner and other individuals and entities in the Contract or otherwise.
- N. All the policies of insurance required to be purchased and maintained under this Contract will contain a provision or endorsement that the coverage afforded will not be canceled, or renewal refused, until at least 10 days prior written notice has been given to the purchasing policyholder. Within three days of receipt of any such written notice, the purchasing policyholder shall provide a copy of the notice to each other insured and Engineer.

6.03 *Contractor's Insurance*

- A. *Required Insurance:* Contractor shall purchase and maintain Worker's Compensation, Commercial General Liability, and other insurance pursuant to the specific requirements of the Supplementary Conditions.
- B. *General Provisions:* The policies of insurance required by this Paragraph 6.03 as supplemented must:
 - 1. include at least the specific coverages required;
 - 2. be written for not less than the limits provided, or those required by Laws or Regulations, whichever is greater;
 - 3. remain in effect at least until the Work is complete (as set forth in Paragraph 15.06.D), and longer if expressly required elsewhere in this Contract, and at all times thereafter when Contractor may be correcting, removing, or replacing defective Work as a warranty or correction obligation, or otherwise, or returning to the Site to conduct other tasks arising from the Contract;
 - 4. apply with respect to the performance of the Work, whether such performance is by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable; and
 - 5. include all necessary endorsements to support the stated requirements.
- C. *Additional Insureds:* The Contractor's commercial general liability, automobile liability, employer's liability, umbrella or excess, pollution liability, and unmanned aerial vehicle liability policies, if required by this Contract, must:
 - 1. include and list as additional insureds Owner and Engineer, and any individuals or entities identified as additional insureds in the Supplementary Conditions;
 - 2. include coverage for the respective officers, directors, members, partners, employees, and consultants of all such additional insureds;
 - 3. afford primary coverage to these additional insureds for all claims covered thereby (including as applicable those arising from both ongoing and completed operations);

4. not seek contribution from insurance maintained by the additional insured; and
5. as to commercial general liability insurance, apply to additional insureds with respect to liability caused in whole or in part by Contractor's acts or omissions, or the acts and omissions of those working on Contractor's behalf, in the performance of Contractor's operations.

6.04 *Builder's Risk and Other Property Insurance*

- A. *Builder's Risk*: Unless otherwise provided in the Supplementary Conditions, Contractor shall purchase and maintain builder's risk insurance upon the Work on a completed value basis, in the amount of the Work's full insurable replacement cost (subject to such deductible amounts as may be provided in the Supplementary Conditions or required by Laws and Regulations). The specific requirements applicable to the builder's risk insurance are set forth in the Supplementary Conditions.
- B. *Property Insurance for Facilities of Owner Where Work Will Occur*: Owner is responsible for obtaining and maintaining property insurance covering each existing structure, building, or facility in which any part of the Work will occur, or to which any part of the Work will attach or be adjoined. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, providing coverage consistent with that required for the builder's risk insurance, and will be maintained until the Work is complete, as set forth in Paragraph 15.06.D.
- C. *Property Insurance for Substantially Complete Facilities*: Promptly after Substantial Completion, and before actual occupancy or use of the substantially completed Work, Owner will obtain property insurance for such substantially completed Work, and maintain such property insurance at least until the Work is complete, as set forth in Paragraph 15.06.D. Such property insurance will be written on a special perils (all-risk) form, on a replacement cost basis, and provide coverage consistent with that required for the builder's risk insurance. The builder's risk insurance may terminate upon written confirmation of Owner's procurement of such property insurance.
- D. *Partial Occupancy or Use by Owner*: If Owner will occupy or use a portion or portions of the Work prior to Substantial Completion of all the Work, as provided in Paragraph 15.04, then Owner (directly, if it is the purchaser of the builder's risk policy, or through Contractor) will provide advance notice of such occupancy or use to the builder's risk insurer, and obtain an endorsement consenting to the continuation of coverage prior to commencing such partial occupancy or use.
- E. *Insurance of Other Property; Additional Insurance*: If the express insurance provisions of the Contract do not require or address the insurance of a property item or interest, then the entity or individual owning such property item will be responsible for insuring it. If Contractor elects to obtain other special insurance to be included in or supplement the builder's risk or property insurance policies provided under this Paragraph 6.04, it may do so at Contractor's expense.

6.05 *Property Losses; Subrogation*

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

Engineer or its consultants, or their officers, directors, members, partners, employees, agents, consultants, or subcontractors.

1. Owner and Contractor waive all rights against each other and the respective officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from any of the perils, risks, or causes of loss covered by such policies and any other property insurance applicable to the Work; and, in addition, waive all such rights against Engineer, its consultants, all individuals or entities identified in the Supplementary Conditions as builder's risk or installation floater insureds, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, under such policies for losses and damages so caused.
 2. None of the above waivers extends to the rights that any party making such waiver may have to the proceeds of insurance held by Owner or Contractor as trustee or fiduciary, or otherwise payable under any policy so issued.
- B. Any property insurance policy maintained by Owner covering any loss, damage, or consequential loss to Owner's existing structures, buildings, or facilities in which any part of the Work will occur, or to which any part of the Work will attach or adjoin; to adjacent structures, buildings, or facilities of Owner; or to part or all of the completed or substantially completed Work, during partial occupancy or use pursuant to Paragraph 15.04, after Substantial Completion pursuant to Paragraph 15.03, or after final payment pursuant to Paragraph 15.06, will contain provisions to the effect that in the event of payment of any loss or damage the insurer will have no rights of recovery against any insureds thereunder, or against Contractor, Subcontractors, or Engineer, or the officers, directors, members, partners, employees, agents, consultants, or subcontractors of each and any of them, and that the insured is allowed to waive the insurer's rights of subrogation in a written contract executed prior to the loss, damage, or consequential loss.
1. Owner waives all rights against Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, for all losses and damages caused by, arising out of, or resulting from fire or any of the perils, risks, or causes of loss covered by such policies.
- C. The waivers in this Paragraph 6.05 include the waiver of rights due to business interruption, loss of use, or other consequential loss extending beyond direct physical loss or damage to Owner's property or the Work caused by, arising out of, or resulting from fire or other insured peril, risk, or cause of loss.
- D. Contractor shall be responsible for assuring that each Subcontract contains provisions whereby the Subcontractor waives all rights against Owner, Contractor, all individuals or entities identified in the Supplementary Conditions as insureds, the Engineer and its consultants, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, for all losses and damages caused by, arising out of, relating to, or resulting from fire or other peril, risk, or cause of loss covered by builder's risk insurance, installation floater, and any other property insurance applicable to the Work.

6.06 *Receipt and Application of Property Insurance Proceeds*

- A. Any insured loss under the builder's risk and other policies of property insurance required by Paragraph 6.04 will be adjusted and settled with the named insured that purchased the policy. Such named insured shall act as fiduciary for the other insureds, and give notice to such other insureds that adjustment and settlement of a claim is in progress. Any other insured may state its position regarding a claim for insured loss in writing within 15 days after notice of such claim.
- B. Proceeds for such insured losses may be made payable by the insurer either jointly to multiple insureds, or to the named insured that purchased the policy in its own right and as fiduciary for other insureds, subject to the requirements of any applicable mortgage clause. A named insured receiving insurance proceeds under the builder's risk and other policies of insurance required by Paragraph 6.04 shall maintain such proceeds in a segregated account, and distribute such proceeds in accordance with such agreement as the parties in interest may reach, or as otherwise required under the dispute resolution provisions of this Contract or applicable Laws and Regulations.
- C. If no other special agreement is reached, Contractor shall repair or replace the damaged Work, using allocated insurance proceeds.

ARTICLE 7—CONTRACTOR'S RESPONSIBILITIES

7.01 *Contractor's Means and Methods of Construction*

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

7.02 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents.
- B. At all times during the progress of the Work, Contractor shall assign a competent resident superintendent who will not be replaced without written notice to Owner and Engineer except under extraordinary circumstances.

7.03 *Labor; Working Hours*

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

- B. Contractor shall be fully responsible to Owner and Engineer for all acts and omissions of Contractor's employees; of Suppliers and Subcontractors, and their employees; and of any other individuals or entities performing or furnishing any of the Work, just as Contractor is responsible for Contractor's own acts and omissions.
- C. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site will be performed during regular working hours, Monday through Friday. Contractor will not perform Work on a Saturday, Sunday, or any legal holiday. Contractor may perform Work outside regular working hours or on Saturdays, Sundays, or legal holidays only with Owner's written consent, which will not be unreasonably withheld.

7.04 *Services, Materials, and Equipment*

- A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, testing, start up, and completion of the Work, whether or not such items are specifically called for in the Contract Documents.
- B. All materials and equipment incorporated into the Work must be new and of good quality, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications will expressly run to the benefit of Owner. If required by Engineer, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.
- C. All materials and equipment must be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.

7.05 *"Or Equals"*

- A. *Contractor's Request; Governing Criteria:* Whenever an item of equipment or material is specified or described in the Contract Documents by using the names of one or more proprietary items or specific Suppliers, the Contract Price has been based upon Contractor furnishing such item as specified. The specification or description of such an item is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or equal" item is permitted, Contractor may request that Engineer authorize the use of other items of equipment or material, or items from other proposed Suppliers, under the circumstances described below.
 - 1. If Engineer in its sole discretion determines that an item of equipment or material proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, Engineer will deem it an "or equal" item. For the purposes of this paragraph, a proposed item of equipment or material will be considered functionally equal to an item so named if:
 - a. in the exercise of reasonable judgment Engineer determines that the proposed item:
 - 1) is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole;
 - 3) has a proven record of performance and availability of responsive service; and
 - 4) is not objectionable to Owner.
- b. Contractor certifies that, if the proposed item is approved and incorporated into the Work:
- 1) there will be no increase in cost to the Owner or increase in Contract Times; and
 - 2) the item will conform substantially to the detailed requirements of the item named in the Contract Documents.
- B. *Contractor's Expense*: Contractor shall provide all data in support of any proposed "or equal" item at Contractor's expense.
- C. *Engineer's Evaluation and Determination*: Engineer will be allowed a reasonable time to evaluate each "or-equal" request. Engineer may require Contractor to furnish additional data about the proposed "or-equal" item. Engineer will be the sole judge of acceptability. No "or-equal" item will be ordered, furnished, installed, or utilized until Engineer's review is complete 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*

- A. Contractor may retain Subcontractors and Suppliers for the performance of parts of the Work. Such Subcontractors and Suppliers must be acceptable to Owner. The Contractor's retention of a Subcontractor or Supplier for the performance of parts of the Work will not relieve Contractor's obligation to Owner to perform and complete the Work in accordance with the Contract Documents.
- B. Contractor shall retain specific Subcontractors and Suppliers for the performance of designated parts of the Work if required by the Contract to do so.
- C. Subsequent to the submittal of Contractor's Bid or final negotiation of the terms of the Contract, Owner may not require Contractor to retain any Subcontractor or Supplier to furnish or perform any of the Work against which Contractor has reasonable objection.
- D. Prior to entry into any binding subcontract or purchase order, Contractor shall submit to Owner the identity of the proposed Subcontractor or Supplier (unless Owner has already deemed such proposed Subcontractor or Supplier acceptable during the bidding process or otherwise). Such proposed Subcontractor or Supplier shall be deemed acceptable to Owner unless Owner raises a substantive, reasonable objection within 5 days.
- E. Owner may require the replacement of any Subcontractor or Supplier. Owner also may require Contractor to retain specific replacements; provided, however, that Owner may not require a replacement to which Contractor has a reasonable objection. If Contractor has submitted the identity of certain Subcontractors or Suppliers for acceptance by Owner, and Owner has accepted it (either in writing or by failing to make written objection thereto), then Owner may subsequently revoke the acceptance of any such Subcontractor or Supplier so identified solely on the basis of substantive, reasonable objection after due investigation. Contractor shall submit an acceptable replacement for the rejected Subcontractor or Supplier.
- F. If Owner requires the replacement of any Subcontractor or Supplier retained by Contractor to perform any part of the Work, then Contractor shall be entitled to an adjustment in Contract Price or Contract Times, with respect to the replacement; and Contractor shall initiate a Change Proposal for such adjustment within 30 days of Owner's requirement of replacement.
- G. No acceptance by Owner of any such Subcontractor or Supplier, whether initially or as a replacement, will constitute a waiver of the right of Owner to the completion of the Work in accordance with the Contract Documents.

- H. On a monthly basis, Contractor shall submit to Engineer a complete list of all Subcontractors and Suppliers having a direct contract with Contractor, and of all other Subcontractors and Suppliers known to Contractor at the time of submittal.
- I. Contractor shall be solely responsible for scheduling and coordinating the work of Subcontractors and Suppliers.
- J. The divisions and sections of the Specifications and the identifications of any Drawings do not control Contractor in dividing the Work among Subcontractors or Suppliers, or in delineating the Work to be performed by any specific trade.
- K. All Work performed for Contractor by a Subcontractor or Supplier must be pursuant to an appropriate contractual agreement that specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract for the benefit of Owner and Engineer.
- L. Owner may furnish to any Subcontractor or Supplier, to the extent practicable, information about amounts paid to Contractor for Work performed for Contractor by the Subcontractor or Supplier.
- M. Contractor shall restrict all Subcontractors and Suppliers from communicating with Engineer or Owner, except through Contractor or in case of an emergency, or as otherwise expressly allowed in this Contract.

7.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If an invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of Owner or Engineer, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights will be disclosed in the Contract Documents.
- B. To the fullest extent permitted by Laws and Regulations, Owner shall indemnify and hold harmless Contractor, and its officers, directors, members, partners, employees, agents, consultants, and subcontractors, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device specified in the Contract Documents, but not identified as being subject to payment of any license fee or royalty to others required by patent rights or copyrights.
- C. To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

7.09 *Permits*

- A. Unless otherwise provided in the Contract Documents, Contractor shall obtain and pay for all construction permits, licenses, and certificates of occupancy. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of the submission of Contractor's Bid (or when Contractor became bound under a negotiated contract). Owner shall pay all charges of utility owners for connections for providing permanent service to the Work.

7.10 *Taxes*

- A. Contractor shall pay all sales, consumer, use, and other similar taxes required to be paid by Contractor in accordance with the Laws and Regulations of the place of the Project which are applicable during the performance of the Work.

7.11 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Neither Owner nor Engineer shall be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work or takes any other action knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all resulting costs and losses, and shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such Work or other action. It is not Contractor's responsibility to make certain that the Work described in the Contract Documents is in accordance with Laws and Regulations, but this does not relieve Contractor of its obligations under Paragraph 3.03.
- C. Owner or Contractor may give written notice to the other party of any changes after the submission of Contractor's Bid (or after the date when Contractor became bound under a negotiated contract) in Laws or Regulations having an effect on the cost or time of performance of the Work, including but not limited to changes in Laws or Regulations having an effect on procuring permits and on sales, use, value-added, consumption, and other similar taxes. If Owner and Contractor are unable to agree on entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times resulting from such changes, then within 30 days of such written notice Contractor may submit a Change Proposal, or Owner may initiate a Claim.

7.12 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site one printed record copy of all Drawings, Specifications, Addenda, Change Orders, Work Change Directives, Field Orders, written interpretations and clarifications, and approved Shop Drawings. Contractor shall keep such record documents in good order and annotate them to show changes made during construction. These record documents, together with all approved Samples, will be available to Engineer for reference. Upon completion of the Work, Contractor shall deliver these record documents to Engineer.

7.13 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations.
- B. Contractor shall designate a qualified and experienced safety representative whose duties and responsibilities are the prevention of Work-related accidents and the maintenance and supervision of safety precautions and programs.
- C. Contractor shall take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury, or loss to:
 - 1. all persons on the Site or who may be affected by the Work;
 - 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 - 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, other work in progress, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- D. All damage, injury, or loss to any property referred to in Paragraph 7.13.C.2 or 7.13.C.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor at its expense (except damage or loss attributable to the fault of Drawings or Specifications or to the acts or omissions of Owner or Engineer or anyone employed by any of them, or anyone for whose acts any of them may be liable, and not attributable, directly or indirectly, in whole or in part, to the fault or negligence of Contractor or any Subcontractor, Supplier, or other individual or entity directly or indirectly employed by any of them).
- E. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection.
- F. Contractor shall notify Owner; the owners of adjacent property; the owners of Underground Facilities and other utilities (if the identity of such owners is known to Contractor); and other contractors and utility owners performing work at or adjacent to the Site, in writing, when Contractor knows that prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property or work in progress.
- G. Contractor shall comply with the applicable requirements of Owner's safety programs, if any. Any Owner's safety programs that are applicable to the Work are identified or included in the Supplementary Conditions or Specifications.
- H. Contractor shall inform Owner and Engineer of the specific requirements of Contractor's safety program with which Owner's and Engineer's employees and representatives must comply while at the Site.

- I. Contractor's duties and responsibilities for safety and protection will continue until all the Work is completed, Engineer has issued a written notice to Owner and Contractor in accordance with Paragraph 15.06.C that the Work is acceptable, and Contractor has left the Site (except as otherwise expressly provided in connection with Substantial Completion).
- J. Contractor's duties and responsibilities for safety and protection will resume whenever Contractor or any Subcontractor or Supplier returns to the Site to fulfill warranty or correction obligations, or to conduct other tasks arising from the Contract Documents.

7.14 *Hazard Communication Programs*

- A. Contractor shall be responsible for coordinating any exchange of safety data sheets (formerly known as material safety data sheets) or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with Laws or Regulations.

7.15 *Emergencies*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent damage, injury, or loss. Contractor shall give Engineer prompt written notice if Contractor believes that any significant changes in the Work or variations from the Contract Documents have been caused by an emergency, or are required as a result of Contractor's response to an emergency. If Engineer determines that a change in the Contract Documents is required because of an emergency or Contractor's response, a Work Change Directive or Change Order will be issued.

7.16 *Submittals*

A. *Shop Drawing and Sample Requirements*

- 1. Before submitting a Shop Drawing or Sample, Contractor shall:
 - a. review and coordinate the Shop Drawing or Sample with other Shop Drawings and Samples and with the requirements of the Work and the Contract Documents;
 - b. determine and verify:
 - 1) all field measurements, quantities, dimensions, specified performance and design criteria, installation requirements, materials, catalog numbers, and similar information with respect to the Submittal;
 - 2) the suitability of all materials and equipment offered with respect to the indicated application, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work; and
 - 3) all information relative to Contractor's responsibilities for means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto;
 - c. confirm that the Submittal is complete with respect to all related data included in the Submittal.
- 2. Each Shop Drawing or Sample must bear a stamp or specific written certification that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review of that Submittal, and that Contractor approves the Submittal.

3. With each Shop Drawing or Sample, Contractor shall give Engineer specific written notice of any variations that the Submittal may have from the requirements of the Contract Documents. This notice must be set forth in a written communication separate from the Submittal; and, in addition, in the case of a Shop Drawing by a specific notation made on the Shop Drawing itself.
- B. *Submittal Procedures for Shop Drawings and Samples:* Contractor shall label and submit Shop Drawings and Samples to Engineer for review and approval in accordance with the accepted Schedule of Submittals.
1. *Shop Drawings*
 - a. Contractor shall submit the number of copies required in the Specifications.
 - 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

- A. To the fullest extent permitted by Laws and Regulations, and in addition to any other obligations of Contractor under the Contract or otherwise, Contractor shall indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them, from losses, damages, costs, and judgments (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals, and all court or arbitration or other dispute resolution costs) arising from third-party claims or actions relating to or resulting from the performance or furnishing of the Work, provided that any such claim, action, loss, cost, judgment or damage is attributable to bodily injury, sickness, disease, or death, or to damage to or destruction of tangible property (other than the Work itself), including the loss of use resulting therefrom, but only to the extent caused by any negligent act or omission of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable.
- B. In any and all claims against Owner or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, by any employee (or the survivor or personal representative of such employee) of Contractor, any Subcontractor, any Supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, the indemnification obligation under Paragraph 7.18.A will not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for Contractor or any such Subcontractor, Supplier, or other individual or entity under workers' compensation acts, disability benefit acts, or other employee benefit acts.

7.19 Delegation of Professional Design Services

- A. Owner may require Contractor to provide professional design services for a portion of the Work by express delegation in the Contract Documents. Such delegation will specify the performance and design criteria that such services must satisfy, and the Submittals that Contractor must furnish to Engineer with respect to the Owner-delegated design.
- B. Contractor shall cause such Owner-delegated professional design services to be provided pursuant to the professional standard of care by a properly licensed design professional, whose signature and seal must appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such design professional. Such design professional must issue all certifications of design required by Laws and Regulations.
- C. If a Shop Drawing or other Submittal related to the Owner-delegated design is prepared by Contractor, a Subcontractor, or others for submittal to Engineer, then such Shop Drawing or other Submittal must bear the written approval of Contractor's design professional when submitted by Contractor to Engineer.

- D. Owner and Engineer shall be entitled to rely upon the adequacy, accuracy, and completeness of the services, certifications, and approvals performed or provided by the design professionals retained or employed by Contractor under an Owner-delegated design, subject to the professional standard of care and the performance and design criteria stated in the Contract Documents.
- E. Pursuant to this Paragraph 7.19, Engineer's review, approval, and other determinations regarding design drawings, calculations, specifications, certifications, and other Submittals furnished by Contractor pursuant to an Owner-delegated design will be only for the following limited purposes:
 - 1. Checking for conformance with the requirements of this Paragraph 7.19;
 - 2. Confirming that Contractor (through its design professionals) has used the performance and design criteria specified in the Contract Documents; and
 - 3. Establishing that the design furnished by Contractor is consistent with the design concept expressed in the Contract Documents.
- F. Contractor shall not be responsible for the adequacy of performance or design criteria specified by Owner or Engineer.
- G. Contractor is not required to provide professional services in violation of applicable Laws and Regulations.

ARTICLE 8—OTHER WORK AT THE SITE

8.01 *Other Work*

- A. In addition to and apart from the Work under the Contract Documents, the Owner may perform other work at or adjacent to the Site. Such other work may be performed by Owner's employees, or through contracts between the Owner and third parties. Owner may also arrange to have third-party utility owners perform work on their utilities and facilities at or adjacent to the Site.
- B. If Owner performs other work at or adjacent to the Site with Owner's employees, or through contracts for such other work, then Owner shall give Contractor written notice thereof prior to starting any such other work. If Owner has advance information regarding the start of any third-party utility work that Owner has arranged to take place at or adjacent to the Site, Owner shall provide such information to Contractor.
- C. Contractor shall afford proper and safe access to the Site to each contractor that performs such other work, each utility owner performing other work, and Owner, if Owner is performing other work with Owner's employees, and provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work.
- D. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of Engineer and the others whose work will be affected.

- E. If the proper execution or results of any part of Contractor's Work depends upon work performed by others, Contractor shall inspect such other work and promptly report to Engineer in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects and deficiencies in such other work.
- F. The provisions of this article are not applicable to work that is performed by third-party utilities or other third-party entities without a contract with Owner, or that is performed without having been arranged by Owner. If such work occurs, then any related delay, disruption, or interference incurred by Contractor is governed by the provisions of Paragraph 4.05.C.3.

8.02 *Coordination*

- A. If Owner intends to contract with others for the performance of other work at or adjacent to the Site, to perform other work at or adjacent to the Site with Owner's employees, or to arrange to have utility owners perform work at or adjacent to the Site, the following will be set forth in the Supplementary Conditions or provided to Contractor prior to the start of any such other work:
 - 1. The identity of the individual or entity that will have authority and responsibility for coordination of the activities among the various contractors;
 - 2. An itemization of the specific matters to be covered by such authority and responsibility; and
 - 3. The extent of such authority and responsibilities.
- B. Unless otherwise provided in the Supplementary Conditions, Owner shall have sole authority and responsibility for such coordination.

8.03 *Legal Relationships*

- A. If, in the course of performing other work for Owner at or adjacent to the Site, the Owner's employees, any other contractor working for Owner, or any utility owner that Owner has arranged to perform work, causes damage to the Work or to the property of Contractor or its Subcontractors, or delays, disrupts, interferes with, or increases the scope or cost of the performance of the Work, through actions or inaction, then Contractor shall be entitled to an equitable adjustment in the Contract Price or the Contract Times. Contractor must submit any Change Proposal seeking an equitable adjustment in the Contract Price or the Contract Times under this paragraph within 30 days of the damaging, delaying, disrupting, or interfering event. The entitlement to, and extent of, any such equitable adjustment will take into account information (if any) regarding such other work that was provided to Contractor in the Contract Documents prior to the submittal of the Bid or the final negotiation of the terms of the Contract, and any remedies available to Contractor under Laws or Regulations concerning utility action or inaction. When applicable, any such equitable adjustment in Contract Price will be conditioned on Contractor assigning to Owner all Contractor's rights against such other contractor or utility owner with respect to the damage, delay, disruption, or interference that is the subject of the adjustment. Contractor's entitlement to an adjustment of the Contract Times or Contract Price is subject to the provisions of Paragraphs 4.05.D and 4.05.E.

- B. Contractor shall take reasonable and customary measures to avoid damaging, delaying, disrupting, or interfering with the work of Owner, any other contractor, or any utility owner performing other work at or adjacent to the Site.
 - 1. If Contractor fails to take such measures and as a result damages, delays, disrupts, or interferes with the work of any such other contractor or utility owner, then Owner may impose a set-off against payments due Contractor, and assign to such other contractor or utility owner the Owner's contractual rights against Contractor with respect to the breach of the obligations set forth in this Paragraph 8.03.B.
 - 2. When Owner is performing other work at or adjacent to the Site with Owner's employees, Contractor shall be liable to Owner for damage to such other work, and for the reasonable direct delay, disruption, and interference costs incurred by Owner as a result of Contractor's failure to take reasonable and customary measures with respect to Owner's other work. In response to such damage, delay, disruption, or interference, Owner may impose a set-off against payments due Contractor.
- C. If Contractor damages, delays, disrupts, or interferes with the work of any other contractor, or any utility owner performing other work at or adjacent to the Site, through Contractor's failure to take reasonable and customary measures to avoid such impacts, or if any claim arising out of Contractor's actions, inactions, or negligence in performance of the Work at or adjacent to the Site is made by any such other contractor or utility owner against Contractor, Owner, or Engineer, then Contractor shall (1) promptly attempt to settle the claim as to all parties through negotiations with such other contractor or utility owner, or otherwise resolve the claim by arbitration or other dispute resolution proceeding or at law, and (2) indemnify and hold harmless Owner and Engineer, and the officers, directors, members, partners, employees, agents, consultants and subcontractors of each and any of them from and against any such claims, and against all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such damage, delay, disruption, or interference.

ARTICLE 9—OWNER'S RESPONSIBILITIES

9.01 *Communications to Contractor*

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

9.02 *Replacement of Engineer*

- A. Owner may at its discretion appoint an engineer to replace Engineer, provided Contractor makes no reasonable objection to the replacement engineer. The replacement engineer's status under the Contract Documents will be that of the former Engineer.

9.03 *Furnish Data*

- A. Owner shall promptly furnish the data required of Owner under the Contract Documents.

9.04 *Pay When Due*

- A. Owner shall make payments to Contractor when they are due as provided in the Agreement.

- 9.05 *Lands and Easements; Reports, Tests, and Drawings*
- A. Owner's duties with respect to providing lands and easements are set forth in Paragraph 5.01.
 - B. Owner's duties with respect to providing engineering surveys to establish reference points are set forth in Paragraph 4.03.
 - C. Article 5 refers to Owner's identifying and making available to Contractor copies of reports of explorations and tests of conditions at the Site, and drawings of physical conditions relating to existing surface or subsurface structures at the Site.
- 9.06 *Insurance*
- A. Owner's responsibilities, if any, with respect to purchasing and maintaining liability and property insurance are set forth in Article 6.
- 9.07 *Change Orders*
- A. Owner's responsibilities with respect to Change Orders are set forth in Article 11.
- 9.08 *Inspections, Tests, and Approvals*
- A. Owner's responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 14.02.B.
- 9.09 *Limitations on Owner's Responsibilities*
- A. The Owner shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Owner will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.
- 9.10 *Undisclosed Hazardous Environmental Condition*
- A. Owner's responsibility in respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 5.06.
- 9.11 *Evidence of Financial Arrangements*
- A. Upon request of Contractor, Owner shall furnish Contractor reasonable evidence that financial arrangements have been made to satisfy Owner's obligations under the Contract (including obligations under proposed changes in the Work).
- 9.12 *Safety Programs*
- A. While at the Site, Owner's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which Owner has been informed.
 - B. Owner shall furnish copies of any applicable Owner safety programs to Contractor.

ARTICLE 10—ENGINEER'S STATUS DURING CONSTRUCTION

10.01 *Owner's Representative*

- A. Engineer will be Owner's representative during the construction period. The duties and responsibilities and the limitations of authority of Engineer as Owner's representative during construction are set forth in the Contract.

10.02 *Visits to Site*

- A. Engineer will make visits to the Site at intervals appropriate to the various stages of construction as Engineer deems necessary in order to observe, as an experienced and qualified design professional, the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, Engineer, for the benefit of Owner, will determine, in general, if the Work is proceeding in accordance with the Contract Documents. Engineer will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. Engineer's efforts will be directed toward providing for Owner a greater degree of confidence that the completed Work will conform generally to the Contract Documents. On the basis of such visits and observations, Engineer will keep Owner informed of the progress of the Work and will endeavor to guard Owner against defective Work.
- B. Engineer's visits and observations are subject to all the limitations on Engineer's authority and responsibility set forth in Paragraph 10.07. Particularly, but without limitation, during or as a result of Engineer's visits or observations of Contractor's Work, Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work.

10.03 *Resident Project Representative*

- A. If Owner and Engineer have agreed that Engineer will furnish a Resident Project Representative to represent Engineer at the Site and assist Engineer in observing the progress and quality of the Work, then the authority and responsibilities of any such Resident Project Representative will be as provided in the Supplementary Conditions, and limitations on the responsibilities thereof will be as provided in the Supplementary Conditions and in Paragraph 10.07.
- B. If Owner designates an individual or entity who is not Engineer's consultant, agent, or employee to represent Owner at the Site, then the responsibilities and authority of such individual or entity will be as provided in the Supplementary Conditions.

10.04 *Engineer's Authority*

- A. Engineer has the authority to reject Work in accordance with Article 14.
- B. Engineer's authority as to Submittals is set forth in Paragraph 7.16.
- C. Engineer's authority as to design drawings, calculations, specifications, certifications and other Submittals from Contractor in response to Owner's delegation (if any) to Contractor of professional design services, is set forth in Paragraph 7.19.
- D. Engineer's authority as to changes in the Work is set forth in Article 11.

E. Engineer's authority as to Applications for Payment is set forth in Article 15.

10.05 *Determinations for Unit Price Work*

A. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor as set forth in Paragraph 13.03.

10.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

A. Engineer will render decisions regarding the requirements of the Contract Documents, and judge the acceptability of the Work, pursuant to the specific procedures set forth herein for initial interpretations, Change Proposals, and acceptance of the Work. In rendering such decisions and judgments, Engineer will not show partiality to Owner or Contractor, and will not be liable to Owner, Contractor, or others in connection with any proceedings, interpretations, decisions, or judgments conducted or rendered in good faith.

10.07 *Limitations on Engineer's Authority and Responsibilities*

A. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract, nor any decision made by Engineer in good faith either to exercise or not exercise such authority or responsibility or the undertaking, exercise, or performance of any authority or responsibility by Engineer, will create, impose, or give rise to any duty in contract, tort, or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, any other individual or entity, or to any surety for or employee or agent of any of them.

B. Engineer will not supervise, direct, control, or have authority over or be responsible for Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. Engineer will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

C. Engineer will not be responsible for the acts or omissions of Contractor or of any Subcontractor, any Supplier, or of any other individual or entity performing any of the Work.

D. Engineer's review of the final Application for Payment and accompanying documentation, and all maintenance and operating instructions, schedules, guarantees, bonds, certificates of inspection, tests and approvals, and other documentation required to be delivered by Contractor under Paragraph 15.06.A, will only be to determine generally that their content complies with the requirements of, and in the case of certificates of inspections, tests, and approvals, that the results certified indicate compliance with the Contract Documents.

E. The limitations upon authority and responsibility set forth in this Paragraph 10.07 also apply to the Resident Project Representative, if any.

10.08 *Compliance with Safety Program*

A. While at the Site, Engineer's employees and representatives will comply with the specific applicable requirements of Owner's and Contractor's safety programs of which Engineer has been informed.

ARTICLE 11—CHANGES TO THE CONTRACT

11.01 *Amending and Supplementing the Contract*

- A. The Contract may be amended or supplemented by a Change Order, a Work Change Directive, or a Field Order.
- B. If an amendment or supplement to the Contract includes a change in the Contract Price or the Contract Times, such amendment or supplement must be set forth in a Change Order.
- C. All changes to the Contract that involve (1) the performance or acceptability of the Work, (2) the design (as set forth in the Drawings, Specifications, or otherwise), or (3) other engineering or technical matters, must be supported by Engineer's recommendation. Owner and Contractor may amend other terms and conditions of the Contract without the recommendation of the Engineer.

11.02 *Change Orders*

- A. Owner and Contractor shall execute appropriate Change Orders covering:
 - 1. Changes in Contract Price or Contract Times which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed in accordance with a Work Change Directive;
 - 2. Changes in Contract Price resulting from an Owner set-off, unless Contractor has duly contested such set-off;
 - 3. Changes in the Work which are: (a) ordered by Owner pursuant to Paragraph 11.05, (b) required because of Owner's acceptance of defective Work under Paragraph 14.04 or Owner's correction of defective Work under Paragraph 14.07, or (c) agreed to by the parties, subject to the need for Engineer's recommendation if the change in the Work involves the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters; and
 - 4. Changes that embody the substance of any final and binding results under: Paragraph 11.03.B, resolving the impact of a Work Change Directive; Paragraph 11.09, concerning Change Proposals; Article 12, Claims; Paragraph 13.02.D, final adjustments resulting from allowances; Paragraph 13.03.D, final adjustments relating to determination of quantities for Unit Price Work; and similar provisions.
- B. If Owner or Contractor refuses to execute a Change Order that is required to be executed under the terms of Paragraph 11.02.A, it will be deemed to be of full force and effect, as if fully executed.

11.03 *Work Change Directives*

- A. A Work Change Directive will not change the Contract Price or the Contract Times but is evidence that the parties expect that the modification ordered or documented by a Work Change Directive will be incorporated in a subsequently issued Change Order, following negotiations by the parties as to the Work Change Directive's effect, if any, on the Contract Price and Contract Times; or, if negotiations are unsuccessful, by a determination under the terms of the Contract Documents governing adjustments, expressly including Paragraph 11.07 regarding change of Contract Price.

- B. If Owner has issued a Work Change Directive and:
 - 1. Contractor believes that an adjustment in Contract Times or Contract Price is necessary, then Contractor shall submit any Change Proposal seeking such an adjustment no later than 30 days after the completion of the Work set out in the Work Change Directive.
 - 2. Owner believes that an adjustment in Contract Times or Contract Price is necessary, then Owner shall submit any Claim seeking such an adjustment no later than 60 days after issuance of the Work Change Directive.

11.04 *Field Orders*

- A. Engineer may authorize minor changes in the Work if the changes do not involve an adjustment in the Contract Price or the Contract Times and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. Such changes will be accomplished by a Field Order and will be binding on Owner and also on Contractor, which shall perform the Work involved promptly.
- B. If Contractor believes that a Field Order justifies an adjustment in the Contract Price or Contract Times, then before proceeding with the Work at issue, Contractor shall submit a Change Proposal as provided herein.

11.05 *Owner-Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, Owner may, at any time or from time to time, order additions, deletions, or revisions in the Work. Changes involving the design (as set forth in the Drawings, Specifications, or otherwise) or other engineering or technical matters will be supported by Engineer's recommendation.
- B. Such changes in the Work may be accomplished by a Change Order, if Owner and Contractor have agreed as to the effect, if any, of the changes on Contract Times or Contract Price; or by a Work Change Directive. Upon receipt of any such document, Contractor shall promptly proceed with the Work involved; or, in the case of a deletion in the Work, promptly cease construction activities with respect to such deleted Work. Added or revised Work must be performed under the applicable conditions of the Contract Documents.
- C. Nothing in this Paragraph 11.05 obligates Contractor to undertake work that Contractor reasonably concludes cannot be performed in a manner consistent with Contractor's safety obligations under the Contract Documents or Laws and Regulations.

11.06 *Unauthorized Changes in the Work*

- A. Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Times with respect to any work performed that is not required by the Contract Documents, as amended, modified, or supplemented, except in the case of an emergency as provided in Paragraph 7.15 or in the case of uncovering Work as provided in Paragraph 14.05.C.2.

11.07 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Price must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment of Contract Price must comply with the provisions of Article 12.
- B. An adjustment in the Contract Price will be determined as follows:

1. Where the Work involved is covered by unit prices contained in the Contract Documents, then by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 13.03);
 2. Where the Work involved is not covered by unit prices contained in the Contract Documents, then by a mutually agreed lump sum (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 11.07.C.2); or
 3. Where the Work involved is not covered by unit prices contained in the Contract Documents and the parties do not reach mutual agreement to a lump sum, then on the basis of the Cost of the Work (determined as provided in Paragraph 13.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 11.07.C).
- C. *Contractor's Fee:* When applicable, the Contractor's fee for overhead and profit will be determined as follows:
1. A mutually acceptable fixed fee; or
 2. If a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. For costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2, the Contractor's fee will be 15 percent;
 - b. For costs incurred under Paragraph 13.01.B.3, the Contractor's fee will be 5 percent;
 - c. Where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 11.07.C.2.a and 11.07.C.2.b is that the Contractor's fee will be based on: (1) a fee of 15 percent of the costs incurred under Paragraphs 13.01.B.1 and 13.01.B.2 by the Subcontractor that actually performs the Work, at whatever tier, and (2) with respect to Contractor itself and to any Subcontractors of a tier higher than that of the Subcontractor that actually performs the Work, a fee of 5 percent of the amount (fee plus underlying costs incurred) attributable to the next lower tier Subcontractor; provided, however, that for any such subcontracted Work the maximum total fee to be paid by Owner will be no greater than 27 percent of the costs incurred by the Subcontractor that actually performs the Work;
 - d. No fee will be payable on the basis of costs itemized under Paragraphs 13.01.B.4, 13.01.B.5, and 13.01.C;
 - e. The amount of credit to be allowed by Contractor to Owner for any change which results in a net decrease in Cost of the Work will be the amount of the actual net decrease in Cost of the Work and a deduction of an additional amount equal to 5 percent of such actual net decrease in Cost of the Work; and
 - f. When both additions and credits are involved in any one change or Change Proposal, the adjustment in Contractor's fee will be computed by determining the sum of the costs in each of the cost categories in Paragraph 13.01.B (specifically, payroll costs, Paragraph 13.01.B.1; incorporated materials and equipment costs, Paragraph 13.01.B.2; Subcontract costs, Paragraph 13.01.B.3; special consultants costs, Paragraph 13.01.B.4; and other costs, Paragraph 13.01.B.5) and applying to each such cost category sum the appropriate fee from Paragraphs 11.07.C.2.a through 11.07.C.2.e, inclusive.

11.08 *Change of Contract Times*

- A. The Contract Times may only be changed by a Change Order. Any Change Proposal for an adjustment in the Contract Times must comply with the provisions of Paragraph 11.09. Any Claim for an adjustment in the Contract Times must comply with the provisions of Article 12.
- B. Delay, disruption, and interference in the Work, and any related changes in Contract Times, are addressed in and governed by Paragraph 4.05.

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*

- A. If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Times), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted to reflect the effect of any such change.

ARTICLE 12—CLAIMS

12.01 *Claims*

- A. *Claims Process*: The following disputes between Owner and Contractor are subject to the Claims process set forth in this article:
 1. Appeals by Owner or Contractor of Engineer's decisions regarding Change Proposals;
 2. Owner demands for adjustments in the Contract Price or Contract Times, or other relief under the Contract Documents;
 3. Disputes that Engineer has been unable to address because they do not involve the design (as set forth in the Drawings, Specifications, or otherwise), the acceptability of the Work, or other engineering or technical matters; and
 4. Subject to the waiver provisions of Paragraph 15.07, any dispute arising after Engineer has issued a written recommendation of final payment pursuant to Paragraph 15.06.B.
- B. *Submittal of Claim*: The party submitting a Claim shall deliver it directly to the other party to the Contract promptly (but in no event later than 30 days) after the start of the event giving rise thereto; in the case of appeals regarding Change Proposals within 30 days of the decision under appeal. The party submitting the Claim shall also furnish a copy to the Engineer, for its information only. The responsibility to substantiate a Claim rests with the party making the Claim. In the case of a Claim by Contractor seeking an increase in the Contract Times or Contract Price, Contractor shall certify that the Claim is made in good faith, that the supporting data are accurate and complete, and that to the best of Contractor's knowledge

and belief the amount of time or money requested accurately reflects the full amount to which Contractor is entitled.

- C. *Review and Resolution*: The party receiving a Claim shall review it thoroughly, giving full consideration to its merits. The two parties shall seek to resolve the Claim through the exchange of information and direct negotiations. The parties may extend the time for resolving the Claim by mutual agreement. All actions taken on a Claim will be stated in writing and submitted to the other party, with a copy to Engineer.
- 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 equipment rental rate book specified in the Supplementary Conditions. An hourly rate will be computed by dividing the monthly rates by 176. These computed rates will include all operating costs.
 - 3) With respect to Work that is the result of a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price ("changed Work"), included costs will be based on the time the equipment or machinery is in use on the changed Work and the costs of transportation, loading, unloading, assembly, dismantling, and removal when directly attributable to the changed Work. The cost of any such equipment or machinery, or parts thereof, must cease to accrue when the use thereof is no longer necessary for the changed Work.
- d. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable, as imposed by Laws and Regulations.
- e. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
- f. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work (except losses and damages within the deductible amounts of builder's risk or other property insurance established in accordance with Paragraph 6.04), provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses include settlements made with the written consent and approval of Owner. No such losses, damages, and expenses will be included in the Cost of the Work for the purpose of determining Contractor's fee.

- g. The cost of utilities, fuel, and sanitary facilities at the Site.
 - h. Minor expenses such as communication service at the Site, express and courier services, and similar petty cash items in connection with the Work.
 - 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, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 13.01.B.1 or specifically covered by Paragraph 13.01.B.4. The payroll costs and other compensation excluded here are to be considered administrative costs covered by the Contractor's fee.
 - 2. The cost of purchasing, renting, or furnishing small tools and hand tools.
 - 3. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
 - 4. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
 - 5. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
 - 6. Expenses incurred in preparing and advancing Claims.
 - 7. Other overhead or general expense costs of any kind and the costs of any item not specifically and expressly included in Paragraph 13.01.B.
- D. *Contractor's Fee*
 - 1. When the Work as a whole is performed on the basis of cost-plus-a-fee, then:
 - a. Contractor's fee for the Work set forth in the Contract Documents as of the Effective Date of the Contract will be determined as set forth in the Agreement.
 - b. for any Work covered by a Change Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work, Contractor's fee will be determined as follows:
 - 1) When the fee for the Work as a whole is a percentage of the Cost of the Work, the fee will automatically adjust as the Cost of the Work changes.
 - 2) When the fee for the Work as a whole is a fixed fee, the fee for any additions or deletions will be determined in accordance with Paragraph 11.07.C.2.
 - 2. When the Work as a whole is performed on the basis of a stipulated sum, or any other basis other than cost-plus-a-fee, then Contractor's fee for any Work covered by a Change

Order, Change Proposal, Claim, set-off, or other adjustment in Contract Price on the basis of Cost of the Work will be determined in accordance with Paragraph 11.07.C.2.

- E. *Documentation and Audit:* Whenever the Cost of the Work for any purpose is to be determined pursuant to this Article 13, Contractor and pertinent Subcontractors will establish and maintain records of the costs in accordance with generally accepted accounting practices. Subject to prior written notice, Owner will be afforded reasonable access, during normal business hours, to all Contractor's accounts, records, books, correspondence, instructions, drawings, receipts, vouchers, memoranda, and similar data relating to the Cost of the Work and Contractor's fee. Contractor shall preserve all such documents for a period of three years after the final payment by Owner. Pertinent Subcontractors will afford such access to Owner, and preserve such documents, to the same extent required of Contractor.

13.02 Allowances

- A. It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to Owner and Engineer.
- B. *Cash Allowances:* Contractor agrees that:
1. the cash allowances include the cost to Contractor (less any applicable trade discounts) of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 2. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the cash allowances have been included in the Contract Price and not in the allowances, and no demand for additional payment for any of the foregoing will be valid.
- C. *Owner's Contingency Allowance:* Contractor agrees that an Owner's contingency allowance, if any, is for the sole use of Owner to cover unanticipated costs.
- D. Prior to final payment, an appropriate Change Order will be issued as recommended by Engineer to reflect actual amounts due Contractor for Work covered by allowances, and the Contract Price will be correspondingly adjusted.

13.03 Unit Price Work

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Payments to Contractor for Unit Price Work will be based on actual quantities.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item.
- D. Engineer will determine the actual quantities and classifications of Unit Price Work performed by Contractor. Engineer will review with Contractor the Engineer's preliminary determinations on such matters before rendering a written decision thereon (by recommendation of an Application for Payment or otherwise). Engineer's written decision

thereon will be final and binding (except as modified by Engineer to reflect changed factual conditions or more accurate data) upon Owner and Contractor, and the final adjustment of Contract Price will be set forth in a Change Order, subject to the provisions of the following paragraph.

E. *Adjustments in Unit Price*

1. Contractor or Owner shall be entitled to an adjustment in the unit price with respect to an item of Unit Price Work if:
 - a. the quantity of the item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 - b. Contractor's unit costs to perform the item of Unit Price Work have changed materially and significantly as a result of the quantity change.
2. The adjustment in unit price will account for and be coordinated with any related changes in quantities of other items of Work, and in Contractor's costs to perform such other Work, such that the resulting overall change in Contract Price is equitable to Owner and Contractor.
3. Adjusted unit prices will apply to all units of that item.

ARTICLE 14—TESTS AND INSPECTIONS; CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.01 *Access to Work*

- A. Owner, Engineer, their consultants and other representatives and personnel of Owner, independent testing laboratories, and authorities having jurisdiction have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply with such procedures and programs as applicable.

14.02 *Tests, Inspections, and Approvals*

- A. Contractor shall give Engineer timely notice of readiness of the Work (or specific parts thereof) for all required inspections and tests, and shall cooperate with inspection and testing personnel to facilitate required inspections and tests.
- B. Owner shall retain and pay for the services of an independent inspector, testing laboratory, or other qualified individual or entity to perform all inspections and tests expressly required by the Contract Documents to be furnished and paid for by Owner, except that costs incurred in connection with tests or inspections of covered Work will be governed by the provisions of Paragraph 14.05.
- C. If Laws or Regulations of any public body having jurisdiction require any Work (or part thereof) specifically to be inspected, tested, or approved by an employee or other representative of such public body, Contractor shall assume full responsibility for arranging and obtaining such inspections, tests, or approvals, pay all costs in connection therewith, and furnish Engineer the required certificates of inspection or approval.

- 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*

- A. If, instead of requiring correction or removal and replacement of defective Work, Owner prefers to accept it, Owner may do so (subject, if such acceptance occurs prior to final payment, to Engineer's confirmation that such acceptance is in general accord with the design intent and applicable engineering principles, and will not endanger public safety). Contractor shall pay all claims, costs, losses, and damages attributable to Owner's evaluation of and determination to accept such defective Work (such costs to be approved by Engineer as to reasonableness), and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to final payment, the necessary revisions in the Contract Documents with respect to the Work will be incorporated in a Change Order. If the parties are unable to agree as to the decrease in the Contract Price, reflecting the diminished value of Work so accepted, then Owner may impose a reasonable set-off against payments due under Article 15. If the acceptance of defective Work occurs after final payment, Contractor shall pay an appropriate amount to Owner.

14.05 *Uncovering Work*

- A. Engineer has the authority to require additional inspection or testing of the Work, whether or not the Work is fabricated, installed, or completed.
- B. If any Work is covered contrary to the written request of Engineer, then Contractor shall, if requested by Engineer, uncover such Work for Engineer's observation, and then replace the covering, all at Contractor's expense.
- C. If Engineer considers it necessary or advisable that covered Work be observed by Engineer or inspected or tested by others, then Contractor, at Engineer's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as Engineer may require, that portion of the Work in question, and provide all necessary labor, material, and equipment.
 - 1. If it is found that the uncovered Work is defective, Contractor shall be responsible for all claims, costs, losses, and damages arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); and pending Contractor's full discharge of this responsibility the Owner shall be entitled to impose a reasonable set-off against payments due under Article 15.
 - 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Times, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction. If the parties are unable to agree as to the amount or extent thereof, then Contractor may submit a Change Proposal within 30 days of the determination that the Work is not defective.

14.06 *Owner May Stop the Work*

- A. If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, then Owner may order Contractor to stop the Work,

or any portion thereof, until the cause for such order has been eliminated; however, this right of Owner to stop the Work will not give rise to any duty on the part of Owner to exercise this right for the benefit of Contractor, any Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

14.07 Owner May Correct Defective Work

- A. If Contractor fails within a reasonable time after written notice from Engineer to correct defective Work, or to remove and replace defective Work as required by Engineer, then Owner may, after 7 days' written notice to Contractor, correct or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 14.07, Owner shall proceed expeditiously. In connection with such corrective or remedial action, Owner may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere. Contractor shall allow Owner, Owner's representatives, agents and employees, Owner's other contractors, and Engineer and Engineer's consultants access to the Site to enable Owner to exercise the rights and remedies under this paragraph.
- C. All claims, costs, losses, and damages incurred or sustained by Owner in exercising the rights and remedies under this Paragraph 14.07 will be charged against Contractor as set-offs against payments due under Article 15. Such claims, costs, losses and damages will include but not be limited to all costs of repair, or replacement of work of others destroyed or damaged by correction, removal, or replacement of Contractor's defective Work.
- D. Contractor shall not be allowed an extension of the Contract Times because of any delay in the performance of the Work attributable to the exercise by Owner of Owner's rights and remedies under this Paragraph 14.07.

ARTICLE 15—PAYMENTS TO CONTRACTOR; SET-OFFS; COMPLETION; CORRECTION PERIOD

15.01 Progress Payments

- A. *Basis for Progress Payments:* The Schedule of Values established as provided in Article 2 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to Engineer. Progress payments for Unit Price Work will be based on the number of units completed during the pay period, as determined under the provisions of Paragraph 13.03. Progress payments for cost-based Work will be based on Cost of the Work completed by Contractor during the pay period.
- B. *Applications for Payments*
 - 1. At least 20 days before the date established in the Agreement for each progress payment (but not more often than once a month), Contractor shall submit to Engineer for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
 - 2. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment must also be accompanied by: (a) a bill of sale, invoice, copies of subcontract or purchase order payments, or other documentation

establishing full payment by Contractor for the materials and equipment; (b) at Owner's request, documentation warranting that Owner has received the materials and equipment free and clear of all Liens; and (c) evidence that the materials and equipment are covered by appropriate property insurance, a warehouse bond, or other arrangements to protect Owner's interest therein, all of which must be satisfactory to Owner.

3. Beginning with the second Application for Payment, each Application must include an affidavit of Contractor stating that all previous progress payments received by Contractor have been applied to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
4. The amount of retainage with respect to progress payments will be as stipulated in the Agreement.

C. Review of Applications

1. Engineer will, within 10 days after receipt of each Application for Payment, including each resubmittal, either indicate in writing a recommendation of payment and present the Application to Owner, or return the Application to Contractor indicating in writing Engineer's reasons for refusing to recommend payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. Engineer's recommendation of any payment requested in an Application for Payment will constitute a representation by Engineer to Owner, based on Engineer's observations of the executed Work as an experienced and qualified design professional, and on Engineer's review of the Application for Payment and the accompanying data and schedules, that to the best of Engineer's knowledge, information and belief:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Substantial Completion, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Unit Price Work under Paragraph 13.03, and any other qualifications stated in the recommendation); and
 - c. the conditions precedent to Contractor's being entitled to such payment appear to have been fulfilled in so far as it is Engineer's responsibility to observe the Work.
3. By recommending any such payment Engineer will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, 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, and interference with other work at or adjacent to the Site;
 - c. Contractor has failed to provide and maintain required bonds or insurance;
 - d. Owner has been required to remove or remediate a Hazardous Environmental Condition for which Contractor is responsible;
 - e. Owner has incurred extra charges or engineering costs related to submittal reviews, evaluations of proposed substitutes, tests and inspections, or return visits to manufacturing or assembly facilities;
 - f. The Work is defective, requiring correction or replacement;
 - g. Owner has been required to correct defective Work in accordance with Paragraph 14.07, or has accepted defective Work pursuant to Paragraph 14.04;
 - h. The Contract Price has been reduced by Change Orders;
 - i. An event has occurred that would constitute a default by Contractor and therefore justify a termination for cause;
 - j. Liquidated or other damages have accrued as a result of Contractor's failure to achieve Milestones, Substantial Completion, or final completion of the Work;
 - k. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to Owner to secure the satisfaction and discharge of such Liens; or
 - l. Other items entitle Owner to a set-off against the amount recommended.
2. If Owner imposes any set-off against payment, whether based on its own knowledge or on the written recommendations of Engineer, Owner will give Contractor immediate written notice (with a copy to Engineer) stating the reasons for such action and the specific amount of the reduction, and promptly pay Contractor any amount remaining after deduction of the amount so withheld. Owner shall promptly pay Contractor the amount so withheld, or any adjustment thereto agreed to by Owner and Contractor, if Contractor remedies the reasons for such action. The reduction imposed will be binding on Contractor unless it duly submits a Change Proposal contesting the reduction.
 3. Upon a subsequent determination that Owner's refusal of payment was not justified, the amount wrongfully withheld will be treated as an amount due as determined by Paragraph 15.01.D.1 and subject to interest as provided in the Agreement.

15.02 *Contractor's Warranty of Title*

- A. Contractor warrants and guarantees that title to all Work, materials, and equipment furnished under the Contract will pass to Owner free and clear of (1) all Liens and other title defects, and (2) all patent, licensing, copyright, or royalty obligations, no later than 7 days after the time of payment by Owner.

15.03 *Substantial Completion*

- A. When Contractor considers the entire Work ready for its intended use Contractor shall notify Owner and Engineer in writing that the entire Work is substantially complete and request that Engineer issue a certificate of Substantial Completion. Contractor shall at the same time

submit to Owner and Engineer an initial draft of punch list items to be completed or corrected before final payment.

- B. Promptly after Contractor's notification, Owner, Contractor, and Engineer shall make an inspection of the Work to determine the status of completion. If Engineer does not consider the Work substantially complete, Engineer will notify Contractor in writing giving the reasons therefor.
- C. If Engineer considers the Work substantially complete, Engineer will deliver to Owner a preliminary certificate of Substantial Completion which will fix the date of Substantial Completion. Engineer shall attach to the certificate a punch list of items to be completed or corrected before final payment. Owner shall have 7 days after receipt of the preliminary certificate during which to make written objection to Engineer as to any provisions of the certificate or attached punch list. If, after considering the objections to the provisions of the preliminary certificate, Engineer concludes that the Work is not substantially complete, Engineer will, within 14 days after submission of the preliminary certificate to Owner, notify Contractor in writing that the Work is not substantially complete, stating the reasons therefor. If Owner does not object to the provisions of the certificate, or if despite consideration of Owner's objections Engineer concludes that the Work is substantially complete, then Engineer will, within said 14 days, execute and deliver to Owner and Contractor a final certificate of Substantial Completion (with a revised punch list of items to be completed or corrected) reflecting such changes from the preliminary certificate as Engineer believes justified after consideration of any objections from Owner.
- D. At the time of receipt of the preliminary certificate of Substantial Completion, Owner and Contractor will confer regarding Owner's use or occupancy of the Work following Substantial Completion, review the builder's risk insurance policy with respect to the end of the builder's risk coverage, and confirm the transition to coverage of the Work under a permanent property insurance policy held by Owner. Unless Owner and Contractor agree otherwise in writing, Owner shall bear responsibility for security, operation, protection of the Work, property insurance, maintenance, heat, and utilities upon Owner's use or occupancy of the Work.
- E. After Substantial Completion the Contractor shall promptly begin work on the punch list of items to be completed or corrected prior to final payment. In appropriate cases Contractor may submit monthly Applications for Payment for completed punch list items, following the progress payment procedures set forth above.
- F. Owner shall have the right to exclude Contractor from the Site after the date of Substantial Completion subject to allowing Contractor reasonable access to remove its property and complete or correct items on the punch list.

15.04 *Partial Use or Occupancy*

- A. Prior to Substantial Completion of all the Work, Owner may use or occupy any substantially completed part of the Work which has specifically been identified in the Contract Documents, or which Owner, Engineer, and Contractor agree constitutes a separately functioning and usable part of the Work that can be used by Owner for its intended purpose without

significant interference with Contractor's performance of the remainder of the Work, subject to the following conditions:

1. At any time, Owner may request in writing that Contractor permit Owner to use or occupy any such part of the Work that Owner believes to be substantially complete. If and when Contractor agrees that such part of the Work is substantially complete, Contractor, Owner, and Engineer will follow the procedures of Paragraph 15.03.A through 15.03.E for that part of the Work.
2. At any time, Contractor may notify Owner and Engineer in writing that Contractor considers any such part of the Work substantially complete and request Engineer to issue a certificate of Substantial Completion for that part of the Work.
3. Within a reasonable time after either such request, Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion. If Engineer does not consider that part of the Work to be substantially complete, Engineer will notify Owner and Contractor in writing giving the reasons therefor. If Engineer considers that part of the Work to be substantially complete, the provisions of Paragraph 15.03 will apply with respect to certification of Substantial Completion of that part of the Work and the division of responsibility in respect thereof and access thereto.
4. No use or occupancy or separate operation of part of the Work may occur prior to compliance with the requirements of Paragraph 6.04 regarding builder's risk or other property insurance.

15.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work or an agreed portion thereof is complete, Engineer will promptly make a final inspection with Owner and Contractor and will notify Contractor in writing of all particulars in which this inspection reveals that the Work, or agreed portion thereof, is incomplete or defective. Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.

15.06 *Final Payment*

A. *Application for Payment*

1. After Contractor has, in the opinion of Engineer, satisfactorily completed all corrections identified during the final inspection and has delivered, in accordance with the Contract Documents, all maintenance and operating instructions, schedules, guarantees, bonds, certificates or other evidence of insurance, certificates of inspection, annotated record documents (as provided in Paragraph 7.12), and other documents, Contractor may make application for final payment.
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.

15.07 *Waiver of Claims*

- A. By making final payment, Owner waives its claim or right to liquidated damages or other damages for late completion by Contractor, except as set forth in an outstanding Claim,

appeal under the provisions of Article 17, set-off, or express reservation of rights by Owner. Owner reserves all other claims or rights after final payment.

- B. The acceptance of final payment by Contractor will constitute a waiver by Contractor of all claims and rights against Owner other than those pending matters that have been duly submitted as a Claim, or appealed under the provisions of Article 17.

15.08 *Correction Period*

- A. If within one year after the date of Substantial Completion (or such longer period of time as may be prescribed by the Supplementary Conditions or the terms of any applicable special guarantee required by the Contract Documents), Owner gives Contractor written notice that any Work has been found to be defective, or that Contractor's repair of any damages to the Site or adjacent areas has been found to be defective, then after receipt of such notice of defect Contractor shall promptly, without cost to Owner and in accordance with Owner's written instructions:
 - 1. correct the defective repairs to the Site or such adjacent areas;
 - 2. correct such defective Work;
 - 3. remove the defective Work from the Project and replace it with Work that is not defective, if the defective Work has been rejected by Owner, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others, or to other land or areas resulting from the corrective measures.
- B. Owner shall give any such notice of defect within 60 days of the discovery that such Work or repairs is defective. If such notice is given within such 60 days but after the end of the correction period, the notice will be deemed a notice of defective Work under Paragraph 7.17.B.
- C. If, after receipt of a notice of defect within 60 days and within the correction period, Contractor does not promptly comply with the terms of Owner's written instructions, or in an emergency where delay would cause serious risk of loss or damage, Owner may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. Contractor shall pay all costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others). Contractor's failure to pay such costs, losses, and damages within 10 days of invoice from Owner will be deemed the start of an event giving rise to a Claim under Paragraph 12.01.B, such that any related Claim must be brought within 30 days of the failure to pay.
- D. In special circumstances where a particular item of equipment is placed in continuous service before Substantial Completion of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Specifications.
- E. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this paragraph, the correction period hereunder with respect to such Work will be extended for an additional period of one year after such correction or removal and replacement has been satisfactorily completed.

- F. Contractor's obligations under this paragraph are in addition to all other obligations and warranties. The provisions of this paragraph are not to be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

ARTICLE 16—SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

- A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not more than 90 consecutive days by written notice to Contractor and Engineer. Such notice will fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. Contractor shall be entitled to an adjustment in the Contract Price or an extension of the Contract Times directly attributable to any such suspension. Any Change Proposal seeking such adjustments must be submitted no later than 30 days after the date fixed for resumption of Work.

16.02 *Owner May Terminate for Cause*

- A. The occurrence of any one or more of the following events will constitute a default by Contractor and justify termination for cause:
 - 1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, or failure to adhere to the Progress Schedule);
 - 2. Failure of Contractor to perform or otherwise to comply with a material term of the Contract Documents;
 - 3. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
 - 4. Contractor's repeated disregard of the authority of Owner or Engineer.
- B. If one or more of the events identified in Paragraph 16.02.A occurs, then after giving Contractor (and any surety) 10 days' written notice that Owner is considering a declaration that Contractor is in default and termination of the Contract, Owner may proceed to:
 - 1. declare Contractor to be in default, and give Contractor (and any surety) written notice that the Contract is terminated; and
 - 2. enforce the rights available to Owner under any applicable performance bond.
- C. Subject to the terms and operation of any applicable performance bond, if Owner has terminated the Contract for cause, Owner may exclude Contractor from the Site, take 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*

- A. If, through no act or fault of Contractor, (1) the Work is suspended for more than 90 consecutive days by Owner or under an order of court or other public authority, or (2) Engineer fails to act on any Application for Payment within 30 days after it is submitted, or (3) Owner fails for 30 days to pay Contractor any sum finally determined to be due, then Contractor may, upon 7 days' written notice to Owner and Engineer, and provided Owner or Engineer do not remedy such suspension or failure within that time, terminate the contract and recover from Owner payment on the same terms as provided in Paragraph 16.03.
- B. In lieu of terminating the Contract and without prejudice to any other right or remedy, if Engineer has failed to act on an Application for Payment within 30 days after it is submitted, or Owner has failed for 30 days to pay Contractor any sum finally determined to be due, Contractor may, 7 days after written notice to Owner and Engineer, stop the Work until payment is made of all such amounts due Contractor, including interest thereon. The

provisions of this paragraph are not intended to preclude Contractor from submitting a Change Proposal for an adjustment in Contract Price or Contract Times or otherwise for expenses or damage directly attributable to Contractor's stopping the Work as permitted by this paragraph.

ARTICLE 17—FINAL RESOLUTION OF DISPUTES

17.01 *Methods and Procedures*

- A. *Disputes Subject to Final Resolution:* The following disputed matters are subject to final resolution under the provisions of this article:
 - 1. A timely appeal of an approval in part and denial in part of a Claim, or of a denial in full, pursuant to Article 12; and
 - 2. Disputes between Owner and Contractor concerning the Work, or obligations under the Contract Documents, that arise after final payment has been made.
- B. *Final Resolution of Disputes:* For any dispute subject to resolution under this article, Owner or Contractor may:
 - 1. elect in writing to invoke the dispute resolution process provided for in the Supplementary Conditions;
 - 2. agree with the other party to submit the dispute to another dispute resolution process; or
 - 3. if no dispute resolution process is provided for in the Supplementary Conditions or mutually agreed to, give written notice to the other party of the intent to submit the dispute to a court of competent jurisdiction.

ARTICLE 18—MISCELLANEOUS

18.01 *Giving Notice*

- A. Whenever any provision of the Contract requires the giving of written notice to Owner, Engineer, or Contractor, it will be deemed to have been validly given only if delivered:
 - 1. in person, by a commercial courier service or otherwise, to the recipient's place of business;
 - 2. by registered or certified mail, postage prepaid, to the recipient's place of business; or
 - 3. by e-mail to the recipient, with the words "Formal Notice" or similar in the e-mail's subject line.

18.02 *Computation of Times*

- A. When any period of time is referred to in the Contract by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

18.03 *Cumulative Remedies*

- A. The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract. The provisions of this paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

18.04 *Limitation of Damages*

- A. With respect to any and all Change Proposals, Claims, disputes subject to final resolution, and other matters at issue, neither Owner nor Engineer, nor any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors, shall be liable to Contractor for any claims, costs, losses, or damages sustained by Contractor on or in connection with any other project or anticipated project.

18.05 *No Waiver*

- A. A party's non-enforcement of any provision will not constitute a waiver of that provision, nor will it affect the enforceability of that provision or of the remainder of this Contract.

18.06 *Survival of Obligations*

- A. All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract, as well as all continuing obligations indicated in the Contract, will survive final payment, completion, and acceptance of the Work or termination of the Contract or of the services of Contractor.

18.07 *Controlling Law*

- A. This Contract is to be governed by the law of the state in which the Project is located.

18.08 *Assignment of Contract*

- A. Unless expressly agreed to elsewhere in the Contract, no assignment by a party to this Contract of any rights under or interests in the Contract will be binding on the other party without the written consent of the party sought to be bound; and, specifically but without limitation, money that may become due and money that is due may not be assigned without such consent (except to the extent that the effect of this restriction may be limited by law), and unless specifically stated to the contrary in any written consent to an assignment, no assignment will release or discharge the assignor from any duty or responsibility under the Contract.

18.09 *Successors and Assigns*

- A. Owner and Contractor each binds itself, its successors, assigns, and legal representatives to the other party hereto, its successors, assigns, and legal representatives in respect to all covenants, agreements, and obligations contained in the Contract Documents.

18.10 *Headings*

- A. Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00 73 00
SUPPLEMENTARY CONDITIONS

These Supplementary Conditions amend or supplement EJCDC C-700, Standard General Conditions of the Construction Contract (2018). The General Conditions remain in full force and effect except as amended.

The terms used in these Supplementary Conditions have the meanings stated in the General Conditions. Additional terms used in these Supplementary Conditions have the meanings stated below, which are applicable to both the singular and plural thereof.

The address system used in these Supplementary Conditions is the same as the address system used in the General Conditions, with the prefix "SC" added—for example, "Paragraph SC-4.05."

ARTICLE 1 - DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

SC-1.01 Delete Paragraph 1.01.A.42 in its entirety and insert the following in its place:

42. *Substantial Completion* – The time at which the Work (or a specified part thereof) has progressed to the point where, in the opinion of the Engineer, the Work (or a specified part thereof) is sufficiently complete, in accordance with the Contract Documents, so that the Work (or a specified part thereof) can be utilized for the purposes for which it is intended. In addition, to achieve Substantial Completion of the Work for distribution and transmission pipelines and all associated appurtenances required for a complete and operable installation located in agricultural fields, completed Work shall include top soil replacement, spreading, and cultivation of disturbed field areas to allow full and unhindered use by property owners as agricultural land for seed bed purposes in the spring of the immediately following spring planting season in each respective project zone. The terms "substantially complete" and "substantially completed" as applied to all or a part of the Work refer to Substantial Completion thereof.

1.02 *Terminology*

SC-1.02 Amend Paragraph 1.02.A at the end of the paragraph to add the following language:

Other terms used repeatedly in the Supplementary Conditions may be referenced in Paragraph 1.02.

SC-1.02 Amend Paragraph 1.02.C at the end of the paragraph to add the following language:

Note that Paragraph 1.02.C provides that the word "day" means a calendar day. An intended or inadvertent change to "working" day has ramifications throughout the documents and is not intended as a substitute for calendar days unless specifically agreed to, in writing, by the Owner.

ARTICLE 2 - PRELIMINARY MATTERS

2.01 *Delivery of Bonds and Evidence of Insurance*

SC-2.01 Delete paragraph 2.01.B in its entirety and insert the following in its place:

B. *Evidence of Contractor's Insurance*: Before any Work at the Site is started, Contractor shall deliver to the Owner, with copies to each additional insured identified in the Supplementary Conditions, if any, certificates of insurance, certified copies of insurance policies, (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor is required to purchase and maintain in accordance with Article 6.

2.02 *Copies of Documents*

SC-2.02 Delete paragraph 2.02.A in its entirety and insert the following in its place:

A. Owner shall furnish to Contractor up to three (3) printed copies of conformed Contract Documents (Project Manual and 11x17 Drawings) incorporating and integrating all Addenda and any amendments negotiated prior to the Effective Date of the Contract and one copy in electronic portable document format (PDF). Additional printed copies of the conformed Contract Documents will be furnished upon request at the cost of reproduction. Full sized (22-inch x 34-inch) sets of the Construction Drawings will be furnished at the cost of printing, which shall include labor and materials within the cost of reproduction.

2.03 *Before Starting Construction*

SC-2.03 Add the following information immediately after Paragraph 2.03.A.3:

4. revise the schedule as requested by the Owner's Representative when:
 - a. Work progress falls 10 percent behind scheduled progress.
 - b. When time extensions are approved for changes and causes beyond Contractor's control.

2.04 Preconstruction Conference; Designation of Authorized Representatives

SC-2.04 Delete Paragraph 2.04.A in its entirety and insert the following new paragraph in its place:

A. Before any Work at the Site is started, a preconstruction conference will be held at a mutually agreed upon time and place to establish a working understanding among the parties as to the Work and to discuss the status of Contractor's insurance and bonds schedules referred to in Article 6, procedures for handling Shop Drawings and other submittals, processing Applications for Payment, critical Work sequencing, field decisions and change orders, material deliveries, use of easements, Contractor's assignments for safety and first aid, daily report forms, and maintaining required records. The conference shall be attended by the Owner, Contractor's Project Manager, Contractor's Superintendent, Contractor's Subcontractors as the Contractor deems appropriate, Engineer, Engineer's Resident Project Representative, Governmental representatives, as appropriate, and others as requested by Contractor, Owner, and Engineer. The Engineer/Owner will preside at the preconstruction conference and will arrange for keeping and distributing the minutes to all persons in attendance. Contractor shall bring to the preconstruction conference submittals in accordance with specifications.

2.06 Electronic Transmittals

SC-2.06 Delete Paragraphs 2.06.B and 2.06.C in their entirety and insert the following in their place:

B. *Electronic Documents Protocol:* The parties shall conform to the following provisions in Paragraphs 2.06.B and 2.06.C, together referred to as the Electronic Documents Protocol ("EDP" or "Protocol") for exchange of electronic transmittals.

1. Basic Requirements

- a. To the fullest extent practical, the parties agree to and will transmit and accept Electronic Documents in an electronic or digital format using the procedures described in this Protocol. Use of the Electronic Documents and any information contained therein is subject to the requirements of this Protocol and other provisions of the Contract.
- b. The contents of the information in any Electronic Document will be the responsibility of the transmitting party.
- c. Electronic Documents as exchanged by this Protocol may be used in the same manner as the printed versions of the same documents that are exchanged using non-electronic format and methods, subject to the same governing requirements, limitations, and restrictions, set forth in the Contract Documents.
- d. Except as otherwise explicitly stated herein, the terms of this Protocol will be incorporated into any other agreement or subcontract between a party and any third party for any portion of the Work on the Project, or any Project-related services, where that third party is, either directly or indirectly, required to exchange Electronic Documents with a party or with Engineer. Nothing herein will modify the requirements of the Contract regarding communications between and among the parties and their subcontractors and consultants.
- e. When transmitting Electronic Documents, the transmitting party makes no representations as to long term compatibility, usability, or readability of the items resulting from the receiving party's use of software application packages, operating systems, or computer hardware differing from those established in this Protocol.
- f. Nothing herein negates any obligation 1) in the Contract to create, provide, or maintain an original printed record version of Drawings and Specifications, signed and sealed according to applicable Laws and Regulations; 2) to comply

with any applicable Law or Regulation governing the signing and sealing of design documents or the signing and electronic transmission of any other documents; or 3) to comply with the notice requirements of Paragraph 18.01 of the General Conditions.

2. System Infrastructure for Electronic Document Exchange

a. Each party will provide hardware, operating system(s) software, internet, e-mail, and large file transfer functions ("System Infrastructure") at its own cost and sufficient for complying with the EDP requirements. With the exception of minimum standards set forth in this EDP, and any explicit system requirements specified by attachment to this EDP, it is the obligation of each party to determine, for itself, its own System Infrastructure.

1) The maximum size of an email attachment for exchange of Electronic Documents under this EDP is **10 MB**. Attachments larger than that may be exchanged using large file transfer or physical media.

2) Each Party assumes full and complete responsibility for any and all of its own costs, delays, deficiencies, and errors associated with converting, translating, updating, verifying, licensing, or otherwise enabling its System Infrastructure, including operating systems and software, for use with respect to this EDP.

b. Each party is responsible for its own system operations, security, back-up, archiving, audits, printing resources, and other Information Technology ("IT") for maintaining operations of its System Infrastructure during the Project, including coordination with the party's individual(s) or entity responsible for managing its System Infrastructure and capable of addressing routine communications and other IT issues affecting the exchange of Electronic Documents.

c. Each party will operate and maintain industry-standard, industry-accepted, ISO-standard, commercial-grade security software and systems that are intended to protect the other party from: software viruses and other malicious software like worms, trojans, adware; data breaches; loss of confidentiality; and other threats in the transmission to or storage of information from the other parties, including transmission of Electronic Documents by physical media such as CD/DVD/flash drive/hard drive. To the extent that a party maintains and operates such security software and systems, it shall not be liable to the other party for any breach of system security.

d. In the case of disputes, conflicts, or modifications to the EDP required to address issues affecting System Infrastructure, the parties shall cooperatively resolve the issues; but, failing resolution, the Owner is authorized to make and require reasonable and necessary changes to the EDP to effectuate its original intent. If the changes cause additional cost or time to Contractor, not reasonably anticipated under the original EDP, Contractor may seek an adjustment in price or time under the appropriate process in the Contract.

e. Each party is responsible for its own back-up and archive of documents sent and received during the term of the contract under this EDP, unless this EDP establishes a Project document archive, either as part of a mandatory Project website or other communications protocol, upon which the parties may rely for document archiving during the specified term of operation of such Project document archive. Further, each party remains solely responsible for its own post-Project back-up and archive of Project documents after the term of the Contract, or after termination of the Project document archive, if one is established, for as long as required by the Contract and as each party deems necessary for its own purposes.

f. If a receiving party receives an obviously corrupted, damaged, or unreadable Electronic Document, the receiving party will advise the sending party of the incomplete transmission.

g. The parties will bring any non-conforming Electronic Documents into compliance with the EDP. The parties will attempt to complete a successful transmission of the Electronic Document or use an alternative delivery method to

complete the communication.

h. The Engineer will operate a Project information management system (also referred to in this EDP as "Newforma") for use of Owner, Engineer, and Contractor during the Project for exchange and storage of Project-related communications and information. Except as otherwise provided in this EDP or the General Conditions, use of Newforma by the parties as described in this Paragraph will be mandatory for exchange of Project submittals, requests for information (RFIs), and other Project-related information.

SC-2.06 Supplement Paragraph 2.06 of the General Conditions by adding the following paragraph:

D. Requests by Contractor for Electronic Documents in Other Formats

1. Release of any Electronic Document versions of the Project documents in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be at the sole discretion of the Owner.
2. To extent determined by Owner, in its sole discretion, to be prudent and necessary, release of Electronic Documents versions of Project documents and other Project information requested by Contractor ("Request") in formats other than those identified in the Electronic Documents Protocol (if any) or elsewhere in the Contract will be subject to the provisions of the Owner's response to the Request, and to the following conditions to which Contractor agrees:
 - a. The content included in the Electronic Documents created by Engineer and covered by the Request was prepared by Engineer as an internal working document for Engineer's purposes solely, and is being provided to Contractor on an "AS IS" basis without any warranties of any kind, including, but not limited to any implied warranties of fitness for any purpose. As such, Contractor is advised and acknowledges that the content may not be suitable for Contractor's application, or may require substantial modification and independent verification by Contractor. The content may include limited resolution of models, not-to-scale schematic representations and symbols, use of notes to convey design concepts in lieu of accurate graphics, approximations, graphical simplifications, undocumented intermediate revisions, and other devices that may affect subsequent reuse.
 - b. Electronic Documents containing text, graphics, metadata, or other types of data that are provided by Engineer to Contractor under the request are only for convenience of Contractor. Any conclusion or information obtained or derived from such data will be at the Contractor's sole risk and the Contractor waives any claims against Engineer or Owner arising from use of data in Electronic Documents covered by the Request.
 - c. Contractor shall indemnify and hold harmless Owner and Engineer and their subconsultants from all claims, damages, losses, and expenses, including attorneys' fees and defense costs arising out of or resulting from Contractor's use, adaptation, or distribution of any Electronic Documents provided under the Request.
 - d. Contractor agrees not to sell, copy, transfer, forward, give away or otherwise distribute this information (in source or modified file format) to any third party without the direct written authorization of Engineer, unless such distribution is specifically identified in the Request and is limited to Contractor's subcontractors. Contractor warrants that subsequent use by Contractor's subcontractors complies with all terms of the Contract Documents and Owner's response to Request.
3. In the event that Owner elects to provide or directs the Engineer to provide to Contractor any Contractor-requested Electronic Document versions of Project information that is not explicitly identified in the Contract Documents as being available to Contractor, the Owner shall be reimbursed by Contractor on an hourly basis for any engineering costs necessary to create or otherwise prepare the data in a manner deemed appropriate by Engineer.

ARTICLE 3 - CONTRACT DOCUMENTS: INTENT, REQUIREMENTS, REUSE

3.01 Intent

SC-3.01 Add the following new paragraph immediately after Paragraph 3.01.G:

H. The provisions of the Instructions to Bidders and Supplementary Conditions shall take precedence over the General Conditions. In the case of conflict, ambiguity, or discrepancy between Drawings and Specifications, or otherwise within the Contract Documents, the better quality or greater quantity of Work resulting in the greater cost shall be furnished and included in the Contract Price and the matter shall be brought to the Engineer's attention for resolution.

ARTICLE 4 - COMMENCEMENT AND PROGRESS OF THE WORK

4.01 Commencement of Contract Times; Notice to Proceed

SC-4.01 Delete Paragraph 4.01.A in its entirety and insert the following paragraph in its place:

A. The Contract Times will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given at any time within 60 days after the Effective Date of the Agreement.

4.03 Reference Points

SC-4.03 Add the following new paragraph immediately after paragraph 4.03.A:

B. Reference points shall be provided by the Engineer one (1) time. Subsequent reestablishment of reference points shall be the responsibility of the Contractor. Contractor shall notify the Engineer a minimum of five (5) days in advance of the need for construction reference points for the Project. All other layout and staking shall be the responsibility of the Contractor.

SC-5.01 Delete paragraph 5.01.C in its entirety and insert the following in its place:

C. The Contractor shall obtain, at no increase in Contract Price or Contract Time, any additional lands, rights-of-way, and easements that the Contractor, in its sole discretion, requires beyond those provided by the Owner for temporary facilities, ingress and egress, shipping and delivery, equipment and material storage, disposal of spoil or waste material, or any other purpose for completion of the Work. The Contractor shall obtain (a) all required permits beyond those provided by Owner from the U.S. Government, the State, and any Political Subdivision and public utility with jurisdiction, or (b) permission by written agreement, if private property. The Contractor shall submit copies of all such permits and written agreements to the Owner.

ARTICLE 5 - SITE, SUBSURFACE AND PHYSICAL CONDITIONS, HAZARDOUS ENVIRONMENTAL CONDITIONS

5.02 Use of Site and Other Areas

SC-5.02 Add the following new language immediately after paragraph 5.02.D:

E. Control of Work:

1. The Contractor shall execute the Work so that it will cause the least practicable interference with, and avoid prolonged interruption of or damage to, existing facilities, underground utilities, overhead utilities, and roadways. The Contractor shall obtain written approval from the Owner at least 72 hours before performing any Work that involves either connection to existing facilities or interruption of service or existing operations. The Contractor shall perform that Work when it causes the least interference with or annoyance, as determined by the Owner and Engineer.

2. The Contractor shall initiate, maintain, and supervise all weather protection and local and area climatic and seasonal precipitation event programs applicable to the Work. In the event of severe weather, the Contractor shall immediately inspect the Work at the Site and take all necessary actions to ensure that public access and safety are maintained.

3. The Contractor shall be responsible for: (a) performing the pumping, draining, and controlling of surface water and groundwater in a way that it will not endanger the Work or any adjacent facility or property, or interrupt, restrict, or interfere with the use of any adjacent facility or property, and (b) taking into account any dewatering operations from

other Work.

4. Neither the Owner nor Engineer will accept or coordinate deliveries for the Contractor. The Contractor shall coordinate and be at the site to receive all deliveries. Materials and equipment stored on the site or right of way shall be placed so as to insure minimum danger and obstruction to the traveling public or property owners.

5. The Contractor shall take whatever steps, procedures, or means required to prevent dust nuisance due to the Contractor's operations on-site, along haul routes, within stockpile areas, and within or along equipment or material staging areas. Dust control measures shall be maintained at all times to the satisfaction of the Owner and Engineer and as required by any other Political Subdivision with jurisdiction.

6. Any dumping of spoil or waste material by the Contractor shall comply with all Federal, State, and local laws and regulations. Whether public or private landfills are used, the Contractor shall pay all required dumping fees and shall furnish to the Engineer evidence of such payments."

5.03 Subsurface and Physical Conditions

SC-5.03 Add the following new paragraphs immediately after 5.03.D:

E. In the preparation of Drawings and Specifications, Engineer relied upon the following information of explorations and tests of subsurface conditions at the Site, if any. It shall be the responsibility of the Contractor to determine to Contractor's own satisfaction the location and nature of surface and subsurface obstacles and the soil and water conditions, which will be encountered during the Work. Additional test borings and other exploratory options may be made by the Contractor at Contractor's own expense. Contractor shall make arrangements for soil investigation with Owner. Reports and existing drawings are intended for reference only. Contractor shall verify existing conditions prior to Bidding.

1. The following table lists the reports of explorations and tests of subsurface conditions at or adjacent to the Site that contain Technical Data (if any), and specifically identifies the Technical Data in the report upon which Contractor may rely:

Report Title	Date of Report	Technical Data
Geotechnical Evaluation Report, Fargo WWTP Flood Protection Levee North Broadway	April 14, 2015	Geotechnical Exploration and summary of findings.
Stockpile Suitability Letter, Fargo RWRF Flood Protection, Stockpile Suitability	December 13, 2023	Geotechnical letter for soil sampling and suitable uses.
Fargo WWTP Flood Protection, 30% Design Review	October 16, 2017	Technical Memorandum Geotechnical Exploration and summary of findings.
Fargo Wastewater Treatment Facility Phase IIB Improvements	September 26, 2019	Geotechnical Exploration and Engineering Review
Stormwater Lift Station #24, Fargo WWTF Phase IIB Expansion	October 3, 2019	Geotechnical Exploration and Engineering Review

2. The following table lists the drawings of existing physical conditions at or adjacent to the Site, including those drawings depicting existing surface and subsurface structures at or adjacent to the Site (except Underground Facilities), that contain Technical Data (if any), and specifically identifies the Technical Data upon which Contractor may rely:

Drawings Title	Date of Drawings	Technical Data
Pump House & Force Main Fargo Sewage Plant Project No. 3349	9/1/1971	As Built Plans
Wastewater Treatment Facility – 150' Clarifier Project No. 4022-2	9/15/1995	Record Drawing
Wastewater Treatment Plant Expansion Phase III Project No. 4022-3	10/6/1995	Record Drawing
Wastewater Treatment Plant Expansion Sludge Handling & Disposal Phase IV-A Project No. 4022-4A	12/12/1997	Record Drawing
Wastewater Treatment Facility, Phase VI Project No. 4022-6	1/25/2002	Record Drawing
WWTP Tie Sheets	Varies	Record Drawings
Phase IIB Expansion Fargo Wastewater Treatment Facility Project No. WW1701	2/3/2020	Construction Documents (Design Drawings)

F. Copies of reports and drawings itemized in SC 5.03.E, if any, that are not included with the Bidding Documents may be examined at Advanced Engineering and Environmental Services, LLC. (AE2S) in the Engineer of Record's home office location during regular business hours. These reports and drawings, if any, are not part of the Contract Documents, but the "technical data" contained therein upon which Contractor may rely as identified and established above are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Engineer and Engineer's Consultants in the preparation of Drawings and Specifications.

5.05 Underground Facilities

SC-5.05 Add the following new paragraphs immediately after Paragraph 5.05.A.5:

6. contacting all affected utilities prior to construction on this Contract and making their own investigations including exploratory excavation as needed to determine the location and type of crossing or paralleling a particular utility; associated costs shall be subsidiary to the pipeline unit prices, and shall be made in accordance with that specific State's Department of Health, State's Department of Environmental and Natural Resource, or similar department;

7. notification to all utilities and underground service agencies a minimum of 72 hours in advance of Work scheduled or envisioned and arrange to have their respective services located. The Contractor shall obtain acceptance, in writing, from the utility regarding the preservation of their respective service during construction. The acceptance letters/forms shall be submitted monthly (at a minimum) to the Owner's representative;

8. using extreme care when working around overhead utilities. If required, work permits from the respective utility shall be obtained by the Contractor. Should any facility, either underground or overhead, be unexpectedly encountered or damaged during construction, the Contractor shall immediately notify a representative of the company involved and take such steps as necessary for protection of the general public and his own personnel.

SC-5.05 Add the following new paragraph immediately after Paragraph 5.05.F:

G. The right is reserved to governmental agencies and to owners of utilities to enter at any time upon any street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work and for the purpose of maintaining and making repairs to their property.

5.06 Hazardous Environmental Conditions at Site

SC-5.06 Add the following new paragraphs immediately after Paragraph 5.06.A.3:

4. The following table lists the reports known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and the Technical Data (if any) upon which Contractor may rely:

Report Title	Date of Report	Technical Data

5. The following table lists the drawings known to Owner relating to Hazardous Environmental Conditions at or adjacent to the Site, and Technical Data (if any) contained in such Drawings upon which Contractor may rely.

Drawings Title	Date of Drawings	Technical Data

ARTICLE 6 - BONDS AND INSURANCE

6.01 Performance, Payment, and Other Bonds

SC-6.01 Delete Paragraph 6.01.A in its entirety and insert the following paragraph in its place:

A. Contractor shall furnish performance and payment bonds, each in an amount at least equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents. These bonds shall remain in effect at 100 percent of the Contract Price for one (1) full year after the date when Substantial Completion is granted or to the end of the Warranty Period, whichever is greater, except as provided otherwise by Laws or Regulations or by the Contract Documents. Contractor shall also furnish such other bonds as are required by the Contract Documents.

SC-6.01 Add the following paragraph immediately after Paragraph 6.01.B:

1. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be one (1) year after Final Completion.

6.03 Contractor's Insurance

SC-6.03 Supplement Paragraph 6.03 with the following provisions after Paragraph 6.03.C:

D. *Other Additional Insureds:* Advanced Engineering and Environmental Services, LLC (AE2S) and City of Fargo, as additional insured. AE2S and City of Fargo and subconsultants shall have all the benefits, rights, and coverage of an additional insured under these policies.

E. *Other Additional Insureds:* State of North Dakota Agencies, Officers, and Employees shall also have all the benefits, rights, and coverage of an additional insured under these policies. Policies shall contain a "Waiver of subrogation in favor of the state of North Dakota" waiving any right of recovery the insurance company may have against the State.

F. *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

Employer's Liability	
Each accident	\$500,000
Each employee	\$500,000

G. *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.

H. *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 three years after final payment.
 - b. Contractor shall furnish Owner and each other additional insured (as identified in the Supplementary Conditions or elsewhere in the Contract) evidence of continuation of such insurance at final payment and three years thereafter.
2. Blanket contractual liability coverage, including but not limited to coverage of Contractor's contractual indemnity obligations in Paragraph 7.18.
3. Severability of interests and no insured-versus-insured or cross-liability exclusions.
4. Underground, explosion, and collapse coverage.
5. Personal injury coverage.
6. Additional insured endorsements that include both ongoing operations and products and completed operations coverage through ISO Endorsements CG 20 10 10 01 and CG 20 37 10 01 (together). If Contractor demonstrates to Owner that the specified ISO endorsements are not commercially available, then Contractor may satisfy this requirement by providing equivalent endorsements.
7. For design professional additional insureds, ISO Endorsement CG 20 32 07 04 "Additional Insured—Engineers, Architects or Surveyors Not Engaged by the Named Insured" or its equivalent.

I. *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.

J. *Commercial General Liability - Minimum Policy Limits*

Commercial General Liability	Policy limits of not less
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	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

K. *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

L. *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	\$2,000,000
General Aggregate	\$2,000,000

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	\$2,000,000
Annual Aggregate	\$2,000,000

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	\$2,000,000
General Aggregate	\$2,000,000

P. The insurance required by the Contract Documents, through a policy or endorsement, shall include:

- 1) A provision that the policy and endorsements may not be cancelled or modified without thirty days' prior written notice to Owner;
- 2) A provision that any attorney who represents the State under this policy must first qualify as and be appointed by the North Dakota Attorney General as a Special Assistant General as required under North Dakota Century Code 54-12-08;
- 3) A provision that Contractor's insurance coverage shall be primary (i.e. pay first) as respects to any insurance, self-insurance or self-retention maintained by the State and that any insurance, self-insurance or self-retention maintained by the State shall be in excess of the Contractor's insurance and shall not contribute with it;
- 4) Cross liability/severability of interest for all policies and endorsements.

Q. The legal defense provided to the State under the policy and any endorsements must be free of any conflicts of interest, even if retention of separate legal counsel for the State is necessary.

R. The Contractor shall furnish certificates of insurance and all endorsements to Owner prior to commencement of Work at the Site.

S. Failure to provide insurance as required by the Contract Documents is a material breach of contract entitling the State to Terminate for Cause.

T. The Certificate of Insurance MUST include provision for 30 days prior written notice prior to cancellation. "Will Endeavor to Mail" is not acceptable. Crossing out or X-ing over the words "endeavor to" will not be acceptable. Failure to comply with the required cancellation provision will cause the contracts to be rejected and will delay the Notice to Proceed."

6.04 *Builder's Risk and Other Property Insurance*

SC-6.04 Delete Paragraph 6.04.B and insert the following in its place:

B. Property Insurance for Facilities of Owner Where Work Will Occur: Contractor shall purchase and maintain property insurance upon the Work at the Site in the amount of the full replacement cost thereof.

1. This insurance shall:

- a. Include the interests of Owner, Contractor, Subcontractors, Engineer, and any other individuals or entities identified herein, and the officers, directors, partners, employees, agents and other consultants and subcontractors of any of them each of whom is deemed to have an insurable interest and shall be listed as an insured or additional insured;
- b. Be written on a Builder's Risk "all-risk" or open peril or special causes of loss policy form that shall at least include insurance for physical loss and damage to the Work, temporary buildings, false work, and materials and equipment in transit and shall insure against at least the following perils or causes of loss: fire, lightning, extended coverage, theft, vandalism and malicious mischief, earthquake, collapse, debris removal, demolition occasioned by enforcement of Laws and Regulations, water damage (other than that caused by flood), and such other perils or causes of loss as may be specifically required by the Supplementary Conditions;
- c. Include expenses incurred in the repair or replacement of any insured property (including but not limited to fees and charges of engineers and architects);
- d. Cover materials and equipment stored at the Site or at another location that was agreed to in writing by Owner prior to being incorporated in the Work, provided that such materials and equipment have been included in an Application for Payment recommended by Engineer;
- e. Allow for partial utilization of the Work by Owner;
- f. Include testing and startup; and
- g. Be maintained in effect until final payment is made unless otherwise agreed to in writing by Owner, Contractor and Engineer with 30 days written notice to each

other additional insured to whom a certificate of insurance has been issued.

2. Contractor shall be responsible for any deductible or self-insured retention.
3. The policies or insurance required to be purchased and maintained by Contractor in accordance with this Paragraph SC-6.04.B shall comply with the requirements of Paragraph 6.03 of the General Conditions and as revised by the Supplementary Conditions.
4. Additional Insureds:
 - a. City of Fargo
 - b. Advanced Engineering and Environmental Services, LLC (AE2S)
 - d. State of North Dakota

SC-6.04 Delete Paragraph 6.04.D in its entirety.

ARTICLE 7 - CONTRACTOR'S RESPONSIBILITIES

7.03 Labor; Working Hours

SC-7.03 Add the following new subparagraphs immediately after Paragraph 7.03.C:

1. Regular working hours will be 7:00 AM to 7:00 PM local time.
2. Owner's legal holidays are federal holidays.
3. Contractor will not be permitted to work on a Saturday, Sunday, or legal holiday without Owner's written consent given after Contractor has provided written notice to Engineer a minimum of two (2) weeks in advance.

SC-7.03 Add the following paragraph immediately after Paragraph 7.03.C:

D. The Contractor shall be responsible for the conduct of Contractor's employees and employees of Subcontractors and suppliers on the Work Site. The Contractor shall take immediate steps to remedy any activity that may be construed as discriminatory, or which creates a hostile work environment. Activities covered by this provision include, but shall not be limited to, physical contact or signs or language that is vulgar, profane, or racially or sexually derogatory.

7.05 "Or Equals"

SC-7.05 Add the following new subparagraph immediately after Paragraph 7.05.C:

1. "Or Equals" items of materials or equipment will be considered only during the bidding period as outlined in the Instructions to Bidders and Substitution Procedures.

7.06 Substitutes

SC-7.06 Add the following new subparagraph immediately after Paragraph 7.06.C:

1. Substitute items of materials or equipment will be considered only during the bidding period as outlined in the Instructions to Bidders and Substitution Procedures.

7.07 Concerning Subcontractors and Suppliers

SC-7.07 Amend Paragraph 7.07.D to include the following language after the last sentence:

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 a substitute, in which case apparent Successful Bidder shall submit an acceptable substitute, Bidder's Bid price will be increased (or decreased) by the difference in the cost occasioned by such substitution, and Owner may consider such price adjustment in evaluating Bids and making the Contract award.

SC-7.07 Add the following new paragraph immediately after Paragraph 7.07.M:

7.12 Record Documents

SC-7.12 Amend Paragraph 7.12.A to include the following language after the last sentence:

If the requirements of this Paragraph 7.12.A have not been satisfied, Engineer may negate all or part of a progress payment until compliance is reached.

7.13 Safety and Protection

SC-7.13 Add a new paragraph immediately after Paragraph 7.13.J:

K. Contractor agrees to promptly notify Owner of all potential Claims which arise from or result from this agreement. Contractor further agrees to take all reasonable steps to preserve all physical evidence and information which may be relevant to the circumstances surrounding a potential claim, while maintaining public safety, and to grant to the Owner the opportunity to review and inspect such evidence, including the scene of the accident.

7.16 Submittals

SC-7.16 Add a new paragraph immediately after Paragraph 7.16.F:

G. If applicable, Contractor shall furnish with the Shop Drawings a certification of asserting compliance with American Iron and Steel (AIS) requirements for all applicable materials and items.

ARTICLE 8 - OTHER WORK AT THE SITE

8.02 Coordination

SC-8.02 Add the following new Paragraph 8.02.C immediately after Paragraph 8.02.B:

C. Owner intends to contract with other contractors listed below for the performance of other work at or adjacent to the Site.

1. None specified at the writing of these Supplementary Conditions. If Owner contracts work at or adjacent to the Site, Contractor shall work with Owner to coordinate with other various contractors and work forces at the Site.

ARTICLE 9 - OWNER'S RESPONSIBILITIES

SC-9.13 Add the following new paragraph immediately after Paragraph 9.12:

9.13 Owner's Site Representative

A. Owner may furnish an "Owner's Site Representative" to represent Owner at the Site and assist Owner in observing the progress and quality of the Work. The Owner's Site Representative is not Engineer's consultant, agent, or employee. Owner's Site Representative will be identified by the Owner at the preconstruction meeting, if any. The authority and responsibilities of Owner's Site Representative will be identified at the preconstruction meeting, if any.

B. The Owner may, from time to time, provide representatives during construction to also observe the Work and report to the Owner.

ARTICLE 10 - ENGINEER'S STATUS DURING CONSTRUCTION

10.02 Visits to Site

SC-10.02 Add the following new paragraphs immediately after Paragraph 10.02.B:

C. Progress Meetings

1. The Engineer shall schedule and hold regular on-Site progress meetings at least weekly and at other times (i.e. – more or less frequently) as requested by Contractor or as required by progress of the Work. The Contractor, Engineer, and all Subcontractors active on the Site shall attend each meeting. Contractor may at its discretion request attendance by representatives of its Suppliers, manufacturers, and other Subcontractors.

2. The Engineer will preside at the progress meeting and will arrange for keeping and distributing the minutes. The purpose of the meetings is to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the contractors shall present any issues which may impact progress with a view to resolve these issues expeditiously.

10.03 Resident Project Representative

SC-10.03 Add the following new paragraphs immediately after Paragraph 10.03.B:

C. The Resident Project Representative (RPR) will be Engineer's representative at the Site. The Owner will designate the Engineer to represent the Owner's interest during the course of construction. The authority of the Engineer and RPR's is further defined in Article 10 of the General Conditions. 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. 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.
 - 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.
6. Participate in specialized field or laboratory tests or inspections conducted off-site by others except as specifically authorized by Engineer.

7. Authorize Owner to occupy the Project in whole or in part.

E. Neither Engineer's authority or responsibility under this Article 10 or under any other provision of the Contract Documents 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 shall create, impose, or give rise to any duty or contract, tort or otherwise owed by Engineer to Contractor, any Subcontractor, any Supplier, or to any surety for or employee or agent of any of them.

ARTICLE 11 - CHANGES TO THE CONTRACT

11.05 Owner-Authorized Changes in the Work

SC-11.05 Add new paragraphs immediately after Paragraph 11.05.C:

D. Except as specifically authorized in writing by the Engineer at the time additional Work is done beyond the original scope of the Contract Documents, the Contractor shall make no claims for additional compensation. The Contractor's plea of ignorance of foreseeable conditions which will create difficulties or hindrances in the execution of the Work will not be acceptable to the Owner as an excuse for any failure of the Contractor to fulfill the requirements of the Contract Documents, and shall not be a basis for the Contractor's claim for additional compensation. Any discrepancies in, or conflicts between, the items described in these Contract Documents must be submitted in writing to the Engineer for adjustment prior to proceeding with the Work, as any claims for additional compensation to achieve compliance with the requirements of those items will not be allowed or considered.

ARTICLE 12 - CLAIMS

12.01 Claims

SC-12.01 Add new paragraphs immediately after Paragraph 12.01.G:

H. Claims Between Contractors

1. Should Contractor cause damage to the Work or property of any separate contractor at the Site, or should any claim arising out of Contractor's performance of Work at the Site be made by any separate Contractor against another Contractor, the Owner, Engineer, or Engineer's Consultants, Contractor shall promptly attempt to settle with such other contractor by agreement, or to otherwise resolve the dispute by arbitration, or at law.

2. Contractor shall, to the fullest extent permitted by Law, indemnify and hold harmless Owner, Engineer, Engineer's Consultant and the officers, directors, partners, employees, agents and other consultants and subcontractors of each and any of them from and against all claims, costs, losses and damages (including, but not limited to fees and charges of engineers, architects, attorneys and other professionals and court and arbitration costs) arising directly, indirectly, or consequentially out of any action, legal or equitable, brought by any separate contractor against Owner, Engineer, or Engineer's Consultant to the extent that said claim is based on, or arises out of, Contractor's performance of the Work. Should a separate contractor cause damage to the Work or property of Contractor, or, should the performance of the Work by any separate contractor at the Site give rise to any other Claim, Contractor shall not institute any action, legal or equitable, against Owner, Engineer, or Engineer's Consultant or permit any action against any of them to be maintained and continued in its name or for its benefit in any court, or before any arbiter, which seeks to impose liability on, or to recover damages from, Owner, Engineer, or Engineer's Consultant on account of any such damage or Claim.

3. If Contractor is delayed at any time in performing or furnishing Work by any act or neglect of a separate contractor, and Owner and Contractor are unable to agree as to the extent of any adjustment in Contract Times attributable thereto, Contractor may make a Claim for an extension of times in accordance with Article 12. An extension of the Contract Times shall be Contractor's exclusive remedy with respect to Owner, Engineer, and Engineer's Consultant(s) for any delay, disruption, interference or hindrance caused by any separate contractor.

ARTICLE 13 - COST OF WORK: ALLOWANCES, UNIT PRICE WORK

13.01 *Cost of the Work*

SC-13.01 Supplement Paragraph 13.01.B.5.c.(2) by adding the following sentence:

The equipment rental rate book that governs the included costs for the rental of machinery and equipment owned by Contractor (or a related entity) under the Cost of the Work provisions of this Contract is the most current edition of Rental Rate Blue Book for Construction Equipment or the AED Green Book: Rental Rates & Specifications for Construction Equipment or as identified during a preconstruction conference and agreed to by Owner, Engineer, and Contractor.

SC-13.01 Supplement Paragraph 13.01.C.2 by adding the following definition of 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 \$500.

13.03 *Unit Price Work*

SC-13.03 Delete Paragraph 13.03.E in its entirety and insert the following in its place:

E. Adjustments in Unit Price

1. There will be no adjustments in the Unit Prices for Unit Price Work for increased or decreased quantities under this Contract. Quantities for items listed on the Contractor's Bid Form will be measured during construction by Engineer's Field Representative, and the final measured quantities multiplied by the Unit Price shall be used to determine the Contract Price. To complete the Project in accordance with the intent of the Contract Documents it is anticipated that quantities of several items will be more or less than estimated on the Contractor's Bid Form. Accordingly, there will be no compensation for material restocking, if necessary.

ARTICLE 14 - TESTS AND INSPECTIONS: CORRECTION, REMOVAL, OR ACCEPTANCE OF DEFECTIVE WORK

14.02 *Tests, Inspections, and Approvals*

SC-14.02 Delete Paragraph 14.02.B in its entirety and insert the following in its place:

B. Contractor 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, unless specifically identified as a service to be retained and paid for by the Owner.

ARTICLE 15 - PAYMENTS TO CONTRACTOR, SET OFFS; COMPLETIONS; CORRECTION PERIOD

15.01 *Progress Payments*

SC-15.05 Add the following new Paragraphs immediately following Paragraph 15.01.C.6.e:

- f. Failure to make payment to Subcontractors, Supplier, or labor.
- g. Claims made by Engineer for additional compensation because of Contractor delays or rejection of *defective* Work.
- h. Liability for liquidated damages has been incurred by Contractor.

SC-15.01 Delete Paragraph 15.01.D and replace with the following:

D. Payment Becomes Due

1. 60 days after presentation of the Application for Payment to the Owner's Regulatory Authority with Engineer's recommendation, and if approved by the Owner's Regulatory Authority, the amount recommended will (subject to the provisions of Paragraph 15.01.C and 15.01.E) become due, and when due will be paid by Owner to Contractor.

15.03 *Substantial Completion*

SC-15.03 Add the following new subparagraph to Paragraph 15.03.B:

1. If some or all of the Work has been determined not to be at a point of Substantial Completion and will require re-inspection or re-testing by Engineer, the cost of such re-inspection or re-

testing, including the cost of time, travel and living expenses, will be paid by Contractor to Owner. If Contractor does not pay, or the parties are unable to agree as to the amount owed, then Owner may impose a reasonable set-off against payments due under this Article 15.

15.04 *Partial Use or Occupancy*

SC-15.04 Add the following new subparagraph to Paragraph 15.04.A:

5. Owner may at any time request in writing Contractor to permit Owner to take over operation of any part of the Work although it may not be substantially complete. A copy of such request will be sent to Engineer, and within a reasonable time thereafter Owner, Contractor, and Engineer shall make an inspection of that part of the Work to determine its status of completion and will prepare a list of the items remaining to be completed or corrected prior to final payment. If Contractor does not object in writing to Owner and Engineer that such part of Work is not ready for separate operation by Owner, Engineer will finalize the list of items to be completed or corrected and will deliver such list to Owner and Contractor together with a written recommendation as to the division of responsibility pending final payment between Owner and Contractor with respect to security, operation, safety, maintenance, utilities, insurance, warranties, and guarantees for that part of the Work which will become binding upon Owner and Contractor at the time the Owner takes over such operation (unless they shall have otherwise agreed in writing and so informed Engineer). During such operation and prior to Substantial Completion of such part of Work, Owner shall allow Contractor reasonable access to complete or correct items on said list and to complete other related Work.

15.05 *Final Inspection*

SC-15.05 Add the following new Paragraph 15.05.B:

B. Upon correction of deficiencies and completion of the entire Work within each Project Zone, Contractor shall notify Engineer in writing requesting a final inspection. If, in the Opinion of the Engineer, the Contractor has satisfactorily completed the Work within each respective Project Zone, Contractor, Engineer, and Owner shall execute the Final Inspection and Acceptance form.

15.08 *Correction Period*

SC-15.08 Add the following new Paragraphs 15.08.G and 15.08.H:

G. The correction period specified as one year after the date of Substantial Completion in Paragraph 15.08.A of the General Conditions is hereby revised to be the number of years set forth in SC 6.01.B.1; or if no such revision has been made in SC 6.01.B, then the correction period is hereby specified to be two (2) years after Substantial Completion.

H. It is understood that during the warranty period, repairs due to faulty workmanship or materials shall be covered by the Performance Bond. However, a break in one of the pipelines shall be deemed an emergency and must be repaired immediately. The Contractor, therefore, prior to leaving the Project, shall have an understanding and agreement by signed letter or appropriate entry in the Owner's minutes of the meeting as to procedure for making said emergency repairs and notifications to the Contractor.

ARTICLE 16 - SUSPENSION OF WORK AND TERMINATION

16.01 *Owner May Suspend Work*

SC-16.01 Add the following new paragraph immediately after Paragraph 16.01.A:

B. Historical/Archaeological Finds: If during the course of construction evidence of deposits of historical or archaeological interest is found, the Contractor shall cease operations affecting the find and shall notify the Owner, and the State Historical Society or similar agency of reporting within that particular state. No further disturbance of the deposits shall ensue until the Contractor has been notified in writing by the Engineer that he may proceed.

ARTICLE 18 - MISCELLANEOUS

No suggested Supplementary Conditions in this Article.

EXHIBIT A - SOFTWARE REQUIREMENTS FOR ELECTRONIC DOCUMENT EXCHANGE

Item	Electronic Documents:	Transmittal Means	Data Format	Note (1)
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a.1	General communications, transmittal covers, meeting notices and responses to general information requests for which there is no specific prescribed form.	Email	Email	
a.2	Meeting agendas, meeting minutes, RFI's and responses to RFI's, and Contract forms.	Email w/ Attachment	PDF	(2)
a.3	Contractors Submittals (Shop Drawings, "or equal" requests, substitution requests, documentation accompanying Sample submittals and other submittals) to Owner and Engineer, and Owner's and Engineer's responses to Contractor's Submittals, Shop Drawings, correspondence, and Applications for Payment.	Email w/ Attachment or Newforma	PDF	
a.4	Correspondence; milestone and final version Submittals of reports, layouts, Drawings, maps, calculations and spreadsheets, Specifications, Drawings and other Submittals from Contractor to Owner or Engineer and for responses from Engineer and Owner to Contractor regarding Submittals.	Email w/ Attachment or LFE or Newforma	PDF	
a.5	Layouts and drawings to be submitted to Owner for future use and modification.	Email w/ Attachment or LFE or Newforma	DWG	
a.6	Correspondence, reports and Specifications to be submitted to Owner for future word processing use and modification.	Email w/ Attachment or LFE or Newforma	DOC	
a.7	Spreadsheets and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE or Newforma	EXC	
a.8	Database files and data to be submitted to Owner for future data processing use and modification.	Email w/ Attachment or LFE or Newforma	DB	
Notes				
(1)	All exchanges and uses of transmitted data are subject to the appropriate provisions of Contract Documents.			
(2)	Transmittal of written notices is governed by Paragraph 18.01 of the General Conditions.			
Key				
Email	Standard Email formats (.htm, .rtf, or .txt). Do not use stationery formatting or other features that impair legibility of content on screen or in printed copies.			
LFE	Agreed upon Large File Exchange method (FTP, CD, DVD, hard drive).			
PDF	Portable Document Format readable by Adobe® Acrobat Reader.			
DWG	Autodesk® AutoCAD .dwg format.			
DOC	Microsoft® Word .docx format.			
EXC	Microsoft® Excel .xls or .xml format.			
DB	Microsoft® Access .mdb format.			

END OF SECTION

SECTION 00 73 40
FUNDING AGENCY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Basic funding agency requirements.
2. Debarment, suspension, Ineligibility, and voluntary exclusion.

1.02 BASIC FUNDING AGENCY REQUIREMENTS

- A. Project may be funded in part by North Dakota Department of Emergency Services utilizing the Federal Emergency Management Agency (FEMA) Pre-Disaster Mitigation Program (PDM).
- B. Contractors and subcontractors shall comply with all applicable State and Federal Laws, Rules, and Regulations when developing bids associated with this project.
- C. References to applicable Laws, Rules, Regulations and Environmental Conditions are included in the attached copy of the OWNER'S Pre-Disaster Mitigation Program Subgrant Agreement that follows this Section.

1.03 DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY EXCLUSION

- A. Executive Order 12549 prohibits entering contracts or subcontracts with individual or businesses who are debarred or suspended.
- B. Contractor shall provide a Certification Regarding Debarment, Suspension, and Ineligibility with their bid. A copy of the certification form is included as Attachment C to the OWNER'S Pre-Disaster Mitigation Program Subgrant Agreement that follows this Section.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

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STATE OF NORTH DAKOTA
DEPARTMENT OF EMERGENCY SERVICES

DOUG BURGUM

Governor

Major General Alan Dohrmann

Director – Department of Emergency Services

Cody Schulz

Director - Division of Homeland Security

CFDA Title and Number: Non-Disaster Grants – Pre-Disaster Mitigation Program, 97.047

Non-Disaster Grant Fiscal Year: 2018

Subrecipient: City of Fargo

Project Number: PDMC-PJ-08-ND-2018-023 – 2018 City of Fargo WWTP Flood Protection Plan

**Pre-Disaster Mitigation Program Subgrant Agreement
for
FY 2018 Non-Disaster Grant Awards**

This Agreement is between the State of North Dakota, Department of Emergency Services (Grantee) and, the undersigned state agency, political subdivision of the state, or federally recognized Tribal Nation or authorized tribal organization (Subgrantee). This Agreement is based on the existence of the following facts and conditions:

- A. WHEREAS, on March 4, 2020, the Federal Emergency Management Agency (FEMA) obligated project funding under Application Number PDMC -08-ND-2018; and
- B. WHEREAS, the Grantee represents that it is fully qualified and eligible to receive these grant funds to provide the services identified herein and agrees to comply with all the requirements of this Agreement; and
- C. WHEREAS, the Subgrantee has submitted an application, which is incorporated herein by reference, to the Grantee setting forth a list of activities (herein referred to individually as "Project"). The Grantee and FEMA have approved the Project along with any exceptions that have been made prior to signing of this agreement.
- D. WHEREAS, Subgrantee has the legal authority to accept mitigation funds and shall provide all necessary financial and managerial resources to meet the terms and conditions of receiving federal and state mitigation funds.

NOW, THEREFORE, the Grantee and Subgrantee, based upon the existence of the foregoing conditions, do further agree to the following:

ARTICLE I. Definitions. As used in this Agreement, the following terms shall have the following meanings unless another meaning is specified elsewhere:

- A. "Eligible activities" are those activities authorized in the FEMA-State Agreement, and in the Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended, 42 U.S.C §§ 5121-5207 (Stafford Act); in accordance with 44 CFR § 206.44; and applicable policies of the FEMA.
- B. "Articles of Agreement" is the agreement electronically signed between the FEMA and the State of North Dakota, for projects awarded through the FY 2018 PDM Program. The Recipient and Subrecipient must abide by the Federal award terms and conditions set forth in the Articles of Agreement.

ARTICLE II. Applicable Law. The parties agree to all the conditions, obligations, and duties imposed by the FEMA-State Agreement and all applicable state and federal legal requirements including, without any limitation on the generality of the foregoing, the requirements of Title 44 of the Code of Federal Regulations (CFR) Part(s) 13, 80, and 206, and the policies of the FEMA. The Subgrantee further agrees to comply with the Statement of Assurances attached hereto as Attachment B.

ARTICLE III. Funding and Insurance. Grantee shall provide funds to the Subgrantee for eligible activities for the project approved by the Grantee and the FEMA, as specified in Attachment A – Approved Project Data. The federal allowable costs shall be determined as per 44 CFR Part(s) 13 and 206, which shall be up to seventy-five percent of all eligible costs.

- A. The approved project documentation shall be transmitted to Subgrantee, and shall state the cumulative funding allowed, the scope of the eligible project, and the costs eligible under this Agreement. Amendments may obligate or deobligate funding, thereby amending the total funding for the project. The approved project documentation shall document the total eligible costs and the total federal share of those costs, which shall be seventy-five percent of all eligible costs. Contingent upon an appropriation by the State Legislature, the Grantee may provide some portion of any nonfederal share for some sub grantees. As a condition of receipt of the federal funding, the Subgrantee agrees to provide any nonfederal share not paid by the Grantee.
- B. If the Subgrantee is required to repay the Grantee funds already disbursed by the Grantee, the Subgrantee will have 60 days to reimburse the full amount. If Subgrantee has not reimbursed the grantee the full amount within the 60 days, the Grantee will have all the rights and remedies available to them by law; including, but not limited to, the withhold of future fund disbursement to off-set amount due to Grantee.
- C. As a further condition to funding under this Agreement, the Subgrantee agrees to procure insurance sufficient for the type or types of hazards for which the disaster was declared to cover any and all projects to be funded under this Agreement where insurance is available and reasonable. Subgrantee shall provide Grantee with a certificate of such insurance as a condition to funding under this Agreement.

ARTICLE IV. Duplication of Benefits Prohibition. Subgrantee may not receive funding under this Agreement to pay for damage covered by insurance, nor may Subgrantee receive any other duplicate benefits under this Agreement.

- A. Without delay, Subgrantee shall advise Grantee of any insurance coverage for the damage identified on the applicable project application and of any entitlement to compensation or indemnification from such insurance. All such duplicate benefits are "ineligible costs"

which the Subgrantee shall reimburse to the Grantee without delay. The Subgrantee shall also reimburse the Grantee if the Subgrantee receives any duplicate benefits from any other source for any damage identified on the applicable project application for which Subgrantee has received payment from Grantee.

- B. In the event that Grantee should determine that Subgrantee has received duplicate benefits, by its execution of this Agreement the Subgrantee gives Grantee the authority to set off the sum of any such duplicate benefits by withholding it from any other funds otherwise due and owing to Subgrantee, or to use such remedies available at law or equity to the repayment of said sums to Grantee.

ARTICLE V. Compliance with Environmental, Planning and Permitting Laws. Subgrantee shall be responsible for the implementation and completion of the approved projects described in Attachment A – Approved Project Data, in a manner acceptable to Grantee, and in accordance with applicable legal requirements. The contract documents for any project undertaken by Subgrantee, and any land use permitted by or engaged in by Subgrantee, shall be consistent with the local ordinances and State law. Subgrantee shall ensure that any development or development order complies with all applicable planning, permitting and building requirements. Subgrantee shall engage such competent, properly licensed engineering, building, and other technical and professional assistance at all project sites as may be needed to ensure that the project complies with the contract documents.

ARTICLE VI. Subgrantee Risk Assessment. As required by 2 CFR § 200.331 NDDDES will complete a Financial Assistance Recipient Risk Assessment rating form for every subgrantee receiving an award to evaluate their potential risk of non-compliance. Subgrantees will be evaluated on factors such as their prior experience with the same or similar subawards, results of previous audits including whether or not they received a Single Audit and the extent to which the same or similar subaward has been audited as a major program; if they have new personnel or new or substantially changed systems, and the extent and results of Federal awarding agency monitoring.

A Risk Assessment will be completed immediately prior to executing this Subgrant Agreement. All new and existing active subgrantees will be rated upon new disaster and program funding opportunities. The Business Manager will work with the State Hazard Mitigation Officer (SHMO) or assigned staff, to jointly complete the risk assessment and score subgrantees, as applicable. Results of the Risk Assessment may result in the imposition of specific conditions as allowed in 2 CFR § 200.207, and will be identified within Attachment D of this Subgrant Agreement.

Every January, or as needed, NDDDES will re-evaluate all subgrantee Risk Assessments. Based on overall compliance with project requirements and any issues noticed therein, an updated Financial Assistance Recipient Risk Assessment will be completed and subgrantees can be upgraded or removed from low, medium or high risk status. If a subgrantee is non-compliant with the additional requirements of a subaward due to being considered high risk, the subaward and all federal and state monies can be deobligated at the request of NDDDES. Upon deobligation due to non-compliance, a subgrantee will be considered high risk in perpetuity.

ARTICLE VII. Required Documentation, Reviews, and Inspections. Subgrantee shall create and maintain documentation of work performed and costs incurred sufficient to permit a formal audit comporting with ordinary, customary and prudent public accounting requirements. Upon the failure of Subgrantee to create and maintain such documentation, Grantee may terminate further funding under this Agreement, and Subgrantee shall reimburse to Grantee (within 60 days) all payments disbursed earlier to Subgrantee, together with any and all accrued interest.

To ensure all State and Federal Standards are met, Grantee will conduct a physical inspection of all non-plan projects before a project is started and again before the project is closed.

Throughout the life of an approved project, Grantee will undertake a number of project monitoring activities to ensure successful completion of projects. Grantee will monitor and evaluate project accomplishments and adherence to the project work schedule. Through the review of Subgrantee quarterly reports mitigation staff will attempt to identify any potential problems in grant performance. If problems or concerns exist Grantee will contact Subgrantee to further research potential issues. Technical administration or program assistance may be offered or coordinated if required. In addition, mitigation staff will contact Subgrantee on an as needed basis to provide project management support and to aid in the successful completion and closeout of projects. If a project has not been completed and closed within 120 days of the project's period of performance Grantee will send a letter to the applicant that details project deadlines, includes instructions for project closeout, and gives instructions and deadlines for requesting a time extension if necessary.

For all projects, Subgrantee shall certify that: the project was completed in accordance with FEMA approvals; all required and allowable funds have been paid; all reported costs were incurred in the performance of eligible work; work was completed in compliance with the provisions of the FEMA-State Agreement; payments for the project were made in accordance with the existing requirements of Federal and State laws and regulations; no further requests for funding will be made; and there are no pending bills.

As required by 44 CFR Part 80.14 (d), for all acquisition and relocation projects, every 3 years the Subgrantee (in coordination with any current successor in interest) through the grantee, shall submit to the FEMA Regional Administrator a report certifying that the Subgrantee has inspected the property within the month preceding the report, and that the property continues to be maintained consistent with the provisions of 44 CFR Part 80, the property conveyance and the grant award.

ARTICLE VIII. Cost Sharing. The federal share of the eligible costs specified in Attachment A – Approved Project Data, under this Agreement shall be up to seventy five (75) percent of such costs, and the nonfederal share shall be the remaining amount. Payment of a specified portion of the nonfederal share of such costs is contingent upon a potential future State appropriation defining the apportionment of the nonfederal share. Subgrantee commits to meet any local matching funds required for successful project completion. Further, at the time of project application, Subgrantee must provide Grantee with a Resolution of Commitment from its authorized governing body. Subgrantee also certifies that any matching funds borne by the Subgrantee will come from a nonfederal source as required by 44 CFR § 13.24.

ARTICLE IX. Payment of Costs. Grantee shall disburse the eligible costs to Subgrantee in accordance with the following procedures:

- A. Following the receipt of a project reimbursement request (including supporting documentation in the way of invoices, contracts, force account labor and equipment schedules, and cancelled checks or vouchers), a payment will be issued for any funding that is eligible to be paid to the Subgrantee, as it becomes available. Payment authorizations shall be calculated in accordance with the federal/non-federal cost share, and on the terms and conditions set forth in the FEMA/State Agreement and this agreement. Authorization for payment will include documentation to substantiate the amount of the authorization.
- B. Grantee may advance funds under this Agreement to Subgrantee up to 90 percent of the 75 percent federal share for projects other than Acquisition/Relocation/Elevation projects. Upon completion of the project, submission of the summary of documentation (cancelled checks, warrants, certified transaction reports, etc.) and final approval by FEMA, the

remaining 10 percent share of the federal share and the appropriate state share will be paid. For Acquisition/Relocation/Elevations projects, all conditions for advances listed above shall apply except that the grantee may advance 100 percent of the federal share rather than 90 percent. Subgrantee must meet the following conditions to be eligible for an advance of funds:

1. Subgrantee shall certify to Grantee that Subgrantee has procedures in place to ensure that funds are disbursed to project vendors, contractors, and subcontractors without unnecessary delay;
 2. Subgrantee shall submit to Grantee the budget supporting the request;
 3. Subgrantee shall submit a statement justifying the advance and the proposed use of the funds and specifying the amount of funds requested; and
 4. Subgrantee shall pay over to Grantee any interest earned on advances for remittance to the FEMA as often as practicable, but not later than ten (10) business days after the close of each calendar quarter.
- C. Grantee may, in its discretion, withhold its portion of the nonfederal share of funding under this Agreement from Subgrantee if Grantee has reason to expect a subsequent unfavorable determination by the FEMA that a previous disbursement of funds under this Agreement was improper.

ARTICLE X. Final Payment. Grantee shall disburse the final payment to Subgrantee upon the performance of the following conditions:

- A. Subgrantee shall have completed the project to the satisfaction of the Grantee;
- B. Subgrantee shall have submitted the documentation specified in Articles VI and VIII of this Agreement;
- C. Grantee shall have performed the final inspection;
- D. Subgrantee shall have requested final reimbursement.
- E. Subgrantee shall have requested project closeout by letter

ARTICLE XI. Records Maintenance. The funding of eligible costs under this Agreement and the performance of all other conditions shall be subject to the following requirements, in addition to such other and further requirements as may be imposed by operation of law:

- A. The "Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments," as codified in 44 Code of Federal Regulations Part 13, as amended.
- B. Office of Management and Budget Circular No. A-87, "Cost Principles for State and Local Governments," as amended.
- C. Office of Management and Budget Circular No. A-110, "Uniform Administrative Requirements for Grants and Other Agreements with Institutions of Higher Education, Hospitals and Other Non-Profit Organizations," as amended.
- D. Office of Management and Budget Circular No. A-122, "Cost Principles for Non-Profit Organizations," as amended.
- E. Subgrantee shall retain sufficient records to show its compliance with the terms of this Agreement, as well as the compliance of all subcontractors or consultants paid from funds under this Agreement for a period of three years from the date of formal notification from the Grantee that FEMA has officially closed the disaster program. The Subgrantee shall allow the Grantee or its designee, the Comptroller General of the United States, FEMA, and the North Dakota State Auditor's Office, access to records upon request. The three year period may be extended for the following exceptions:
 1. If any litigation, claim or audit is started before the three year period expires, and extend beyond the three year period, the records shall be retained until all litigation, claims or audit findings involving the records have been resolved.

2. Records for the disposition of non-expendable personal property valued at \$5,000 or more at the time it is acquired shall be retained for five years after final disposition.
 3. Records relating to real property acquired shall be retained for five years after the closing on the transfer of title.
- F. The Subgrantee shall maintain all records for the Subgrantee and for all subcontractors or consultants to be paid from funds provided under this Agreement, including documentation of all program costs, in a form sufficient to determine compliance with the requirements and objectives under this Agreement and all other applicable laws and regulations.
- G. The Subgrantee, its employees or agents, including all subcontractors or consultants to be paid from funds provided under this Agreement, shall allow access to its records at reasonable times to the Grantee, its employees, and agents. "Reasonable" shall ordinarily mean during normal business hours of 8:00 a.m. to 5:00 p.m., local time, on Monday through Friday. "Agents" shall include, but not be limited to, auditors retained by the Grantee.

ARTICLE XII. Reimbursement of Funds. If upon final inspection, final audit, or other review by Grantee, the FEMA or other authority determines that the disbursements to Subgrantee under this Agreement exceed the eligible costs, Subgrantee shall reimburse to Grantee the sum by which the total disbursements exceed the eligible costs within sixty (60) days from the date Subgrantee is notified of such determination. If Subgrantee has not reimbursed the grantee the full amount within the 60 days, the Grantee will have all the rights and remedies available to them by law; including, but not limited to, the withhold of future fund disbursement to off-set amount due to Grantee.

ARTICLE XIII. Repayment by Subgrantee. All refunds or repayments due to the Grantee under this Agreement are to be made payable to the order of "North Dakota Department of Emergency Services" and mailed directly to the following address: **PO Box 5511, Bismarck, ND, 58506.**

ARTICLE XIV. Audit.

- A. The Subgrantee agrees to maintain financial procedures and support documents, in accordance with generally accepted accounting principles, to account for the receipt and expenditure of funds under this Agreement.
- B. These records shall be available at all reasonable times for inspection, review, or audit by state personnel and other personnel duly authorized by the Grantee. "Reasonable" shall be construed according to circumstances, but ordinarily shall mean normal business hours of 8:00 a.m. to 5:00 p.m., local time, Monday through Friday.
- C. The Subgrantee shall also provide the Grantee or its designee with the records, reports or financial statements upon request for the purposes of auditing and monitoring the funds awarded under this Agreement.
- D. If a Subgrantee is a state or local government or a non-profits organization as defined in OMB Circular A-133, as revised, and if the Subgrantee expends \$500,000 or more, then the Subgrantee shall have a single or program specific audit conducted which meets the requirements of the Single Audit Act of 1984, 31 U.S.C. ss. 7501-7507, OMB Circular A-133 Part .200 for the purposes of auditing and monitoring the funds awarded under this Agreement. In connection with the aforementioned audit requirement, the Subgrantee shall fulfill for auditee responsibilities as provided in Subpart C of OMB Circular A-133, as revised.
- E. If the Subgrantee spends less than \$500,000 in federal awards in its fiscal year, an audit conducted in accordance with the provision of OMB Circular A-133, as revised, is not required. In the event the Subgrantee expends less than \$500,000 in federal awards in its

fiscal year and chooses to have an audit conducted in accordance with OMB Circular A-133 Part .200, as revised, the cost of the audit must be paid from nonfederal funds.

- F. In the event the audit shows that the entire funds disbursed hereunder, or any portion thereof, were not spent in accordance with the conditions of this Agreement, the Subgrantee shall be held liable for reimbursement to the Grantee of all funds not spent in accordance with these applicable regulations and Agreement provisions within sixty (60) days after the Grantee has notified the Subgrantee of such non-compliance.
- G. If required, the audit is due nine (9) months after the end of the fiscal year of Subgrantee.
- H. If audit is conducted as required by subsection D. above, the Subgrantee shall submit the data collection form and one copy of the reporting package to the Federal Audit Clearinghouse at the following address: **Federal Audit Clearinghouse, Bureau of the Census, 1201 East 10th Street, Jeffersonville, IN 47132**. If the audit documents any finding or questioned costs, Subgrantee shall submit a copy of the reporting package to the State at the following address:

**ND Department of Emergency Services
PO Box 5511
Bismarck ND 58506**

ARTICLE XV. Noncompliance. If the Subgrantee violates this Agreement or any legislation, regulation, statute, rule or other legal requirement applicable to the performance of this Agreement, the Grantee may withhold any disbursement otherwise due Subgrantee for the project with respect to which the violation has occurred until the violation is cured or has otherwise come to final resolution. If the violation is not cured, Grantee may terminate this Agreement and invoke its remedies under the Agreement as per the Articles of this Agreement.

ARTICLE XVI. Nondiscrimination by Contractors. Pursuant to 44 CFR Parts 7 and 16, and 44 CFR Part 206.36, the Subgrantee shall undertake an active program of nondiscrimination in its administration of disaster assistance under this Agreement. Subgrantee shall also be subject to the requirements in the General Services Administrative Consolidated List of Debarred, Suspended and Ineligible Contractors, in accordance with 44 CFR Part 17.

ARTICLE XVII. Modification. A modification extending the time for completion of a project and any other modification shall be in writing. Modifications to any project to be funded under this Agreement may be requested by Subgrantee through Grantee, but the approval of any such modifications shall reside in the sole discretion of the FEMA. Any approved modification to a project shall be noted in an amendment to the project and in any amendment to this Agreement. If otherwise allowed under this Agreement, any extension shall be in writing and shall be subject to the same terms and conditions as those set out in the initial Agreement.

ARTICLE XVIII. Period of Performance (POP). The POP is the period of time during which the Grantee is expected to complete all grant activities and to incur and expend approved funds. The POP begins on the date that the grant is awarded and ends no later than 36 months from the award of the final subgrant under the grant. The POP termination date is established by the subgrant with the latest completion date.

FEMA will not establish activity completion timeframes for individual subgrants. Grantees are responsible for ensuring that all approved activities are completed by the end of the grant POP.

ARTICLE XIX. Contracts with Others. If the Subgrantee contracts with any other contractor or vendor for performance of all or any portion of the work required under this Agreement, the Subgrantee shall incorporate into its contract with such contractor or vendor an indemnification

clause holding Grantee and Subgrantee harmless from liability to third parties for claims asserted under such contract. The Subgrantee shall also document in the quarterly report the subcontractor's progress in performing its work under this Agreement.

ARTICLE XX. Termination. Either of the parties may terminate this Agreement by notice in writing. Such termination shall take effect thirty (30) days after the date of such notice. Such termination shall not affect the rights, interests, duties or responsibilities of either of the parties or any allowable costs that have accrued as of the date of the notice of termination.

ARTICLE XXI. Liability. Grantee assumes no liability to third parties in connection with this agreement. The Subgrantee shall be solely responsible to any and all contractors, vendors, and other parties with whom it contracts in performing this Agreement. Unless the Subgrantee is a political subdivision under NDCC 32-12.2-13, the Subgrantee shall defend, indemnify and hold harmless Grantee from claims asserted by third parties in connection with the performance of this Agreement. Contractors hired by a Subgrantee, including political subdivisions, shall be required to agree in writing to defend, indemnify and hold the State of North Dakota harmless for any claims arising out the contractor's or any subcontractor's performance under the agreement. For the purposes of this Agreement, the Grantee and Subgrantee agree that neither one is an employee or agent of the other, but that each one stands as an independent entity in relation to one another. Nothing in this Agreement shall be construed as a waiver by the Grantee or Subgrantee of any legal immunity, nor shall anything in this Agreement be construed as consent by either of the parties to be sued by third parties in connection with any matter arising from the performance of this Agreement. Subgrantee represents to the best of its knowledge any hazardous substances at its projected site or sites are present in quantities within statutory and regulatory limitations, and do not require remedial action under any federal, state or local legal requirements concerning such substances, Subgrantee further represents that the presence of any such substance or any condition at the site caused by the presence of any such substance shall be addressed in accordance with all applicable legal requirements.

ARTICLE XXII. Reports. Subgrantee shall provide Quarterly Reports to Grantee using forms provided by the Grantee for each specific project. The first Quarterly Report shall be due at such time as Subgrantee is notified. All subsequent Quarterly Reports shall be due no later than fifteen (15) days after each calendar quarter through final inspection. Quarterly Reports shall indicate the anticipated completion date for each project, together with any other circumstances that may affect the completion date, the scope of work, the project costs, or any other factors that may affect compliance with this Agreement. Interim inspections may be scheduled by Subgrantee before the final inspection and may be required by Grantee based on information supplied in the Quarterly Reports. Grantee may require additional reports as needed, and Subgrantee shall provide any additional reports requested by Grantee as soon as practicable.

ARTICLE XXIII. Monitoring. The Subgrantee shall monitor its performance under this Agreement, as well as that of its subcontractors, Subgrantees and consultants who are paid from funds provided under this Agreement, to ensure that performance under this Agreement are achieved and satisfactorily performed and in compliance with applicable state and federal laws and rules.

In addition to reviews of audits conducted in accordance with OMB Circular A-133, as revised, monitoring procedures may include, but not be limited to, on-site visits by Grantee staff, limited scope audits as defined by OMB Circular A-133, as revised, and/or other procedures. By entering into this Agreement, the Subgrantee agrees to comply and cooperate with all monitoring procedures/processes deemed appropriate by the Grantee. In the event that the Grantee determines

that a limited scope audit of the Subgrantee is appropriate, the Subgrantee agrees to comply with any additional instructions provided by the Grantee to the Subgrantee regarding such audit. The Subgrantee further agrees to comply and cooperate with any inspections, reviews, investigations or audits deemed necessary by the Comptroller or Auditor General. In addition, the Grantee will monitor the performance and financial management by the Subgrantee throughout the contract term to ensure timely completion of all tasks.

ARTICLE XXIV. Mandated Conditions. Subgrantee agrees to the following conditions:

- A. The performance and obligation of Grantee to pay under this Agreement is contingent upon an annual appropriation by the Legislature.
- B. Bills for fees or other compensation for services or expenses must be submitted in detail sufficient for a proper pre-audit and post-audit.
- C. Grantee may unilaterally terminate this Agreement for refusal by the Subgrantee or its contractors or subcontractors to allow public access to all documents, papers, letters or other material that are made or received by Subgrantee or its contractors and subcontractors in connection with this Agreement.
- D. Subgrantee agrees that no funds or other resources received from the Grantee disbursed to it under this Agreement will be used directly or indirectly to influence legislation or any other official action by the North Dakota Legislature or any state agency.
- E. Subgrantee certifies that it possesses the legal authority to receive the funds under this Agreement and that it's governing body (if applicable) has authorized the execution and acceptance of this Agreement. The Subgrantee also certifies that the undersigned person has the authority to legally execute and bind Subgrantee to the terms of this Agreement.
- F. Subgrantee agrees that responsibility for compliance with this Agreement rests with Subgrantee, and further agrees that noncompliance with this Agreement shall be cause for the rescission, suspension or termination of funding under this Agreement, and may affect eligibility for funding under future Subgrantee Agreements.
- G. The Grantee will not intentionally award publicly-funded contracts to any contractor who knowingly employs unauthorized alien workers, constituting a violation of the employment provisions contained in 8 U.S.C. Section 1324a(e) [Section 274A(e) of the Immigration and Nationality Act ("INA")]. The Department shall consider the employment by any contractor of unauthorized aliens a violation of Section 274A (e) of the INA. Such violation by the Subgrantee of the employment provisions contained in Section 274A (e) of the INA shall be grounds for unilateral cancellation of this Agreement by the Department.
- H. A person or affiliate who has been placed on the convicted vendor list following a conviction for a public entity crime or on the discriminatory vendor list may not submit a bid on a contract to provide any goods or services to a public entity, may not submit a bid on a contract with a public entity for the construction or repair of a public building or public work, may not submit bids on leases of real property to a public entity, may not be awarded or perform work as a contractor, supplier, subcontractor, or consultant under a contract with a public entity, and may not transact business with any public entity in excess of Category Two for a period of 36 months from the date of being placed on the convicted vendor list or on the discriminatory vendor list.
- I. The Subgrantee agrees to comply with the Americans With Disabilities Act (Public Law 101-336, 42 U.S.C. Section 12101 et seq.), if applicable, which prohibits discrimination by public and private entities on the basis of disability in the areas of employment, public accommodations, transportation, State and local government services, and in telecommunications.
- J. With respect to any Subgrantee which is not a local government or state agency, and which receives funds under this Agreement from the federal government, by signing this

Agreement, the Subgrantee certifies, to the best of its knowledge and belief, that it and its principals:

1. are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by a federal department or agency;
2. have not, within a five-year period preceding this proposal been convicted of or had a civil judgment rendered against them for:
 - a) the commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (federal, state or local) transaction or contract under public transaction.
 - b) violation of federal or state antitrust statutes or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property.
 - c) have not within a five-year period preceding this Agreement had one or more public transactions (federal, state or local) terminated for cause or default.

Where the Subgrantee is unable to certify to any of the statements in this certification, such Subgrantee shall attach an explanation to this Agreement. In addition, the Subgrantee shall submit to the Grantee (by email or facsimile) the completed "Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion" for each prospective subcontractor which Subgrantee intends to fund under this Agreement. See Attachment C. Such form must be received by the Grantee prior to the Subgrantee entering into a contract with any prospective subcontractor.

- K. The validity of this Agreement is subject to the truth and accuracy of all the information, representations, and materials submitted or provided by the Subgrantee in this Agreement, in any subsequent submission or response to Grantee request, or in any submission or response to fulfill the requirements of this Agreement, and such information, representations, and materials are incorporated by reference. The lack of accuracy thereof or any material changes shall, at the option of the Department and with thirty (30) days written notice to the Subgrantee, cause the termination of this Agreement and the release of the Grantee from all its obligations to the Subgrantee.
- L. This Agreement shall be construed under the laws of the State of North Dakota, and venue for any actions arising out of this Agreement shall lie in Burleigh County. If any provision hereof is in conflict with any applicable statute or rule, or is otherwise unenforceable, then such provision shall be deemed null and void to the extent of such conflict, and shall be deemed severable, but shall not invalidate any other provision of this Agreement.
- M. The Subgrantee certifies, by its signature to this Agreement, that to the best of his or her knowledge and belief:
 1. No federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any federal contract, the making of any federal grant, the making of any federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment or modification of any federal contract, grant, loan or cooperative agreement.
 2. If any funds other than federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this federal contract, grant, loan or cooperative agreement, the undersigned shall complete and submit

Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.

3. The undersigned shall require that the language of this certification be included in the award documents for all sub awards at all tiers (including subcontracts, sub grants, and contracts under grants, loans, and cooperative agreements) and that all sub grantees shall certify and disclose accordingly. This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.
- O. All unmanufactured and manufactured articles, materials and supplies which are acquired for public use under this Agreement have been produced in the United States as required 41 U.S.C. 10a, unless it would not be in the public interest or unreasonable in cost.

ARTICLE XXV. Term. This Agreement shall take effect upon its execution by both parties, and shall terminate upon approval of closeout by the FEMA, unless terminated earlier as specified elsewhere in this Agreement. Subgrantee shall commence project(s) specified by this Agreement without delay.

ARTICLE XXVI. Events of Default, Remedies, and Termination.

1. Upon the occurrence of any one or more of the following events, all obligations of Grantee to disburse further funds under this Agreement shall terminate at the option of Grantee. Notwithstanding the preceding sentence, Grantee may at its option continue to make payments or portions of payments after the occurrence of any one or more such events without waiving the right to exercise such remedies and without incurring liability for further payment. Grantee may at its option terminate this Agreement and any and all funding under this Agreement upon the occurrence of any one or more of the following:
 1. Any representation by Subgrantee in this Agreement is inaccurate or incomplete in any material respect, or Subgrantee has breached any condition of this Agreement with Grantee and has not cured in timely fashion or is unable or unwilling to meet its obligations under this Agreement.
 2. Subgrantee suffers any material adverse change in its financial condition while this Agreement is in effect, as compared to its financial condition as represented in any reports or other documents submitted to Grantee, if Subgrantee has not cured the condition within thirty (30) days after notice in writing from Grantee.
 3. Any reports required by this Agreement have not been submitted to Grantee or have been submitted with inaccurate, incomplete, or inadequate information.
 4. The monies necessary to fund this Agreement are unavailable due to any failure to appropriate or other action or inaction by the State Legislature, Congress or Office of Management and Budget.
2. Upon the occurrence of any one or more of the foregoing events, Grantee may at its option give notice in writing to Subgrantee to cure its failure of performance if such failure may be cured. Upon the failure of Subgrantee to cure, Grantee may exercise any one or more of the following remedies:
 1. Terminate this Agreement upon not less than fifteen (15) days' notice of such termination by certified letter to the Subgrantee, such notice to take effect when delivered to Subgrantee;
 2. Commence a legal action for the judicial enforcement of this Agreement;
 3. Withhold the disbursement of any payment or any portion of a payment otherwise due and payable under this agreement or any other agreement with Subgrantee; and

4. Take any other remedial actions that may otherwise be available under law.
3. Grantee may terminate this Agreement for any misrepresentation of material fact, for failure or nonperformance of any Agreement condition or obligation, or for noncompliance with any applicable legal requirement.
4. Any deobligation of funds or other determination by the FEMA shall be addressed in accordance with the regulations of that Agency.
5. Upon the rescission, suspension or termination of this Agreement, the Subgrantee shall refund to Grantee all funds disbursed to Subgrantee under this Agreement.
6. The venue of any action or proceeding by either Grantee or Subgrantee for enforcement of this Agreement or for adjudication rights, interest, or duties of the parties to it shall lie in South Central District Court, Burleigh County, North Dakota.
7. Notwithstanding anything to the contrary elsewhere in this Agreement, the rescission, suspension or termination of this Agreement by Grantee shall not relieve Subgrantee of liability to Grantee for the restitution of funds advanced to Subgrantee under this Agreement, and Grantee may set off any such funds by withholding future disbursements otherwise due Subgrantee under this Agreement or any other Agreement until such time as the exact amount of restitution due Grantee from Subgrantee is determined. In the event the FEMA should deobligate funds formerly allowed under this Agreement or under any other Agreement funded by the Agency and administered by Grantee, then Subgrantee shall immediately repay such funds to Grantee. If the Subgrantee fails to repay any such funds, then Grantee may recover the same from funding otherwise due Subgrantee.

ARTICLE XXVII. Attachments.

- A. All attachments to this Agreement are incorporated into this Agreement by reference as if set out fully in the text of the Agreement itself.
- B. In the event of any inconsistencies between the language of this Agreement and the Attachments to it if any, the language of the Attachments shall be controlling, but only to the extent of such inconsistencies.

Note: All other grant administrative and electronic forms will be provided by Grantee as necessary or posted on the North Dakota Department of Emergency Services website: <http://www.nd.gov/des/>.

ARTICLE XXVIII. Notice and Contact. All notices under this Agreement shall be in writing and shall be delivered by email, by facsimile, by hand, or by letter to the following respective addresses:

Grantee:

Justin Messner, Disaster Recovery Chief
Department of Emergency Services
PO Box 5511
Bismarck ND 58506
Email: jmessner@nd.gov

Subgrantee:

James Hausauer
Utility Director, Fargo WWTP
3400 North Broadway
Fargo, ND 58102
Email: JHausauer@FargoND.gov

ARTICLE XXIX. Designation of Agent. Subgrantee hereby designates the following agents to execute any Request for Advance or Reimbursement, certification, or other necessary documentation:

Primary Agent

Alternate Agent

Name and Title

Name and Title

Phone Number

Phone Number

E-mail

E-mail

**STATE OF NORTH DAKOTA
DEPARTMENT OF EMERGENCY SERVICES**

SIGNATURE PAGE

**HAZARD MITIGATION GRANT PROGRAM SUBGRANT AGREEMENT
FOR
FY 2018 NON-DISASTER GRANT AWARDS**

IN WITNESS HEREOF, the Grantee and Subgrantee have executed this Agreement:

FOR THE SUBGRANTEE:

Name and Title

Signature

Date

Federal Employer Identification Number (FEIN): _____

DUNS Number: _____

**STATE OF NORTH DAKOTA
DEPARTMENT OF EMERGENCY SERVICES**

SIGNATURE PAGE

**HAZARD MITIGATION GRANT PROGRAM SUBGRANT AGREEMENT
FOR
FY 2018 NON-DISASTER GRANT AWARDS**

IN WITNESS HEREOF, the Grantee and Subgrantee have executed this Agreement:

FOR THE GRANTEE:

DEPARTMENT OF EMERGENCY SERVICES



Justin Messner – Disaster Recovery Chief

3/31/2020

Date

ATTACHMENT A

Approved Project Data

CFDA Title and Number: Disaster Grants – Pre-Disaster Mitigation Program, 97.047

Non-Disaster Grant Fiscal Year: 2018

Subrecipient: City of Fargo

Project Number: PDMC-PL-08-ND-2018-023

Project Cost: 100% - \$4,906,390.00

Federal Funding: 75% - \$3,679,792.50

Local Funding: 25% - \$1,226,597.50

Work Schedule: 4 March 2020 – 4 February 2022

Scope of Work:

The scope of work for this project is to provide permanent flood protection for the City of Fargo's Wastewater Treatment Plant (WWTP) above the 500-year level of protection. The 500-year floodplain elevation for the Red River at the WWTP based on the current Flood Insurance Study (FIS) is 899.2 feet (NAVD 88). The project proposes the use of levees, floodwalls and a road raise to provide protection around the facility. The project has integrated design standards from the City of Fargo, State and FEMA to develop the design. For levees, FEMA requires levees to be constructed (top of clay) to a height of the Base Flood Elevation (BFE) plus three (3) feet for adequate freeboard. In our case, the BFE is 896.5 feet, which sets the top of the clay at 899.5 feet [896.5ft. (BFE) + 3.0 ft.]. For the flood wall design height, the City of Fargo has set the standard as the BFE plus 5.5 feet. For the WWTP location, this would set the top of wall height to an elevation of 902.2 ft. [896.5 ft. + 5.5 ft.]. Both design standards exceed the minimum height requirement for the 500-year floodplain elevation of 899.2 feet. Majority of the site is located within the 500-year floodplain. A portion of the site in the southeast corner is elevated above the 500-year floodplain which the project proposes to tie into.

The alignment of the protection system has been split into five (5) segments for the design: South Access Road, SW Low Area, West Drying Beds, NW Green Space and the NE Clarifier Area. An alternative analysis was completed for the project with details of the analysis can be found in the attached preliminary design report. Provided below is a summary of the selected measures for each of the segments.

Starting on the south side of the facility, the South Access Road segment is proposed to be raised above the 500-year floodplain elevation that will then tie into the southeast corner of the site, the area of the site that is elevated above the 500-year floodplain. This road raise will be completed by removing the existing pavement section, raising and replacing the pavement, adding curb & gutter and installing storm sewer in this area. Working clockwise around the site, the next segment (SW Low Area) is proposed to be an earthen levee. Continuing to the north, the levee is proposed to extend along the West Drying Bed segment. Within this segment, the levee alignment was set strategically to avoid running over top of the existing utilities located along the west side of the site. However, the drying bed will be impacted and are proposed to be mitigated for. Continuing the levee north, it will extend through the NW Green Space segment. The existing access road located in the northwest corner of the site will be removed. Following the NW Green Space, the line of protection transitions from a levee to a sheet pile wall at the NE Clarifier Area. Space limitations in this area do not allow for the construction of a levee and the existing access road in the northeast area of the site will also be removed. The wall will run parallel to the property line, continuing to the south until it ties into the elevated portion of the site, which is

above the 500-year floodplain. The tie-in point is approximately located at the west central access road to the WWTP.

Overall, the project proposed to provide a continuous permanent line of protection around the WWTP above the 500-year floodplain without the need for closures. Mitigation will be implemented by developing construction drawings in specifications based on City of Fargo, State and FEMA standards. The construction plans will integrate any environmental conditions required for the project. The project will then be bid out in accordance with City, State and FEMA requirements to a contractor. Once a contractor is awarded the project, the City will oversee the construction of the mitigation project, ensuring it is built to the standards specified in the project made during the design process. Once the project is completed, the City will work with the State to reimburse all eligible project costs and close the project on the State and Federal levels.

Work Schedule:

Environmental Permitting	2 Months
Final Design	6 Months
Bidding	1 Month
Construction	12 Months
Project Closeout	2 Months
Total:	23 Months

Cost Estimate:

F&I Pavement 8" Thick Doweled Conc	Construction and Project Improvement	1,440.00	Square Yard	\$ 99.60	\$ 143,424.00
Remove & Replace Chain Link Fence	Construction and Project Improvement	2,075.00	Linear Foot	\$ 60.00	\$ 124,500.00
Raise Scrubber	Construction and Project Improvement	1.00	Each	\$ 18,000.00	\$ 18,000.00
Raise Manhole	Construction and Project Improvement	1.00	Each	\$ 4,200.00	\$ 4,200.00
8' x 8' Box Gate Structure	Construction and Project Improvement	1.00	Each	\$ 18,000.00	\$ 18,000.00
F&I Edge Drain 8" Dia PVC	Construction and Project Improvement	485.00	Linear Foot	\$ 14.40	\$ 6,984.00
F&I Pavement 6" Thick Reinforced Conc	Construction and Project Improvement	500.00	Square Yard	\$ 54.00	\$ 27,000.00
Replace Cleanout Length of Drying Beds	Construction and Project Improvement	1.00	Each	\$ 60,000.00	\$ 60,000.00

Site Grading	Construction and Project Improvement	1.00	Unknown	\$ 90,000.00	\$ 90,000.00
F&I Curb and Gutter (2-foot drying beds)	Construction and Project Improvement	600.00	Linear Foot	\$ 156.00	\$ 93,600.00
F&I Drying Bed Walls (6" x 2')	Construction and Project Improvement	18.00	Cubic Yard	\$ 120.00	\$ 2,160.00
F&I Drying Bed Concrete Floor (2.5' x 285' x 6")	Construction and Project Improvement	1,200.00	Square Yard	\$ 54.00	\$ 64,800.00
F&I Woven Geotextile Fabri	Construction and Project Improvement	1,200.00	Square Yard	\$ 2.40	\$ 2,880.00
Erosion Control	Construction and Project Improvement	1.00	Each	\$ 18,000.00	\$ 18,000.00
Remove Pavement All Thickness All Types	Construction and Project Improvement	1,525.00	Square Yard	\$ 13.20	\$ 20,130.00
Class 5 Import	Construction and Project Improvement	800.00	Cubic Yard	\$ 24.00	\$ 19,200.00
Topsoil (Haul and Spread)	Construction and Project Improvement	6,300.00	Cubic Yard	\$ 18.00	\$ 113,400.00
Seeding	Construction and Project Improvement	37,900.00	Cubic Yard	\$ 2.70	\$ 102,330.00
8" Plug Valve and Fitting	Construction and Project Improvement	1.00	Each	\$ 7,200.00	\$ 7,200.00
Relocate Water Main 10" Dia	Construction and Project Improvement	1.00	Each	\$ 8,400.00	\$ 8,400.00
Remove Tree	Construction and Project Improvement	47.00	Each	\$ 120.00	\$ 5,640.00
Salvage Tree	Construction and Project Improvement	20.00	Each	\$ 690.00	\$ 13,800.00
F&I 1-1/4" Trench Found Rock 4" through 12" Dia	Construction and Project Improvement	200.00	Square Yard	\$ 21.60	\$ 4,320.00
Contingency	Contingencies	1.00	Each	\$ 218,200.00	\$ 218,200.00

Project Management Fees	Other Architectural Engineering Basic Fees	1.00	Each	\$ 229,100.00	\$ 229,100.00
18" RCP Storm Pipe	Construction and Project Improvement	895.00	Linear Foot	\$ 66.00	\$ 59,070.00
F&I 48" SDMH w/beehive	Construction and Project Improvement	10.00	Each	\$ 7,800.00	\$ 78,000.00
F&I Gate Valve	Construction and Project Improvement	5.00	Each	\$ 5,400.00	\$ 27,000.00
F&I 12" PVC	Construction and Project Improvement	230.00	Linear Foot	\$ 78.00	\$ 17,940.00
24" Slide Gate	Construction and Project Improvement	1.00	Each	\$ 9,600.00	\$ 9,600.00
F&I Sand	Construction and Project Improvement	600.00	Square Yard	\$ 30.00	\$ 18,000.00
Demo Drying Bed Portion	Construction and Project Improvement	1.00	Each	\$ 24,000.00	\$ 24,000.00
Engineering and Construction	Architectural Engineering Basic Fees	1.00	Unknown	\$ 500,000.00	\$ 500,000.00
F&I Curb and Gutter	Construction and Project Improvement	325.00	Linear Foot	\$ 42.00	\$ 13,650.00
F&I Casting - Inlet	Construction and Project Improvement	5.00	Each	\$ 1,440.00	\$ 7,200.00
Pre-Award Engineering Fees	Preliminary Expense	1.00	Each	\$ 93,700.00	\$ 93,700.00
Mobilization	Construction and Project Improvement	1.00	Unknown	\$ 184,000.00	\$ 184,000.00
Strip Topsoil	Construction and Project Improvement	4,860.00	Cubic Yard	\$ 4.80	\$ 23,328.00
Clay Excavation & Haul	Construction and Project Improvement	33,557.00	Cubic Yard	\$ 42.00	\$ 1,409,394.00
F&I Sheet Piling	Construction and Project Improvement	640.00	Linear Foot	\$ 1,560.00	\$ 998,400.00

F&I Inlet - Manhole (MHI) 4' Dia Reinf Conc	Construction and Project Improvement	8.00	Each	\$ 3,480.00	\$ 27,840.00
Total				\$ 4,906,390.00	

Environmental Conditions/Requirements

Other Conditions:

Environmental requirements, as noted below and in the attached FEMA award letter dated 4 March 2020 must be met and documented. The attached environmental form must be completed and submitted before grant can be closed out:

Source of Condition: Executive Order 11988 – Flood Plains

The current footprint of the wastewater treatment plant does not encroach on a FEMA-identified 1 %-chance floodplain. However, be advised that floodplains (Zone AE) and regulatory flood way are directly adjacent to the facility as it currently exists. Any encroachment on the 1 %-chance floodplain will require a floodplain development permit from the City of Fargo. In addition, development in the regulatory floodway carries additional requirements per NDCC § 61-16.2-14. Before authorizing any development, the community responsible for permitting such use shall request a floodway review from the State Engineer. The application form may be downloaded from our website under "Regulation & Appropriation, Floodplain Management." Please contact Dionne Haynes with any questions regarding this process. The Floodplain Administrator for the City of Fargo is Jody Bertrand (Floodplain Administrator), 701-241-1548, jbertrand@cityoffargo.com.

The NFIP map used to make this determination is Panel I/38017C0591G, Date: 1/16/2015.

Source of Condition: Clean Water Act

The City shall consult with the USACE to determine final project requirements. The City is responsible for obtaining any needed permits and verifying and complying with all permit requirements, including wetland mitigation, any permit conditions, pre-construction notification requirements, and regional conditions as provided by the Army Corps of Engineers. The City is responsible for implementing, monitoring, and maintaining all Best Management Practices (BMPs) and Pre- Construction Notification (PCN) conditions of applicable nationwide permits.

Source of Condition: National Historic Preservation Act

All borrow material and/or rip rap must come from a ND SHPO approved source. If the applicant chooses to use a borrow source that is not NDDOT Certified and/or from an existing stockpile, the following must occur prior to digging:

1. State Historical Preservation Office (SHPO) approval including completion and FEMA approval of required archeological surveys.
2. The applicant shall notify the FEMA Regional Environmental Officer if any listed species or designated critical habitat might be affected or is in the vicinity of the project, and shall not begin work until notified by the FEMA Regional Environmental Officer that the requirements of the Endangered Species Act have been satisfied.

3. Applicant is required to coordinate borrow pit locations with the USFWS Wetland District Manager to avoid project impacts to easements or public lands.
4. Applicant is responsible for ensuring that no borrow pit activity occurs in Waters of the United States, wetlands or a river listed on the Nationwide Rivers Inventory (NRI). Borrow pit activity occurring in a floodplain must not affect pre-existing hydrological profiles. If activities occur in prime farmland ground disturbance must be temporary, one time use, and no permanent loss of farmland may occur.

Source of Condition: State Water and Soil Laws

1. Applicant shall comply with proper construction practices and environmental disturbance requirements as outlined in the NDDOH letter dated 8/29/17.
2. Care is to be taken during construction activity near any water of the state to minimize adverse effects on a water body. This includes minimal disturbance of stream beds and banks to prevent excess siltation, and the replacement and revegetation of any disturbed area as soon as possible after work has been completed. Caution must also be taken to prevent spills of oil and grease that may reach the receiving water from equipment maintenance, and/or the handling of fuels on the site. Guidelines for minimizing degradation to waterways during construction must be followed.
3. Projects disturbing one or more acres are required to have a permit to discharge storm water runoff until the site is stabilized by the reestablishment of vegetation or other permanent cover. Further information on the storm water permit may be obtained from the Department's website or by calling the Division of Water Quality (701-328-5210). Also, cities may impose additional requirements and/or specific best management practices for construction affecting their storm drainage system. Check with the local officials to be sure any local storm water management considerations are addressed.
4. The proposed construction project is located near the West Fargo aquifer. Care should be taken to avoid spills of any materials that may have an adverse effect on groundwater quality. All spills must be immediately reported to this Department and appropriate remedial actions performed.
5. Per the NDSWC, initial review indicates the project does not require a conditional or temporary permit for water appropriation. However, if surface water or groundwater will be diverted for construction of the project, a water permit will be required per North Dakota Century Code (NDCC) § 61-04-02. Please consult with the Water Appropriations Division of the Office of the State Engineer (OSE) at 701-328-2754 or waterpermits@nd.gov if you have questions.
6. A Sovereign Land Permit will be required for any work below the ordinary high water mark of the Red River. Please contact Ashley Persinger, OSE Sovereign Land Specialist, at 701-328-4988 or apersinger@nd.gov if you have questions.
7. It is likely that the levee proposed, including both temporary and permanent levees and floodwalls, requires or will require a construction permit from the OSE. The OSE requests more information regarding the temporary and permanent levees, including plans and specifications for the levees and floodwalls. Additional information may be necessary to submit with a construction permit application to ensure the levee and floodwall design can be adequately reviewed. For further information on the OSE's permitting requirements, please visit the Regulation & Appropriation tab on the OSE's website (swc.nd.gov). Please contact the OSE Engineering and Permitting Section at 701-328-2752 if you have questions.

8. All necessary measures must be taken to minimize fugitive dust emissions created during construction activities. Any complaints that may arise are to be dealt with in an efficient and effective manner.

ATTACHMENT B

Statement of Assurances

To the extent the following provisions apply to this Agreement, the Subgrantee agrees to comply with the following:

1. Contract Work Hours and Safety Standards Act of 1962, 40 U.S.C. 327 et seq., requiring that mechanics and laborers (including watchmen and guards) employed on federally assisted contracts be paid wages of not less than one and one-half times their basic wage rates for all hours worked in excess of forty hours in a workweek.
2. Federal Fair Labor Standards Act, 29 U.S.C. Section 201 et seq., requiring that covered employees be paid at least the minimum prescribed wage, and also that they be paid one and one-half times their basic wage rates for all hours worked in excess of the prescribed work-week.
3. Title VI of the Civil Rights Act of 1964 (P.L. 88-352), and the regulations issued pursuant thereto, which provides that no person in the United States shall on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Subgrantee receives federal financial assistance and will immediately take any measures necessary to effectuate this assurance. If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Subgrantee, this assurance shall obligate the Subgrantee, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended, or for another purpose involving the provision of similar services or benefits.
4. Any prohibition against discrimination on the basis of age under the Age Discrimination Act of 1975, as amended (42 U.S.C.: 6101-6107) which prohibits discrimination on the basis of age or with respect to otherwise qualified handicapped individuals as provided in Section 504 of the Rehabilitation Act of 1973.
5. Executive Order 11246 as amended by Executive Orders 11375 and 12086, and the regulations issued pursuant thereto, which provide that no person shall be discriminated against on the basis of race, color, religion, sex or national origin in all phases of employment during the performance of federal or federally assisted construction contracts; affirmative action to insure fair treatment in employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff/termination, rates of pay or other forms of compensation; and election for training and apprenticeship.
6. It will comply with the Anti-Kickback Act of 1986, 41 U.S.C. Section 51 which outlaws and prescribes penalties for "kickbacks" of wages in federally financed or assisted construction activities.
7. It will comply with the provisions of 18 USC 594, 598, 600-605 (further known as the Hatch Act) which limits the political activities of employees.
8. It will comply with the flood insurance purchase and other requirements of the Flood Disaster Protection Act of 1973 as amended, 42 USC 4002-4107, including requirements regarding the purchase of flood insurance in communities where such insurance is available as a condition for the receipt of any federal financial assistance for construction or acquisition purposes for use in any area having special flood hazards. The phrase "Federal financial assistance" includes any form of loan, grant, guaranty, insurance payment, rebate, subsidy, disaster assistance loan or grant, or any other form of direct or indirect federal assistance.
9. It will require every building or facility (other than a privately owned residential structure) designed, constructed, or altered with funds provided under this Agreement to comply with

the "Uniform Federal Accessibility Standards," (AS) which is Appendix A to 41 CFR Section 101-19.6 for general type buildings and Appendix A to 24 CFR Part 40 for residential structures. The Subgrantee will be responsible for conducting inspections to ensure compliance with these specifications by the contractor.

10. It will, in connection with its performance of environmental assessments under the National Environmental Policy Act of 1969, comply with Section 106 of the National Historic Preservation Act of 1966 (U.S.C. 470), Executive Order 11593, 24 CFR Part 800, and the Preservation of Archaeological and Historical Data Act of 1966 (16 U.S.C. 469a-1, et seq.) by:

- a) Consulting with the State Historic Preservation Office to identify properties listed in or eligible for inclusion in the National Register of Historic Places that are subject to adverse effects (see 36 CFR Section 800.8) by the proposed activity.
- b) Complying with all requirements established by the state to avoid or mitigate adverse effects upon such properties.
- c) When any of Subgrantee's projects funded under this Agreement may affect a historic property, as defined in 36 CFR 800. (2)(e), the FEMA may require Subgrantee to review the eligible scope of work in consultation with the State Historic Preservation Office (SHPO) and suggest methods of repair or construction that will conform with the recommended approaches set out in the "Secretary of Interior's Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings 1992 (Standards), the Secretary of the Interior's Guidelines for Archeological Documentation (Guidelines) (48 Federal Register 44734-37)," or any other applicable Secretary of Interior standards. If FEMA determines that the eligible scope of work will not conform with the Standards, Subgrantee agrees to participate in consultations to develop, and, after execution by all parties, to abide by, a written agreement that establishes mitigation and recondition measures, including but not limited to, impacts to archeological sites, and the salvage, storage, and reuse of any significant architectural features that may otherwise be demolished.
- d) Subgrantee agrees to notify FEMA and the Grantee if any project funded under this Agreement will involve ground disturbing activities, including, but not limited to: subsurface disturbance; removal of trees; excavation for footings and foundations; and installation of utilities (such as water, sewer, storm drains, electrical, gas, leach lines and septic tanks) except where these activities are restricted solely to areas previously disturbed by the installation, replacement or maintenance of such utilities. FEMA will request the SHPO's opinion on the potential that archeological properties may be present and be affected by such activities. The SHPO will advise Subgrantee on any feasible steps to be accomplished to avoid any National Register eligible archeological property or will make recommendations for the development of a treatment plan for the recovery of archeological data from the property. If Subgrantee is unable to avoid the archeological property, develop, in consultation with the SHPO, a treatment plan consistent with the Guidelines and take into account the Advisory Council on Historic Preservation (Council) publication "Treatment of Archeological Properties." Subgrantee shall forward information regarding the treatment plan to FEMA, the SHPO and the Council for review. If the SHPO and the Council do not object within 15 calendar days of receipt of the treatment plan, FEMA may direct Subgrantee to implement the treatment plan. If either the Council or the SHPO object, Subgrantee shall not proceed with the project until the objection is resolved.

- e) Subgrantee shall notify the Grantee and FEMA as soon as practicable: (i) of any changes in the approved scope of work for a National Register eligible or listed property; (ii) of all changes to a project that may result in a supplemental DSR or modify an HMGP project for a National Register eligible or listed property; (iii) if it appears that a project funded under this Agreement will affect a previously unidentified property that may be eligible for inclusion in the National Register or affect a known historic property in an unanticipated manner. Subgrantee acknowledges that FEMA may require Subgrantee to stop construction in the vicinity of the discovery of a previously unidentified property that may be eligible for inclusion in the National Register or upon learning that construction may affect a known historic property in an unanticipated manner. Subgrantee further acknowledges that FEMA may require Subgrantee to take all reasonable measures to avoid or minimize harm to such property until FEMA concludes consultation with the SHPO. Subgrantee also acknowledges that FEMA will require, and Subgrantee shall comply with, modifications to the project scope of work necessary to implement recommendations to address the project and the property.
 - f) Subgrantee acknowledges that, unless FEMA specifically stipulates otherwise, it shall not receive funding for projects when, with intent to avoid the requirements of the NHPA, Subgrantee intentionally and significantly adversely affects a historic property, or having the legal power to prevent it, allowed such significant adverse effect to occur.
11. It will comply with Title IX of the Education Amendments of 1972, as amended (20 U.S.C.: 1681-1683 and 1685 - 1686) which prohibits discrimination on the basis of sex.
 12. It will comply with the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970, (42 U.S.C. 4521-45-94) relating to nondiscrimination on the basis of alcohol abuse or alcoholism.
 13. It will comply with 523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. 290 dd-3 and 290 ee-3), as amended, relating to confidentiality of alcohol and drug abuse patient records.
 14. It will comply with Lead-Based Paint Poison Prevention Act (42 U.S.C.: 4821 et seq.) which prohibits the use of lead based paint in construction of rehabilitation or residential structures.
 15. It will comply with the Energy Policy and Conservation Act (P.L. 94-163; 42 U.S.C. 6201-6422), and the provisions of the state Energy Conservation Plan adopted pursuant thereto.
 16. It will comply with the Laboratory Animal Welfare Act of 1966, 7 U.S.C. 2131-2159, pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by an award of assistance under this agreement.
 17. It will comply with Title VIII of the Civil Rights Act of 1968, 42 U.S.C. 2000c and 42 3601-3619, as amended, relating to non-discrimination in the sale, rental, or financing of housing, and Title VI of the Civil Rights Act of 1964 (P.L. 88-352), which prohibits discrimination on the basis of race, color or nation origin.
 18. It will comply with the Clean Air Act of 1955, as amended, 42 U.S.C. 7401-7642.
 19. It will comply with the Clean Water Act of 1977, as amended, 42 U.S.C. 7419-7626.
 20. It will comply with the Endangered Species Act of 1973, 16 U.S.C. 1531-1544.
 21. It will comply with the Intergovernmental Personnel Act of 1970, 42 U.S.C. 4728-4763.
 22. It will assist the awarding agency in assuring compliance with the National Historic Preservation Act of 1966, as amended, 16 U.S.C. 270.
 23. It will comply with environmental standards which may be prescribed pursuant to the National Environmental Policy Act of 1969, 42 U.S.C. 4321-4347.
 24. It will assist the awarding agency in assuring compliance with the Preservation of Archeological and Historical Preservation Act of 1966, 16 U.S.C. 469a, et seq.

25. It will comply with the Rehabilitation Act of 1973, Section 504, 29 U.S.C. 794, regarding non-discrimination.
26. It will comply with the environmental standards, which may be prescribed pursuant to the Safe Drinking Water Act of 1974, 42 U.S.C. 300f-300j, regarding the protection of underground water sources.
27. It will comply with the requirements of Titles II and III of the Uniform Relocation Assistance and Property Acquisition Policies Act of 1970, 42 U.S.C. 4621-4638, which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of federal or federally assisted programs.
28. It will comply with the Wild and Scenic Rivers Act of 1968, 16 U.S.C. 1271-1287, related to protecting components or potential components of the national wild and scenic rivers system.
29. It will comply with the following Executive Orders: EO 11514 (NEPA); EO 11738 (violating facilities); EO 11988 (Floodplain Management); EO 11990 (Wetlands); and EO 12898 (Environmental Justice).
30. It will comply with the Coastal Barrier Resources Act of 1977, 16 U.S.C. 3510.
31. It will assure project consistency with the approved state program developed under the Coastal Zone Management Act of 1972, 16 U.S.C. 1451-1464.
32. It will comply with the Fish and Wildlife Coordination Act of 1958; 16 U.S.C. 661-666.
33. With respect to demolition activities, it will:
 - a) Create and make available documentation sufficient to demonstrate that the Subgrantee and its demolition contractor have sufficient manpower and equipment to comply with the obligations as outlined in this Agreement.
 - b) Return the property to its natural state as though no improvements had ever been contained thereon.
 - c) Furnish documentation of all qualified personnel, licenses and all equipment necessary to inspect buildings located in Subgrantee's jurisdiction to detect the presence of asbestos and lead in accordance with requirements of the U.S. Environmental Protection Agency, the State health authority and the county health authority.
 - d) Provide documentation of the inspection results for each structure to indicate: safety hazards present; health hazards present; and/or hazardous materials present.
 - e) Provide supervision over contractors or employees employed by Subgrantee to remove asbestos and lead from demolished or otherwise applicable structures.
 - f) Leave the demolished site clean, level and free of debris.
 - g) Notify the Grantee promptly of any unusual existing condition which hampers the contractors work.
 - h) Obtain all required permits.
 - i) Provide addresses and marked maps for each site where water wells and septic tanks are to be closed along with the number of wells and septic tanks located on each site. Provide documentation of closures.
 - j) Comply with mandatory standards and policies relating to energy efficiency which are contained in the state energy conservation plan issued in compliance with the Energy Policy and Conservation Act (Public Law 94-163).
 - k) Comply with all applicable standards, orders, or requirements issued under Section 112 and 306 of the Clean Air Act (42 U.S.C. 1857 (h), Section 508 of the Clean Water Act (33 U.S. 1368), Executive Order 11738, and the U.S. Environmental Protection Agency regulations (40 CFR Part 15 and 61). This clause shall be added to any subcontracts.
 - l) Provide documentation of public notices for demolition activities.

ATTACHMENT C
Certification Regarding
Debarment, Suspension, Ineligibility
and
Voluntary Exclusion

Subcontractor Covered Transactions:

1. The prospective subcontractor of the Subgrantee certifies, by submission of this document, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any federal department or agency.
2. Where the Subgrantee's subcontractor is unable to certify to the above statement, the prospective subcontractor shall attach an explanation to this form.

SUBCONTRACTOR:

Name of Company

Street Address

City, State, Zip

Federal Employer Identification Number (FEIN)

By: _____
Signature Date

Subgrantee's Name

Grantee Agreement Number

ATTACHMENT D

Risk Assessment Conditions

Per Article VI of this contract, NDDES is required to complete a Financial Assistance Risk Assessment rating form for every subgrantee receiving an award to evaluate their potential risk of non-compliance. Subgrantees will be evaluated on factors such as their prior experience with the same or similar subawards, results of previous audits including whether or not they received a Single Audit and the extent to which the same or similar subaward has been audited as a major program; if they have new personnel or new or substantially changed systems, and the extent and results of Federal awarding agency monitoring. Results of the Risk Assessment may result in the imposition of specific conditions, as allowed in 2 CFR § 200.207, and contained within this attachment.

Based upon the Risk Assessment completed for DR-4323-ND, the {Enter Subgrantee Name Here} has received a score of {Enter Score Here} and has been determined to be a {Enter Low, Medium, or High} Risk based upon the above mentioned criteria.

The specific conditions for a subgrantee determined to be Low Risk are the following:

- Subgrantees identified as Low Risk have no further conditions and may continue with their projects as approved by FEMA. This must include the completion of all project specific conditions, to include environmental requirements and/or permitting, placed upon individual projects by FEMA at the time of award or amendment. **Subgrantees that fail to comply with project specific conditions could potentially jeopardize their current and future federal funding.**

Every January, or as needed, NDDES will re-evaluate all subgrantee Risk Assessments. Based on overall compliance with project requirements and any issues noticed therein, an updated Financial Assistance Recipient Risk Assessment will be completed and subgrantees can be upgraded or removed from low, medium or high risk status. If a subgrantee is non-compliant with the additional requirements of a subaward due to being considered high risk, the subaward and all federal and state monies can be deobligated at the request of NDDES. Upon deobligation due to non-compliance, a subgrantee will be considered high risk in perpetuity.

DIVISION 01 GENERAL REQUIREMENTS

SECTION 01 10 00
WORK COVERED BY CONTRACT DOCUMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes:
 - 1. Project Description.
 - 2. Contracts.
 - 3. Completion Dates.
 - 4. NPDES Construction Stormwater Permit.
 - 5. Fines.
 - 6. Reference Standards.
 - 7. Coordination of Existing Conditions
 - 8. Coordination of Contract Documents.
 - 9. Salvaged Demolition Debris.
 - 10. Restocking.

1.02 PROJECT DESCRIPTION

- A. Major components of the Project include:
 - 1. Contract No. 1 – General Construction:
 - a. Work generally consists of general construction associated with the furnishing and installation of Topsoil Strip, Import and Spread; Excavation; Fill Import; Levee Embankment; Levee Inspection Trench; Subgrade Preparation; Sheet Pile; Cladding at Sheet Pile; Stone Cap for Sheet Pile; Paint and Prep of Sheet Pile, Water Main Installation, Concrete Paving; Ornamental Fence; Chainlink Fence; Sluice Gate Structures and other miscellaneous items.

1.03 CONTRACTS

- A. The OWNER will award a single contract for all work under a unit price contract.
- B. The CONTRACTOR shall not commence work until proper execution of the contract and written authorization to proceed has been issued by the OWNER. Proper execution of the contract shall include all surety bonds and insurance requirements.
- C. The division of work as made by the specifications and contract drawings is for the purpose of specifying work which is required. There is no attempt to make classification according to trades or any agreements, which may exist between CONTRACTORS or SUBCONTRACTORS and trade unions. Classification of the work shall be the CONTRACTOR'S responsibility.
- D. The location of work under these contract documents is located on property of the OWNER, as shown on the contract drawings.

1.04 COMPLETION DATES:

- A. All Contracts:

1. Milestone #1 (including all work that requires a closure of Broadway North or North Broadway Drive that won't allow the traveling public to safely utilize two lanes of the roadway.) - 28 calendar days from roadway closure.
 2. Substantial Completion – October 15, 2024
 3. Final Completion – December 15, 2024
- B. Winter construction may be required. CONTRACTOR shall include in their Bid all necessary requirements for sequencing and winter construction to meet the completion dates.
- C. Liquidation Damages for this project are as indicated in the Standard Agreement between OWNER and CONTRACTOR.

1.05 WORK BY OWNER

- A. CONTRACTOR shall coordinate the timing and operational requirements of the Work with the OWNER and ENGINEER in accordance with Section 01 11 16.

1.06 REFERENCE STANDARDS

- A. For products specified by association or trade standards, comply with requirements of the standard, except when requirements that are more rigid are specified or are required by applicable codes.
- B. The date of the standard is that in effect as of the bid date, or date of OWNER-CONTRACTOR Agreement when there are no bids, except when a specific date is specified.
- C. Obtain copies of standards when required by contract documents. Maintain copy at job site during progress of the specific Work.

1.07 COORDINATION OF EXISTING CONDITIONS

- A. Data on subsurface conditions are made available for convenience of CONTRACTOR and are not intended as representations or warranties of accuracy or continuity between soil borings.
- B. It is expressly understood that the OWNER will not be responsible for interpretations or conclusions drawn by CONTRACTOR from subsurface data. Additional subsurface data gathering operations may be made by CONTRACTOR. Contact OWNER for site access for additional test borings and/or other exploratory operations which may be made by CONTRACTOR at no cost to OWNER.
- C. Locate existing underground utilities in areas of work. Provide adequate means of support and protection during operations for utilities that are to remain in place.
- D. The locations of the utilities shown on the Drawings cannot be guaranteed. CONTRACTOR shall determine exact location of utilities. Should uncharted or incorrectly charted piping or other utilities be encountered, consult utility OWNER immediately for directions. Cooperate with OWNER and utility companies in keeping respective services and facilities in operation. Repair damaged utilities

to satisfaction of utility OWNER.

- E. Do not interrupt existing utilities except when permitted in writing by ENGINEER and then only after acceptable temporary utility services have been provided.
- F. Take and verify dimensions of existing structures, piping, and equipment required for the proper fabrication and installation of new piping and equipment.

1.08 COORDINATION OF CONTRACT DOCUMENTS

- A. Coordinate work of the various Sections of Specifications to assure efficient and orderly sequence of installation of construction elements with provisions for accommodating items installed later.
- B. Verify characteristics of elements of interrelated materials are compatible; coordinate work of various Sections having interdependent responsibilities for installing, connection to, and placing in service, such materials.
- C. Data on subsurface conditions are made available for convenience of The Drawings indicate required pipe sizes and the general arrangement for major piping and equipment. Layout and arrangement for certain other piping systems shall be in conformance to the equipment items furnished. Locations shall be verified in the field by the CONTRACTOR. Valves and fittings furnished shall be of such dimensions to allow for the installation of this piping as shown on the Drawings. In the event it should become necessary to change the location of the work due to interference with other work, the CONTRACTOR shall request written permission from the ENGINEER before making changes, and such changes shall be made without added cost to OWNER. Under no circumstances shall the pipe sizes indicated on the Drawings be changed without first having the written approval of the ENGINEER.
- D. The final length and location of required pipe connections to equipment shall be coordinated to meet the requirements and recommendations of the equipment manufacturer and shall be subject to the approval of the ENGINEER.
- E. Install no work that directly connects to equipment until such time as complete shop drawings of said equipment have been reviewed and approved by the ENGINEER.
- F. Discrepancies discovered before or after work has started shall be brought to the attention of the ENGINEER immediately, and the ENGINEER reserves the right to require minor changes in the work of CONTRACTOR to eliminate such discrepancies.

1.09 NPDES CONSTRUCTION STORM WATER PERMIT

- A. Following award of the contract CONTRACTOR will prepare the NPDES/SDS Construction Stormwater Permit Application for the Project to be signed and submitted jointly by the OWNER and CONTRACTOR.
- B. CONTRACTOR shall be responsible for all provisions required in the NPDES Construction Storm Water Permit for the Project including the stormwater

pollution prevention plan (SWPPP) that is required to be submitted with the permit and all comments received by the North Dakota Department of Environmental Quality (NDDEQ) regarding the permit and SWPPP for approval.

- C. See Section 01 57 00 for additional requirements.

1.10 FINES

- A. In the event the OWNER is fined by the North Dakota Department of Environmental Quality or Environmental Protection Agency as a result of the CONTRACTOR'S actions or lack of actions, the OWNER will deduct from payment, due the CONTRACTOR, corresponding amounts to cover the cost of such fines, including the costs of related engineering and legal fees.

1.11 SALVAGED DEMOLITION DEBRIS

- A. OWNER shall have the right to retain select demolition materials or debris. At the discretion of OWNER, select demolition materials or debris items shall be stored on-site and remain the property of the OWNER. OWNER shall designate the location for storage of salvageable demolition material or debris items. CONTRACTOR shall place selected items in designated storage area.

1.12 RESTOCKING

- A. There will be no additional compensation made to CONTRACTOR due to restocking charges for materials not used on the project.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 11 16
WORK BY OWNER

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes:

1. Work By OWNER.

1.02 WORK BY OWNER

A. OWNER shall provide reference points for the Project one time.

1. Establish Site benchmarks once for use by CONTRACTOR as vertical elevation references.
2. Stakes will be provided for horizontal and vertical layout of project improvements by the OWNER. Items include: floodwall, levee, pipes and structures, fences, and roadways.
3. The ENGINEER will provide a surface TIN file and CAD files for CONTRACTOR convenience. CONTRACTOR will be required to sign and submit a CAD Release Waiver prior to providing.
4. Any subsequent re-staking due to CONTRACTOR's failure to protect stakes or benchmarks shall be at CONTRACTOR's expense.

B. All other surveying and staking required for the Project shall be provided by the CONTRACTOR or SUBCONTRACTORS pursuant to their respective scopes of work. CONTRACTOR shall preserve stakes established by the OWNER.

C. OWNER shall be present for all tie-ins to existing waterlines and operation of all valves.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 NOT USED

END OF SECTION

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SECTION 01 12 16
WORK SEQUENCE

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. General Work Sequence.
 - 2. Sequence of Construction.

1.02 GENERAL WORK SEQUENCE

- A. CONTRACTOR shall submit a detailed construction sequence estimating all dates when interruption, temporary shutdown, or bypass, will occur. Dates shall be updated as construction progresses.
- B. CONTRACTOR shall stay within time restraints for certain construction tasks as identified in the Contract Documents.

1.03 SEQUENCE OF CONSTRUCTION

- A. CONTRACTOR shall perform tasks in the order indicated and within the time constraints specified. This is not an exhaustive list of all work to be completed, but gives general idea of the sequencing required.
- B. The work sequence provided herein is for the CONTRACTOR's information. CONTRACTOR shall be free to modify it to meet his or her needs subject to the approval of the OWNER and ENGINEER.
 - 1. Milestone #1 shall include all work that requires a closure of Broadway North or North Broadway Drive that won't allow the traveling public to safely utilize two lanes of the roadway. All work within Milestone #1 shall be complete by 28 calendar days from roadway closure.
 - 2. Substantial Completion of work shall be complete and in operation by October 15, 2024 including site restoration and seeding.
 - 3. Final completion of all work contained in the contract documents including final site stabilization by December 15, 2024.
- C. OWNER recognizes the CONTRACTOR will require scheduled shutdowns in order to complete some necessary tasks. The OWNER will make a reasonable attempt to alter operational procedures, including temporary shutdowns, to allow for CONTRACTOR work. CONTRACTOR shall notify OWNER and ENGINEER of planned shutdowns in accordance with the Contract Documents.
- D. **In an attempt to prevent disruptions to the currently ongoing active construction project for the Phase IIB Expansion Fargo Wastewater Treatment Facility, City Project No. W1701 and the OWNER's CONTRACTOR for this project, PKG Contracting, Inc., the CONTRACTOR, through the OWNER's Resident Project Representative, shall provide a good faith effort to adequately communicate and coordinate intended plans, activities, work sequence, and schedule with ENGINEER, OWNER,**

and PKG Contracting, Inc. Disruptions and/or damages that result in any inadvertent change orders on the Phase IIB Expansion to the OWNER as a result of the CONTRACTOR's poor communication or coordination of plans, activities, work sequence, and schedule will be charged to the CONTRACTOR as liquidated damages.

1. Milestones for Phase IIB Expansion Fargo Wastewater Treatment Facility, City Project No. WW1701
 - a. Construction completion anticipated Summer 2025.

- E. **In an attempt to prevent disruptions to the adjacent active construction project for the Shared Use Path & Incidentals and the Shared Use Path & Incidentals Dakota Underground, the CONTRACTOR, through the OWNER's Resident Project Representative, shall provide a good faith effort to adequately communicate and coordinate intended plans, activities, work sequence, and schedule with ENGINEER, OWNER, and Dakota Underground. Disruptions and/or damages that result in any inadvertent change orders on the Shared Use Path & Incidentals Project to the OWNER as a result of the CONTRACTOR's poor communication or coordination of plans, activities, work sequence, and schedule will be charged to the CONTRACTOR as liquidated damages.**

1. Milestones for Shared Use Path & Incidentals, City Project No. SN-23-A1
 - a. Anticipated Start: Spring 2024
 - b. Substantial Completion Date: October 11, 2024
 - 1) Final Completion Date: November 1, 2024

- F. **In an attempt to prevent disruptions to the currently ongoing active construction project for the NDSP Effluent Reuse Facility (ERF) Improvements, AE2S Project No. P05024-2022-001 and the OWNER's CONTRACTOR for this project, PKG Contracting, Inc., the CONTRACTOR, through the OWNER's Resident Project Representative, shall provide a good faith effort to adequately communicate and coordinate intended plans, activities, work sequence, and schedule with ENGINEER, OWNER, and PKG Contracting, Inc. Disruptions and/or damages that result in any inadvertent change orders on the NDSP ERF Improvements to the OWNER as a result of the CONTRACTOR's poor communication or coordination of plans, activities, work sequence, and schedule will be charged to the CONTRACTOR as liquidated damages.**

1. Milestones for NDSP Effluent Reuse Facility (ERF) Improvements, AE2S Project No. P05024-2022-001
 - a. Construction Substantial Completion anticipated June 1, 2024.
 - b. Construction Final Completion anticipated June 1, 2025.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 14 00
WORK RESTRICTIONS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
1. CONTRACTORs Use of Site and Premises.
 2. OWNER Occupancy Requirements.
 3. Access to Streets and Highways.
 4. Special Work Requests.

1.02 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit use of Site and premises to allow:
1. OWNER occupancy and maintenance.
 2. Work by Others.
 3. Construction of Phase IIB Expansion Fargo Wastewater Treatment Facility, City Project No. W1701.
 4. Construction of Shared Use Path & Incidentals, City Project No. SN-23-A1.
 5. Construction of NDSP Effluent Reuse Facility (ERF) Improvements, AE2S Project No. P05024-2022-001.
- B. Coordinate performance of all Work with OWNER operations.
- C. Coordinate use of premises under direction of OWNER. CONTRACTOR shall confine construction equipment, storage of materials and equipment and operations of workmen to areas permitted by law, ordinances, permits, or requirements of Contract Documents, and shall not unreasonably encumber premises with construction equipment or other materials or equipment.
- D. Assume full responsibility for the protection and safekeeping of products under this Contract, stored on the site.
- E. Move any stored products, under CONTRACTOR's control, which interfere with operations of the OWNER.
- F. Construction personnel may park only in areas designated by the OWNER.
- G. Obtain and pay for use of storage or work areas needed for operations.
- H. CONTRACTOR shall notify and coordinate with Police Department, Fire Department, and Hospital/Ambulance Services. Notice shall include work schedule as construction proceeds, when work affects or obstructs intersections and streets, and when work is completed, or suitable access is available in streets and intersections.
- I. CONTRACTOR shall provide the name, address, and telephone number of person who has access to equipment and is authorized to make emergency repairs to CONTRACTOR's work, such as to correct trench cave-ins, move

excavated material, and correct other problems during weekends and off-work hours, so access can be maintained for firefighting equipment, and to maintain barricades for public safety.

- J. The CONTRACTOR must be satisfied through personal examination of the Site(s) as to all local conditions affecting their performance of the Contract. The CONTRACTOR is deemed to accept such conditions as found to exist.
- K. The CONTRACTOR shall preserve all monuments, benchmarks, reference points, and stakes. In case of destruction thereof, the CONTRACTOR will be charged with expense of replacement and shall be responsible for any mistake or loss of time that may be caused. Permanent monuments or benchmarks which must be removed or disturbed shall be protected until properly referenced for relocation. The CONTRACTOR shall furnish materials and assistance for the proper replacement of such monuments or benchmarks.
- L. Damaged Property:
 - 1. Patch and or clean existing improvements and restore damage of property on, or adjacent to the Site(s) occasioned by the Work, including but not limited to, lawns, walks, driveways, roadways, curbs, pavements, structures, drainage courses, swales/ditches, and utilities which are cut or damaged by operations and are not designated for removal, relocation, or replacement in the course of construction.
 - 2. If any direct or indirect damage is done to public or private property resulting from any act, omission, neglect, or misconduct, the CONTRACTOR shall restore the damaged property to a condition equal to or better than that existing before the damage at no additional cost to the OWNER. Repair, rebuild, or restore property as directed or make good such damage in an acceptable manner.
 - 3. Provide written acceptance of restoration by authority or OWNER.
- M. Existing Facilities:
 - 1. The CONTRACTOR shall take all necessary field measurements affecting all existing construction, drainage, wiring, piping, and equipment in this Contract and shall be solely responsible for proper fit between all Work under the Contract and existing structures, piping, and equipment.
 - 2. Dimensions given on the drawings related to existing structures are based upon existing construction record drawings and it shall be the responsibility of the CONTRACTOR to verify the accuracy of all dimensions shown for existing structures, piping, and equipment. Any discrepancies shall be brought to the attention of the ENGINEER prior to the start of new construction or ordering of any materials.
CONTRACTOR shall be responsible for any materials ordered that will not fit due to the failure to verify any discrepancies of existing structures, piping, and equipment prior to the start of new construction.
- N. Existing Utilities:
 - 1. Existing underground utilities, as shown on the drawings, are located in accordance with available data but locations shall be determined by the CONTRACTOR prior to beginning construction. A utility locate is required prior to any excavation.

2. CONTRACTOR shall protect all existing utilities and provide temporary removal and replacement or relocation as required for completion of the Work in the contract documents. No additional payment shall be made for this work.
 3. Existing utilities not shown on the drawings and requiring relocation shall be exposed by the CONTRACTOR without damage. If damaged, the CONTRACTOR shall bear the responsibility and cost of repair or replacement.
- O. Environmental Resources:
1. Protect environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire period of this Contract. Confine activities to areas defined by the contract documents.
 2. Prior to construction, identify all land resources to be preserved within the work area. Do not remove, cut, deface, injure, or destroy land resources including trees, shrubs, vines, grasses, topsoil, and land forms without permission from the OWNER. Do not fasten or attach ropes, cables, or guys to trees for anchorage unless specifically authorized, or where special emergency use is permitted.
 3. Protect trees, shrubs, vines, grasses, land forms, and other landscape features shown on the drawings to be preserved by marking, fencing, or using other approved techniques.
 4. The erosion and sediment controls selected and maintained by the CONTRACTOR shall be such that water quality standards are not violated as a result of the CONTRACTOR's activities. Maintain temporary erosion and sediment control measures such as fencing, berms, dikes, drains, sedimentation basins, grassing, and mulching, until permanent drainage and erosion control facilities are completed and operative.
 5. See Section 01 57 00 for additional requirements.

1.03 OWNER OCCUPANCY REQUIREMENTS

- A. Cleanliness is crucial and the CONTRACTOR shall maintain a clean and orderly site at all times.
- B. Cooperate with OWNER to minimize conflict and to facilitate OWNER's operations. Schedule all Work to accommodate this requirement. No interruption will be permitted which adversely affects the degree of service the OWNER provides. CONTRACTOR shall provide temporary facilities and make temporary modifications as necessary to keep the facilities in operation during the construction period.
- C. Pre-plan, schedule, coordinate, and stage for required materials, manpower, CONTRACTORS, SUBCONTRACTORS, etc. to complete critical elements of Work.
- D. Existing materials and equipment removed and not reused as part of the Work, and not identified elsewhere in the contract documents for salvage, shall be properly disposed of by the CONTRACTOR at no additional cost to OWNER.

1.04 ACCESS TO STREETS AND HIGHWAYS

- A. Maintain suitable means of access for property OWNERS abutting streets and highways and access roads involved in construction, except as specifically permitted otherwise by OWNER.
- B. Whenever construction is stopped due to inclement weather, weekends, holidays, or other reasons, suitable access shall be provided for all property OWNERS.
- C. Maintain access for firefighting equipment and access to fire hydrants.
- D. Maintain two-way traffic at all times during construction on all impacted streets and highways.

1.05 SPECIAL WORK REQUEST

- A. Saturday and Sunday work is allowed for the purposes of clean-up work only by the CONTRACTOR without prior written approval from the ENGINEER or OWNER. Work shall not start on Saturday or Sunday before 9:00 AM.
- B. If the CONTRACTOR plans to conduct work other than clean-up work, the CONTRACTOR shall submit a Special Work Request to the ENGINEER and OWNER for written approval. OWNER shall provide the CONTRACTOR with the appropriate form. All requests shall be made at least two (2) weeks in advance of scheduled work.
- C. Special Work Request restrictions shall apply for North Dakota state observed holidays. CONTRACTOR shall submit a Special Work Request if work is scheduled for these dates.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 22 00
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Measurement and payment criteria applicable to unit price Work.
2. Defect assessment and non-payment for rejected Work.

B. Related Sections:

1. Section 00 41 00 – Bid Form.
2. Section 00 52 00 – Agreement.
3. Section 00 72 00 – General Conditions.
4. Section 00 73 00 – Supplementary Conditions.
5. Section 01 10 00 – Summary of Work.
6. Section 01 23 00 – Contract Considerations and Alternates.
7. Section 01 26 00 – Contract Modification Procedures.
8. Section 01 29 00 – Progress Payment Procedures.
9. Section 01 31 13 – Project Coordination.
10. Section 01 33 00 – Submittal Procedures.
11. Section 01 77 00 – Closeout Procedures.

1.02 AUTHORITY

- A. The ENGINEER and OWNER will make final determinations regarding the completeness of Work, and subsequent payment of such Work.
- B. The ENGINEER and OWNER will take all measurements and compute quantities accordingly.
- C. CONTRACTOR shall assist by providing necessary measurements, supporting data, and field data as required.

1.03 BID ITEMS

- A. Quantities indicated in the Bid Form are for Bidding and contract purposes only. Quantities and measurements supplied or placed in the Work and verified by the ENGINEER shall determine payment.
- B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit prices contracted.
- C. No other items of Work required by the Drawings or Specifications shall be measured or paid for separately but shall be included as part of the listed item to which the Work pertains. Failure to list all such related Work in the following descriptions of items shall not invalidate this stipulation nor relieve the CONTRACTOR from his obligation for such Work.

1.04 PAYMENT

- A. Payment Includes: Full compensation for all required mobilization, bonding, insurance, labor, skill, products, tools, equipment, transportation, services, incidentals, erection, application, and installation of the Work; submittal of shop drawings, product data and operation and maintenance data or manuals, record data, start-up and system demonstration, where required; warranties, overhead and profit.
- B. All items shall include traffic control, protection of the public, flag persons, construction signs, fences, barricades, transportation and disposal of excavated material, erosion control and stormwater pollution prevention, and cleaning, repair, and maintenance of haul routes.
- C. Final payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities accepted by the ENGINEER multiplied by the unit price for Work which is incorporated in or made necessary by the Work.

1.05 DEFECT ASSESSMENT

- A. Replace the Work or portions of the Work not conforming to specified requirements.
- B. If, in the opinion of the ENGINEER, it is not practical to remove and replace the Work, the ENGINEER will direct one of the following remedies:
 - 1. The defective Work may remain, but the price will be adjusted to a new price at the discretion of the ENGINEER and OWNER.
 - 2. The defective Work will be partially repaired to the satisfaction of the ENGINEER and OWNER, and the price will be adjusted at the discretion of the ENGINEER and OWNER.
- C. The authority of the ENGINEER and OWNER to assess the defect and determine payment adjustment is final.

1.06 NON-PAYMENT FOR REJECTED PRODUCTS

- A. Payment will not be made for any of the following:
 - 1. Products wasted or disposed of in a manner that is not acceptable.
 - 2. Products determined as unacceptable before or after placement.
 - 3. Products not completely unloaded from the transporting vehicle.
 - 4. Products placed beyond the lines and levels of the required Work.
 - 5. Products remaining on hand after completion of the Work.
 - 6. Loading, hauling, and disposing of rejected Products.

1.07 CHANGES IN PLAN QUALITY

- A. Plan quantities are based on assumed existing conditions and/or as stated in payment sections or notes. An increase or decrease from the number of units shown in the Bid Form shall not cause a change in the unit price except as allowed by the General Conditions.

1.08 DESCRIPTION OF UNIT PRICES FOR CONTRACT NO. 1:

- A. Mobilization, Bonding and Insurance, lump sum (l.s.):

1. Consists of all Work and operations, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to and from the Project Site; for the establishment and subsequent removal of all offices and storage facilities, CONTRACTOR's buildings, and other facilities necessary for Work on the Project; and for licenses, fees, permits, and for all other Work and operations which must be performed, or costs incurred, prior to beginning and after completion of Work on the various items on the Project Site. Item shall also include the cost of all bonding and insurance for all the work included in the Contract.
 2. When partial payments are made on the Contract, payment for mobilization will be made according to the following schedule:
 - a. When 5 percent of the original Contract amount is earned, 25 percent of the amount bid for mobilization, bonding, and insurance or 1-½ percent of the original Contract amount, whichever is less, will be paid.
 - b. When 10 percent of the original Contract amount is earned, 50 percent of the amount bid for mobilization, bonding, and insurance or 5 percent of the original Contract amount, whichever is less, will be paid.
 - c. When 65 percent of the original Contract amount is earned, 90 percent of the amount bid for mobilization, bonding, and insurance or 9 percent of the original Contract amount, whichever is less, will be paid.
 - d. When 80 percent of the original Contract amount is earned, 100 percent of the amount bid for mobilization, bonding, and insurance or 10 percent of the original Contract amount, whichever is less, will be paid.
 3. Upon completion of all Work on the Project, payment of any amount bid for mobilization, bonding, and insurance in excess of 10 percent of the total Contract amount will be paid.
- B. Temporary Chain-Link Fence; lump sum (L.S.): Lump sum price includes all cost for installation and maintenance of temporary chain-link safety fence and gates (6' height) for laydown area shown on Drawings, complete and in-place including all locks, appurtenances, accessories along with removal and salvage. CONTRACTOR shall retain ownership of all salvaged fence and gate materials following construction. Measurement and payment will be per each gate installed.
- C. Remove Fence; linear foot (l.f.): Unit price includes all cost for removal of existing fencing and gates (all types). Measurement and payment will be from the center of the initial post to the center of the final post. Quantity shall not exceed the initial measurement prior to removal unless additional quantities are agreed to by the ENGINEER prior to the work being performed. Unit cost shall include replacement of any items damaged or rendered unusable during removal.
- D. Remove Pipe (All Size and Types); linear foot (l.f.): Pipe removal and disposal shall be paid for under the REMOVE PIPE bid item for the type of pipe being removed (be it sanitary sewer, watermain, storm sewer, gas, duct banks, etc.) at the contract unit price per linear foot, irrespective of the depth, pipe material, and/or size of the pipe, which shall include the cost of removing and disposing all pipe material, pipe bend sections, jointing material, restraints, stainless steel

stiffeners and all other appurtenances, and of flushing, handling, hauling, dewatering, trenching, sheeting, excavating and backfilling, plugging the ends of the remaining abandoned pipe, restoring the surface equal to or better than the original condition to the satisfaction of the ENGINEER (unless separate bid item is provided), necessary permits, and all material or work necessary to remove and dispose of the pipe.

- E. Remove Concrete Pavement (All Depths); square yard (s.y.): Unit price includes cost for full-depth removal and disposal of concrete pavement with no differentiation in payment based upon pavement width, thickness, and 6-inches of aggregate surface material to provide room for the new base material under the new concrete pavement.
- F. Remove Tree; each (ea.): Unit price includes all cost on a per tree basis, including removal of the stump and roots, for trees measuring 6 inches in diameter or greater at a point 4.5 feet off the ground. All costs for removal of any/all trees smaller than this shall be considered incidental to the Contract.
- G. Furnish & Install Ornamental Fence; linear foot (l.f.): Unit price includes all cost for furnishing and installation of ornamental fencing. Measurement and payment will be from the center of the initial post to the center of the final post. Quantity shall not exceed the initial units shown in the Bid Form without prior approval from the ENGINEER prior to the work being performed. Unit cost shall include connection to existing or adjacent fencing.
- H. Furnish & Install Chain-link; linear foot (l.f.): Unit price includes all cost for furnishing and installation of chain-link fencing. Measurement and payment will be from the center of the initial post to the center of the final post. Quantity shall not exceed the initial units shown in the Bid Form without prior approval from the ENGINEER prior to the work being performed. Unit cost shall include connection to existing or adjacent fencing.
- I. Encase Pipe with CLSM; cubic yard (c.y.): Unit price includes excavation to and around existing utility pipes within the levee inspection trench, removal of existing granular bedding and backfill material, and backfilling with CLSM as shown in Drawings and detail 3/C001.
- J. Raise Manhole Casting; Each (ea.) Lump price costs shall include all excavation, removal of existing cone, removal of existing adjust rings, salvaging existing casting, backfilling and grading, constructing, furnishing and installing the manhole risers and cone segments in place, and sealing the manhole joints and lift holes and installing salvaged manhole casting, including all sealant, wrap, or chimney seals as specified herein.
- K. F&I Water Main Pipe; linear foot (l.f.): Unit price includes all cost for furnishing, handling, laying, materials, restrained joint pipe, tracer wire, boxes, lugs and fittings associated with tracer wire, appurtenances, and associated pipe fittings not paid for separately, thrust blocking or reaction backing, special linings, concrete encasement, gravel, cleaning, hydrostatic testing and disinfection. The

cost of clearing, topsoil stripping, stockpiling and spreading, excavating, trenching, bedding, backfill, and surface restoration will be included in the unit bid price per linear foot of water main pipe installed by open cut and/or cost of installing pipe by trenchless methods including and entry or receiving pits.

1. Length will be measured along centerline of pipe with no deduction for fittings or valves. After completion of pipe installation and backfill, but prior to completion of hydrostatic pressure testing, payment for transmission main installation shall be paid a maximum of 75% of the contract bid price. Remaining 25% payment for installation of transmission main shall not be paid in full until pressure testing and all other work in this pay item has been completed. Only after meeting these requirements will the distribution main be paid for at 100% of the contract bid price. On CONTRACTOR's Pay Application separate line items shall be used to indicate the length of pipe installed and length of pipe that has successfully passed the hydrostatic pressure testing, cleaning and disinfection, and length of surface restoration associated with each pipe type and diameter listed on the bid form.
- L. Gate Valve; each (ea.): Unit price includes all cost for furnishing, handling, trenching, laying, setting, materials, valves, concrete base, trench adaptors; valve box, cover, and marker sign; operating wrenches, stainless-steel bolts, thrust blocks or reaction blocking, polyethylene plastic wrap, bedding and backfill. Payment will be made for various sizes listed in the Bid Form.
- M. Ductile Iron Fitting; each (ea.): Unit price includes all cost for installation of fittings, joint restraints, handling; trenching, shoring, laying, setting; materials complete with gaskets, glands and stainless-steel bolts, thrust blocks or reaction blocking, polyethylene plastic wrap, bedding and backfill. Payment will be made for the various sizes and fittings listed in the Bid Form.
- N. Connect to Existing Pipe; each (ea.): Unit price includes all cost for installation of piping, fittings and transitions couplers (unless separate pay item is provided), joint restraints, handling; laying, setting; materials; dewatering existing main; disinfection, and maintaining water service. Payment will be made for the various tie-ins listed in the Bid Form. Miscellaneous valves and piping required for filling or testing shall be incidental to this item. CONTRACTORS should note that if a gate valve or hydrant is indicated within a Detailed Tie-In, those are to be paid on an each basis in their own designated line item. They are not to be included in the detailed tie-in price.
- O. Gate Well; each (l.s.): The cost of furnishing and installing the gate well structures will be paid for on a lump sum bid per each structure. Costs shall include all work as shown on details in drawings including, but not limited to, excavation, dewatering, bedding, backfilling, constructing, furnishing and installing the cover, access hatches, ladders, vent pipes, catwalks and landings, casting in place concrete, reinforcing, connections to the existing pipe, water proofing, installing inverts and sealing the manhole or inlet connections, joints, and lift holes. Payment will be made for various sizes listed in the bid form. Sluice Gates will be paid under separate pay item.

- P. Sluice Gate; each (l.s.): The cost of furnishing and installing the sluice gates will be paid for on a lump sum bid per each gate size. The work to be done under this item shall include all labor, tools, materials, and equipment necessary to supply and install the sluice gates and adjust for proper operation and closure of sluice gates. Payment will be made for various sizes listed in the bid form.
- Q. Topsoil - Strip, Stockpile & Spread (Levee and Floodwall Area); cubic yard (c.y.): Unit price includes all costs for labor, tools, material, and equipment necessary for stripping, stockpiling, re-spreading and finishing topsoil required. An assumed thickness of 6-inches to 10-foot outside of levee/floodwall footprint each direction was used to calculate the quantity of topsoil stripping, stockpiling, and re-spreading, however, if more topsoil is present the entire thickness of topsoil shall be stripped. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed. No payment will be made for unauthorized work.
- R. Topsoil - Haul; cubic yard (c.y.): Unit price includes all costs for labor, tools, material, and equipment necessary for hauling and disposing of topsoil in CONTRACTOR furnished off-site disposal area. Payment will be made only for the actual quantity hauled and disposed of off-site as approved by the ENGINEER if existing on-site material is deemed unusable. Topsoil stripped and deemed unusable from the project site shall be hauled off-site and disposed of in a CONTRACTOR-furnished disposal site. No payment will be made for unauthorized work.
- S. Topsoil - Import; cubic yard (c.y.): Unit price includes all costs for labor, tools, material, and equipment necessary for hauling and importing topsoil required for project site (excludes lay-down site). Payment will be made only for the quantities imported as deemed necessary by the ENGINEER if existing on-site material is deemed unusable or is insufficient in quantity. No payment will be made for unauthorized work. Payment for placement shall be included in the bid item "Topsoil – Strip, Stockpile, and Spread (Levee and Floodwall Area)".
- T. Topsoil - Strip, Stockpile & Spread (Laydown site); cubic yard (c.y.): Unit price includes all costs for labor, tools, material, and equipment necessary for stripping, stockpiling, re-spreading and finishing topsoil required. An assumed thickness of 12-inches was used to calculate the quantity of topsoil stripping, stockpiling, and re-spreading, however, if more topsoil is present the entire thickness of topsoil shall be stripped. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed. No payment will be made for unauthorized work.
- U. Excavation – Levee Inspection Trench; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment, material stockpiling to laydown yard facilities for usable material, and supplies required to cut levee inspection trench. Payment for this item shall be based on the volumetric difference between the initial survey of subgrade following topsoil

stripping and the as-built survey of excavation/trench as determined by the ENGINEER. No payment will be made for unauthorized work or over-excavation that is deemed unnecessary by the ENGINEER.

- V. Excavation - Haul; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment necessary for hauling unusable excavation material from the Inspection Trench and disposing off-site in CONTRACTOR-furnished disposal area. Payment for this item shall be based on the in-place volume of unusable material stockpiled at disposal site as determined by the ENGINEER. No payment will be made for unauthorized work and this item will only be utilized as directed by the ENGINEER.
- W. Impervious Fill - Import from Offsite; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment, transportation, material hauling, storage facilities, and supplies required to cut existing material at the specified borrow site, and/or at the CONTRACTOR-furnished borrow site and to haul to the project site. Payment for this item shall be based on the volumetric difference between the initial survey of the off-site stockpile site(s) and as-built surveys after all cutting has been complete as determined by the ENGINEER. Payment for placement shall be included in the bid item "Levee Inspection Trench", "Embankment Levee", or "Embankment Floodwall". No payment will be made for unauthorized work and this item will only be utilized as directed by the ENGINEER.
- X. Impervious Fill - Import From Onsite Stockpiles; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment, transportation, material hauling, material handling, material sorting, material identifying, and supplies required to cut existing material at the stockpile locations shown on drawing G005 (North and South Stockpiles). Payment for this item shall be based on the volumetric difference between the initial survey of the on-site stockpile site(s) and as-built surveys after all cutting has been complete as determined by the ENGINEER. Payment for placement shall be included in the bid item "Levee Inspection Trench", "Embankment Levee", or "Embankment Floodwall". No payment will be made for unauthorized work and this item will only be utilized as directed by the ENGINEER.
- Y. Levee Inspection Trench; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment, and supplies required to place and compact suitable on-site or imported impervious material for the levee inspection trench. This item shall include any additional mixing of soil materials that may be required to make borrow/imported material workable and meet compaction requirements. Payment for this item shall be based on the volumetric difference between as-built survey of excavation/trench and the as-built survey of the final subgrade prior to levee embankment placement as determined by the ENGINEER. The calculated volumetric difference will be multiplied by 1.25 to account for material shrinkage from moisture conditioning and compaction. The CONTRACTOR will not be paid for backfilling of unauthorized over excavation as determined by the ENGINEER.

- Z. Embankment - Levee; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment, and supplies required to place and compact suitable on-site or imported impervious material for the levee embankment. This item shall include any additional mixing of soil materials that may be required to make borrow/imported material workable and meet compaction requirements. This item shall include any miscellaneous grading of any other earthwork not specified but required under the Contract Documents. Payment for this item shall be based on the volumetric difference between as-built survey of the final subgrade prior to levee embankment placement and as-built survey of levee embankment prior to topsoil placement as determined by the ENGINEER. The calculated volumetric difference will be multiplied by 1.25 to account for material shrinkage from moisture conditioning and compaction. No payment will be made for unauthorized work.
- AA. Subgrade Preparation – Levee; square yard (s.y.): Subgrade preparation will be paid for at the unit price bid per square yard for the area of the levee embankment subgrade outside of the levee inspection trench and corresponding quantity as defined on the plans. The unit price shall include all work for scarifying, over-excavation of soft material, recompacting, and fine grading per the project specifications. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed. No payment will be made for unauthorized work.
- BB. Embankment - Floodwall; cubic yard (c.y.): Unit cost shall be determined on a cubic yard basis for all supervision, labor, tools, equipment, and supplies required to place and compact suitable on-site or imported impervious material for the levee embankment. This item shall include any additional mixing of soil materials that may be required to make borrow/imported material workable and meet compaction requirements. This item shall include any miscellaneous grading of any other earthwork not specified but required under the Contract Documents. Payment for this item shall be based on the volumetric difference between as-built survey of the final subgrade prior to embankment placement and as-built survey of embankment prior to topsoil placement as determined by the ENGINEER. The calculated volumetric difference will be multiplied by 1.25 to account for material shrinkage from moisture conditioning and compaction. No payment will be made for unauthorized work.
- CC. Woven Geotextile Fabric; square yard (s.y.): Payment for the woven geotextile fabric will be made on a square yard basis for the area covered. No allowance will be made for overlaps, repairs, drainage trenches or cutoff trenches. Area covered shall be from 1 foot behind the drive to 1 foot up edge of aggregate base on each side of the pavement. Payment shall be considered full compensation for all labor, materials, equipment and other items necessary and incidental to completion of the work. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed.

- DD. Temporary Access Road for Laydown Yard; lump sum (l.s.): Payment shall be on a lump sum basis for temporary access road(s) deemed necessary by the CONTRACTOR to hauling between the levee and floodwall project site to the laydown area as shown on the plans. Cost shall be inclusive of all labor, tools, equipment and supplies for installation, maintenance, removal and clean up of the temporary access road including any aggregate surfacing, geotextile or geogrids deemed necessary by the CONTRACTOR for the access road. The CONTRACTOR is responsible determining the width, thickness and length of the access road(s) for their construction means and methods.
- EE. Subgrade Preparation – Pavement; square yard (s.y.): Subgrade preparation will be paid for at the unit price bid per square yard for the area of the gravel roadway subgrade and corresponding quantity as defined on the plans. The unit price shall include all work for scarifying, over-excavation of soft material, proof-roll, recompact, and fine grading per the project specifications. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed. No payment will be made for unauthorized work.
- FF. Aggregate Crushed Concrete – 12" Thick; square yard (s.y.): The pay area shall be the same as for subgrade preparation described above. Payment shall include full compensation for all base material placed within the pay limits and corresponding quantity as defined in the plans. Any additional base material required to ensure a stable base for paving equipment shall be at the CONTRACTOR's cost. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed.
- GG. Concrete Pavement - 10" Thick Reinforced; square yard (s.y.): Payment will be full compensation for the furnishing and installing the concrete, reinforcing, expansion joints including sealant where specified, form work, and all incidental labor, material, and equipment necessary to construct the concrete pavement in accordance with these Specifications. Payment will be made only for the plan quantities shown on the bid form unless additional quantities are agreed to by the ENGINEER prior to the work being performed.
- HH. Sheet Pile; square foot (s.f.): Sheet Pile shall be paid by the installed square feet. Payment for bid items shall include all equipment, material, shipping, tools, consumables, labor, layout, field testing to install the sheet pile walls to the minimum indicated pile tip elevation. Lengths beyond the minimum pile tip elevation are incidental.
1. Trimming and cut-off at upper elevation of the sheet pile is not included.
- II. Sheet Pile Fabricated Transitions (greater than 10 degrees); each (l.f.): Payment for bid items shall include all fabrication, shipping, equipment, material, tools, consumables, labor, layout, field testing to install the sheet pile transition pieces to the minimum indicated pile tip elevation. Lengths beyond the minimum pile tip elevation are incidental.

- JJ. Tank Wall Vertical Extension; linear foot (l.f.): Tank wall extension shall be paid by the installed linear foot. Payment shall include existing surface preparation, waterstop, formwork, dowels and anchorage of dowels, reinforcing, installation of embedded items, concrete materials and placement, curing, form stripping, and preparation for subsequent construction.
1. See detail 6/S501.
- KK. Fence Brackets; each (ea.): Payment shall include fabrication, shipping, layout, field anchorage materials, and installation of hot rolled steel angle shape fence brackets and final adjustment.
1. See details 7/S501 through 10/S501.
- LL. Fence – Decorative; linear foot (l.f.): Payment shall be paid by the installed linear foot. Payment shall include fencing product, base plate, base plate anchor bolts, fence post clips, field cutting and field trimming, and final adjustment.
- MM. Fence – Decorative, curved; linear foot (l.f.): Payment shall be paid by the installed linear foot. Payment shall include curved fencing product, base plate, base plate anchor bolts, fence post clips, field cutting and field trimming, and final adjustment.
- NN. Tank Tie-In Concrete Pier, Decorative; each (ea.): Payment shall include preparation, formwork, reinforcing, installation of embedded items, concrete materials and placement, curing, form stripping, and preparation for subsequent construction.
- OO. Cladding Ledger – Sheet Pile; linear foot (l.f.): Steel ledger angle at sheet pile wall shall be paid by the installed linear foot. Payment shall include fabrication, finishes, field welding, field finishes, and field preparation, adjustment alignment for subsequent construction.
- PP. Cladding Ledger, rolled at tank; linear foot (l.f.): Rolled steel ledger angle at tank wall extension shall be paid by the installed liner foot. Payment shall include fabrication, finishes, field welding, field finishes, and field preparation, adjustment alignment for subsequent construction.
- QQ. Masonry Cladding at Sheet Pile; square foot (s.f.): Payment for masonry cladding shall be paid by the installed square foot. Payment for bid item shall include all materials and labor for a complete masonry assembly including masonry units, cast stone trim units, veneer anchors, drainage cavity net, weeps, joint sealants, expansion joint materials, testing, cleaning, and field adjustment for subsequent construction.
- RR. Masonry Cladding at Tank, curved; square foot (s.f.): Payment for masonry cladding shall be paid by the installed square foot. Payment for bid item shall include all materials and labor for a complete masonry assembly including masonry units, cast stone trim units, veneer anchors, drainage cavity net, weeps, joint sealants, expansion joint materials, testing, cleaning, and field adjustment for subsequent construction.

- SS. Sheet Pile Cap Steel; linear foot (l.f.): Payment for sheet pile cap steel shall be paid by the installed linear foot. Payment shall include all labor and material to fabricate and install the sheet pile cap steel, including field attachment, testing, cleaning, and adjustment.
1. See detail 2/S501.
- TT. Stone Cap; linear foot (l.f.): Payment for cast stone wall cap shall be paid by the installed linear foot. Payment shall include all labor and material to fabricate and install the cast stone cap, including anchors, joint sealants, testing, cleaning, and adjustment.
- UU. Stone Cap transition pieces; each (ea.): Payment shall include all labor and material to fabricate and install the cast stone cap transition pieces, including anchors, joint sealants, testing, cleaning, and adjustment.
- VV. Sheet Pile Painting; square foot of contact area (s.f.c.a.): Payment for field painting of the sheet pile wall shall be paid by the installed square foot of contact area. Payment shall include all labor and materials for surface preparation, protection, application of all primer and topcoat(s), touch-up painting, and clean-up of the entire sheet pile wall and installed steel fabrications. Payment is for the entire surface contact area (s.f.c.a.) within the installed square foot area. All adjustments to include the s.f.c.a. are incidental.
- WW. Sheet Pile Dry Side Rock Mulch and Edging Strip; cubic yard (c.y.): Payment for the placement of rock mulch and edging shall be paid by the installed cubic yard. Payment shall include all labor, equipment, tools, and incidentals necessary for placement.
- XX. Utility Crossing Walers; each (ea.): Payment shall include all material, labor and equipment required to fabricate and install each horizontal waler at utility crossings through the sheet pile wall, including the CLSM encasement, trimming of bottom elevation of the sheet pile, and incidentals.
1. See detail 2/S301.
- YY. Sheet Pile trimming; hours (hr.): Payment shall include all labor, tools, and incidentals necessary for trimming the top of the sheet pile walls to the final elevation.
- ZZ. Pile Driver Set Up and Mobilization; each (ea.): Payment shall include labor site set up / mobilization for pile driver.
- AAA. Stormwater Management; lump sum (l.s.): Stormwater Management shall include all labor, materials, equipment, and administrative effort required to comply with the NDPDES permit requirements, including obtaining the permit, documentation, reporting, preparation of the Storm Water Pollution Prevention Plan, NOI, NOT, and implementing of any erosion and sedimentation controls not specifically identified on the plans, but required for permit compliance.
- BBB. Sediment Control Log; linear foot (l.f.): Rolls shall be paid per linear foot. Payment for bid items shall include all equipment, material, labor necessary for

installation, inspection, maintenance and removal. Payment for installation shall be paid at a maximum of 75% of the contract unit bid price. Remaining 25% payment shall not be paid in full until the device has been removed.

- CCC. Inlet Protection – Existing Inlet; each (ea.): Inlet protection will be paid by the number of inlets protected. Existing inlets on the project site or along a haul route located on or off the project site will be paid for as “Inlet Protection – Existing Inlet”. Inlet Protection will only be paid for once for each inlet protected, regardless of whether multiple types of devices are used on an inlet over the course of the project. Payment for bid item shall include all equipment, material, labor necessary for installation, inspection, maintenance and removal. Payment for installation shall be paid at a maximum of 75% of the contract unit bid price. Remaining 25% payment shall not be paid in full until the device has been removed.
- DDD. Silt Fence – Standard; linear foot (l.f.): Silt Fence shall be paid per linear foot. Payment for bid items shall include all equipment, material, labor necessary for installation, inspection, maintenance and removal. Payment for installation shall be paid at a maximum of 75% of the contract unit bid price. Remaining 25% payment shall not be paid in full until the device has been removed.
- EEE. Temporary Construction Entrance; each (ea.): Temporary Construction Entrance shall be paid at the contract unit price per each and shall include full compensation for constructing temporary construction entrance, complete in place, including excavation, fabric and backfill, as shown on the plans, and as directed by the ENGINEER. Cleanup, repair, removal, disposal, or replacement due to improper installation or the CONTRACTOR's negligence shall be considered incidental to this item. Payment for installation shall be paid at a maximum of 75% of the contract unit bid price. Remaining 25% payment shall not be paid in full until the device has been removed.
- FFF. Concrete Washout Area; each (ea.): Concrete washout area shall be paid at the contract unit price per each and shall include full compensation for constructing temporary washout area, complete in place, including installation, maintenance, clean-up, and removal. Cleanup, repair, removal, disposal, or replacement due to improper installation or the CONTRACTOR's negligence shall be considered incidental. Payment for installation shall be paid at a maximum of 75% of the contract unit bid price. Remaining 25% payment shall not be paid in full until the device has been removed.
- GGG. Mulching - Type 1 - Hydro; square yard (s.y.): Hydro mulching shall be paid on a per square yard basis. Payment shall include all labor, equipment, tools, and incidentals required to place the mulch.
- HHH. Mulching - Type 2 - straw; square yard (s.y.): Straw mulching shall be paid on a per square yard basis. Payment shall include all labor, equipment, tools, and incidentals required to place the mulch.

- III. Erosion Control Blanket; square yard (s.y.): Erosion Control Blankets (Type 1, 2, and 3) shall be paid per square yard. Payment for bid items shall include full compensation for all equipment, material, labor necessary for installation, inspection, and maintenance.
- JJJ. Seeding; square yard (sy.) or acre (ac.): Unit price for the type indicated on the bid form (Type A, B, or Cover Crop) includes all cost for materials; labor; preparation; finish grading; seed; seeding operations; fertilizer and fertilizer application; herbicide and herbicide application; planting; maintenance operations; watering; and incidentals for reestablishing grass areas disturbed by construction activity. Payment will be made for various types listed on the bid plans.
- KKK. Traffic Control - Major; lump sum (l.s.): This bid item shall be a lump sum bid item and shall include all signing for traffic and pedestrian control (including detour routes), barricades, channelizing devices, temporary striping, changeable message boards, flagmen, etc. This item shall include installation, maintenance, clean-up, and removal. Cleanup, repair, removal, disposal, or replacement due to improper installation or the CONTRACTOR's negligence shall be considered incidental. Payment for installation shall be paid at a maximum of 75% of the contract unit bid price. Remaining 25% payment shall not be paid in full until the traffic control has been removed.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 25 00
SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes how products are referenced.
- B. This section defines the procedures for proposing substitute items by "Approved Equivalent" and "Or Substitution" manufacturers not listed in the specifications.
- C. Acceptance of "Approved Equivalent" manufacturers will be done by addendum to the bidding documents prior to bid date and time.
- D. Acceptance of "Or Substitution" manufacturers will be done by change order after execution of the Agreement.

1.02 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 0 – Contracting and Procurement Requirements
- C. Section 01 33 00 – Submittal Procedures

1.03 GENERAL REQUIREMENTS

- A. The Contract is based on standards of quality established in these Contract Documents:
 - 1. In agreeing to terms and conditions of Contract, CONTRACTOR has accepted a responsibility to verify that specified products are available and to place orders for all required materials in such a timely manner as is needed to meet construction schedule.
 - 2. Neither OWNER nor ENGINEER agrees to substitution of materials or products called for in Contract Documents, except as they may be specifically allowed as stated otherwise in writing.
- B. The Contract Documents may reference product options by the following five methods:
 - 1. Products Specified by Reference to Standards or by Description Only
 - 2. "Named" products
 - 3. "Equal" products
 - 4. "Approved Equivalent" products
 - 5. "Substitution" products
- C. Regardless of how products are referenced, CONTRACTOR must submit information in accordance with Section 01 33 00 demonstrating the proposed product or system meets or exceeds the requirements of the Contract

Documents.

1.04 PRODUCT OPTIONS

- A. Products Specified by Reference to Standards or by Description Only.
 - 1. Refers to any product specified by reference to standard specification or standard such as ASTM, AWWA, or similar standards, or by description without the naming of an acceptable manufacturer.
 - 2. Any product that meets the referenced or specified standard and/or description may be submitted for ENGINEERs consideration of use in the work.
 - 3. These products must be identified and submitted as an "Approved Equivalent" under the provisions of Section 01 33 00 and Section 00 73 00 Article SC-7.04.
- B. "Named" Products.
 - 1. Refers to products or systems specified by specifically naming one or more manufacturer and may be done so with or without inclusion of a model number.
 - 2. Named manufacturer(s) reflects standard of quality and/or the basis of design for the product or system.
 - 3. Where materials, products and/or systems are specified by specifically naming one or more manufacturer, without stating that an "Equal", or "Approved Equivalent" will be considered, only the "Named" material, product and/or system may be used in the Work.
 - 4. Being "Named" does not relieve CONTRACTOR, supplier or manufacturer of the responsibility to meet all of the Contract Document requirements.
- C. "Equal" Products
 - 1. Where "Named" products or systems are followed by the words: "Equal"; or "Or Equal"; CONTRACTOR shall submit on each product that is not "Named" that CONTRACTOR proposes to incorporate into the work under the provisions of Section 00 73 00 Article SC-7.04 as an "Approved Equivalent".
 - 2. "Equal" products must meet or exceed the standard of quality established by reference to the "Named" product, must conform to all referenced standards and specifications and meet all of the Contract Document requirements.
 - 3. "Equal" products are not considered "Substitutions" and are subject to the review provision of Section 01 33 00.
 - 4. "Equal" or "Or Equal" products will only be considered by ENGINEER under the provisions of Section 00 73 00 Article SC-7.04.
- D. "Approved Equivalent" Products
 - 1. "Approved Equivalent" refers to any product or system that is not specifically "Named" or submitted as a "Substitution".
 - 2. Products or systems that are allowable as an "Approved Equivalent" to "Named" products will be considered only if the "Named" product is followed by the words "Approved Equivalent".

3. Where the phrase "Approved Equivalent" occurs in Contract Documents, do not assume that materials, equipment or products will be accepted as a Substitution.
4. Materials, products and/or systems that are allowable as an "Approved Equivalent" will only be considered by ENGINEER under the provisions of Section 01 33 00 and Section 00 73 00 Article SC-7.04.

E. "Substitution" Products

1. "Substitutions" refer to any material, product or system that has not been included with the "Named" manufactures within an individual Specification, and no provision of a Referenced Standard and/or allowance of an "Equal" or "Approved Equivalent" is included.
2. Substitutions to "Named" materials, products and/or systems will be considered only if the Named product through no fault of the CONTRACTOR becomes unavailable after signing of the agreement.
3. Where the phrase "Or Substitution" occurs in Contract Documents, do not assume that materials, equipment or products will be accepted as a Substitution. CONTRACTORS bid price shall be based upon the named manufacturers, not a Substitution.
4. Substitutions will only be considered by ENGINEER after the effective date of the OWNER-CONTRACTOR Agreement upon written request for Substitution in accordance with this Section and the Agreement terms.

1.05 QUALIFICATIONS PACKAGE FOR NON-LISTED "APPROVED EQUIVALENT" PRODUCT CONSIDERATION

- A. Bidders shall submit a qualification package at least ten (10) days prior to the date of receipt of bids for each proposed "Approved Equivalent" manufacturer not already listed as an acceptable or approved "manufacturer" in the specifications, which the Bidder proposes to furnish. Each qualification package shall be bound with protective cover, identified by specification section number and title, and the product manufacturer's name. The Bidder shall submit all qualification packages in a sealed, sturdy box or suitable container.
- B. Qualification packages for non-listed "Approved Equivalent" items shall include the following: (if an item does not apply, indicate so in the submittal):
 1. Completed Substitution Request Form. A copy of which can be found attached to the end of this section.
 2. A complete set of drawings, specifications, catalog cut-sheets, and detailed descriptive material. This information shall identify all technical and performance requirements stipulated on each drawing and in each specification section. Include all items required for shop drawing review.
 3. Provide marked-up product information showing side-by-side comparisons for both the specified products and proposed products
 4. Detailed information for all buy-out items such as hardware, motors, bearings, reducers, belts, sheaves, motor controllers and instrumentation.
 5. Lists showing materials of construction of all components, including all buy-out items.
 6. Manufacturer's recommended spare parts, including all buy-out items.
 7. Information on equipment field erection requirements including total weight of assembled components and weight of each sub-assembly.

8. A maintenance schedule showing the required maintenance, frequency of maintenance, lubricants and other items required at each regular preventative maintenance period, including all buy-out items.
 9. Electrical requirements and schematic diagrams.
 10. Detailed written documentation with discussion of all deviations of equipment, including buy-out items, from the Contract Documents.
 11. A list of all process, mechanical, electrical, and structural changes and requirements for incorporating the "Approved Equivalent" into the project.
 12. A listing of the manufacturer's history. Unless specified otherwise in applicable specification sections, manufacturer's history is to demonstrate a minimum of three (3) years' experience and a minimum of three (3) successful installations of the size and complexity involved in this project. Provide a complete installation list with contact names and telephone numbers.
 13. Documentation easily identifying that the proposed substitution meets or exceeds the specified warranties
- C. Failure to furnish the preceding information at least ten (10) days prior to the date of receipt of bids shall be cause for rejection of a proposed alternate item for use on this project.
- D. No "Approved Equivalent" items will be considered unless, in the opinion of the ENGINEER, they conform to the Contract Documents in all respects, except for make and manufacturer and minor details.
- E. The ENGINEER shall be the sole authority for determining conformance of a proposed "Approved Equivalent" item with the Contract Documents. Except for identification of non-compliance with the specifications, the ENGINEER will not be required to prove that an "Approved Equivalent" item is not equal to "Basis of Bid" items.
- F. Substitutions or modifications to the qualification package will not be considered after opening of Bids.
- G. Acceptance of "Approved Equivalent" items and their qualification packages, does not eliminate the need for shop drawing submittals and reviews during construction, nor does it eliminate the requirement that the seller satisfy the requirements of the Contract Documents.

1.06 BID REQUIREMENTS

- A. Bidders proposing to furnish "Approved Equivalent" items that require changes to the Contract Documents shall notify the ENGINEER in writing of all process, mechanical, electrical and structural changes and requirements for incorporating the "Approved Equivalent" into the Project and shall reimburse the OWNER for all associated redesign costs. Redesign and contract drawing revisions to accommodate the "Approved Equivalent" will be prepared by the ENGINEER during the shop drawing review process. Reimbursement shall be based on the current standard hourly rates of the persons providing the service plus reimbursable expenses at cost.

1.07 SUBSTITUTIONS

- A. ENGINEER will consider requests for Substitutions only within 30 days after date of the Agreement.
- B. Requests for Substitution will only be considered when submitted through CONTRACTOR.
- C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submissions, without having received prior approval of the substitution request in accordance with these Contract Documents.
- D. Substitutions may be considered when a Material, Product or System becomes unavailable through no fault of CONTRACTOR:
 - 1. Should the CONTRACTOR demonstrate to satisfaction of ENGINEER that specified material, product or system was ordered in a timely manner and will not be available in time for incorporation into this Work, CONTRACTOR shall submit to ENGINEER such data on proposed substitute materials, products and/or systems as are needed to help ENGINEER determine suitability of proposed Substitution.
- E. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- F. A request constitutes a representation that CONTRACTOR:
 - 1. Investigated proposed material, product and/or system and determined that it meets or exceeds quality level of specified product and that it will perform and function as required.
 - 2. Will provide same warranty for Substitution as for specified Material, Product and/or System.
 - 3. Will provide a complete operating installation including any and all changes and additions in structure, piping, building, mechanical and electrical work, controls and accessories necessary to accommodate proposed Substitution.

1.08 PROCEDURE FOR REQUESTING SUBSTITUTION

- A. Submit three copies of request for substitution for consideration in a manner similar to provisions for submission requirements under Section 01 33 00:
 - 1. Substitutions will be considered as "deviations" to the Contract Documents.
 - 2. Submit with transmittal letter describing the deviation and justifications for accepting Substitution.
 - 3. Submit documentation including name of vendor, supplier and/or manufacturer contacted; date and time of contact; as well as method of contact used that clearly demonstrates CONTRACTOR attempt to secure material, product and/or system required by the Contract Documents.
 - 4. Submit shop drawings, product data, and certified test results attesting to proposed substitution equivalence.
 - 5. Burden of proof is on the proposer.
 - 6. Additional information and documentation beyond what is specifically identified in the Contract Documents may be required as ENGINEER and/or OWNER deem necessary in review of each Substitution.

- B. Limit each request to one proposed Substitution.
- C. Transmittal Contents:
 - 1. Identification of proposed Substitution:
 - a. Manufacturer's name.
 - b. Telephone number and representative contact name.
 - c. Specification section or drawing reference of originally specified product including discrete name or tag number.
 - 2. Manufacturer's literature clearly marked to show compliance of proposed Substitution with Contract Documents
 - 3. Itemized comparison of original product and proposed Substitution addressing characteristics including but not necessarily limited to:
 - a. Size
 - b. Composition
 - c. Weight
 - d. Electrical or mechanical requirements.
 - e. Installation and maintenance requirements.
 - 4. Product experience:
 - a. Location of at least five previous projects and the date that each installation was completed, commissioned and accepted by OWNER utilizing product in similar situation per Contract Documents.
 - b. Name and telephone number of persons knowledgeable of proposed product associated with referenced projects.
 - c. Field data and test reports associated with proposed product and installations that demonstrate the ability of the system to meet or exceed the specified requirements.
 - d. Identify any changes to construction schedule or cost required to implement proposed substitution.
 - 5. Samples:
 - a. Provide in similar manner under provisions of Section 01 33 00, individual specifications where the requested substitution product is specified, and as requested by ENGINEER.
 - b. Provide full size sample if requested by ENGINEER.
 - c. Samples will be retained by ENGINEER until substantial completion.
 - d. ENGINEER is not responsible for loss or damage to samples.

1.09 ACCEPTANCE OR REJECTION

- A. ENGINEER will notify CONTRACTOR in writing of decision to accept or reject request for Substitution:
 - 1. Decision of ENGINEER is final.
 - 2. ENGINEER will affix stamp and indicate acceptance or rejection of Substitution in writing.
- B. ENGINEER reserves the right to require proposed Substitution to comply with all aspects of specified product to secure design intent.
- C. If request for Substitution results in change of Contract Amount or Contract Time, adjustments will be applied under provisions in General Conditions.

D. Substitutions will be rejected if:

1. Submission is not through CONTRACTOR with CONTRACTOR stamp of approval.
2. Requests for Substitution are not made in accordance with submission procedures outlined herein.
3. Acceptance will require substantial revision of the original design as determined by ENGINEER.
4. Substitution is not equal to original product specified or will not adequately perform intended function as determined by ENGINEER.

1.10 DELAYS

- A. Delays in construction arising by virtue of the non-availability of a specified material and/or product will not be considered by the ENGINEER as justifying an extension of the agreed time of Substantial and/or Final Completion.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 26 00
CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. This section describes procedures by which the agreement and contract documents may be modified or revised. Specifically the following topics are covered:
 - 1. Submittals.
 - 2. Documentation of Change in Contract Price and Contract Time.
 - 3. Change Procedures.
 - 4. Work Change Directive.
 - 5. Stipulated Price Change Order.
 - 6. Time and Material Change Order.
 - 7. Execution of Change Orders.
 - 8. Correlation of CONTRACTOR Submittals.

1.02 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 00 52 00 – Agreement Form.
- C. Section 00 63 49 – Work Change Directive Form.
- D. Section 00 63 63 – Change Order Form.
- E. Section 00 72 00 – General Conditions.
- F. Section 00 73 00 – Supplementary Conditions.
- G. Section 01 29 00 – Payment Procedures.
- H. Section 01 33 00 – Submittal Procedures.
- I. Section 01 61 00 – Common Product Requirements.
- J. Section 01 77 00 – Closeout Procedures.

1.03 GENERAL REQUIREMENTS

- A. The roles and responsibilities of the CONTRACTOR, OWNER and ENGINEER are defined in the General Conditions and Supplementary Conditions of these Contract Documents as well as the procedures for modifying and making revisions to the Contract Documents.
- B. The requirements in this section are in addition to those required in other Specification Sections in Divisions 00 and 01.

1.04 SUBMITTALS

- A. Submit name of the individual authorized to receive change documents, and be responsible for informing others in CONTRACTOR's employ or SUBCONTRACTORS of changes to the Work.
- B. Change Proposal

1.05 DOCUMENTATION OF CHANGE IN CONTRACT PRICE AND CONTRACT TIME

- A. Maintain detailed records of work done on a time and material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs of changes in the Work.
- B. Document each quotation for a change in cost or time with sufficient data to allow evaluation of the quotation.
- C. Provide additional data to support computations:
 - 1. Quantities of products, labor, and equipment.
 - 2. Taxes, insurance, and bonds.
 - 3. Overhead and profit (in accordance with provisions of Section 00 72 00 – General Conditions).
 - 4. Justification for any change in Contract Time.
 - 5. Credit for deletions from Contract, similarly documented.
- D. Support each claim for additional costs, and for work done on a time and material basis, with additional information:
 - 1. Origin and date of claim.
 - 2. Dates and times work was performed, and by whom.
 - 3. Time records and wage rates paid.
 - 4. Invoices and receipts for products, equipment, and subcontracts, similarly documented.

1.06 FIELD ORDER

- A. The ENGINEER will advise of minor changes in the Work not involving an adjustment to Contract Price or Contract Time by issuing supplemental instructions.

1.07 CHANGE PROPOSAL

- A. OWNER may, in anticipation of ordering an addition, deletion, or revision to the Work, request CONTRACTOR to prepare a detailed proposal of cost and times to perform contemplated change and submit to ENGINEER as a Change Proposal.
- B. The ENGINEER may issue a Proposal Request that includes a detailed description of a proposed change with supplementary or revised Drawings and specifications and a change in Contract Time for executing the change.
- C. The CONTRACTOR may propose a change by submitting a request for change to the ENGINEER, describing the proposed change and its full effect on the Work, with a statement describing the reason for the change, and the effect on

the Contract Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other CONTRACTORS.

- D. Change proposal request will include reference number for tracking purposes and detailed description of and reason for proposed change, and such additional information as appropriate and required for CONTRACTOR to accurately estimate impact on Project.
- E. Change proposal request is for information only; CONTRACTOR is neither authorized to execute proposed change nor to stop Work in progress as a result of such request.
- F. CONTRACTOR's written proposal shall be transmitted to ENGINEER promptly, but not later than 14 days after CONTRACTOR's receipt of OWNER's written request. Proposal shall remain a firm irrevocable offer for a maximum period of 45 days after receipt by ENGINEER.
- G. OWNER's request for proposal or CONTRACTOR's failure to submit such proposal within the required time period will not justify a claim.

1.08 WORK CHANGE DIRECTIVE

- A. ENGINEER may issue a document, signed by the OWNER, instructing the CONTRACTOR to proceed with a change in the Work, which may require subsequent inclusion in a Change Order if any change in Contract Price or Contract Time is required.
- B. The document will describe changes in the Work, and will designate method of determining any change in Contract Price or Contract Time. A work change directive will not include any change in Contract Price or Contract Time without written notice and approval by the ENGINEER for inclusion in a Change Order.
- C. CONTRACTOR to document work performed daily on the time and materials (T&M) Work Log form. T&M Work Logs (excluding costs) are to be signed by and a copy submitted to the Resident Project Representative at the end of each business day. CONTRACTOR to retain the original. T&M Work Logs not submitted as described will not be accepted as documentation of Work performed and will not be allowed to be included in the determination of the value of Work performed.
- D. Upon completion of Work covered by the Work Change Directive or when final Contract Times and Contract Price is determined, CONTRACTOR shall submit documentation for inclusion in a Change Order.
- E. CONTRACTOR's documentation shall include but not be limited to:
 - 1. Appropriately detailed T&M Work Logs and other attachments as necessary to enable determination of value of the Work.
 - 2. Full information required to substantiate resulting change in Contract Times and Contract Price for Work. On request of ENGINEER, provide additional data necessary to support documentation.

3. Support data for Work performed on a unit price or Cost of the Work basis with additional information such as:
 - a. Dates Work was performed, and by whom.
 - b. Time records, wage rates paid, and equipment rental rates.
 - c. Invoices and receipts for materials, equipment, and subcontracts, all similarly documented.
4. Effective Date of Work Change Directive: Date of signature by OWNER, unless otherwise indicated thereon.

F. Promptly execute the change in Work.

1.09 STIPULATED PRICE CHANGE ORDER

- A. Based on Change Proposal Request and CONTRACTOR's fixed price quotation or CONTRACTOR's request for a Change Order as approved by ENGINEER.

1.10 TIME AND MATERIAL CHANGE ORDER

- A. Based on Change Proposal Request and CONTRACTOR's itemized price quotation or CONTRACTOR's request for a Change Order as approved by ENGINEER.
- B. Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract.
- C. ENGINEER will determine the change allowable in Contract Price and Contract Time as provided in the Contract Documents.
- D. Maintain detailed records of work done on Time and Material basis.
- E. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.

1.11 EXECUTION OF CHANGE ORDERS

- A. Execution of Change Orders: ENGINEER will issue Change Orders for signatures of parties as provided in Conditions of the Contract. The form to be used shall be that indicated in Paragraph 1.02.B of this Section. ENGINEER will then present the proposed signed Change Order to OWNER for approval. Upon obtaining approval, the Change Order will be submitted to the OWNER for signatures as provided in Conditions of Contract.
- B. ENGINEER on behalf of the OWNER will prepare proposed Change Orders and will transmit such with ENGINEER's written recommendation (Change Order only) and request to CONTRACTOR for signature.
- C. CONTRACTOR shall, upon receipt, either: (i) promptly sign, make a copy for its file, and return original copy to ENGINEER, or (ii) return unsigned with written justification for not executing Change Order to ENGINEER.
- D. Upon receipt of CONTRACTOR-executed Change Order, OWNER will promptly either:
 1. Get funding agency authorization and execute Change Order, retain original copy for its file and return a copy to ENGINEER and

2. CONTRACTOR, or
Promptly return to CONTRACTOR unsigned with written justification for not executing Change Order.
- E. Upon receipt of OWNER-executed Change Order, CONTRACTOR shall:
 1. Perform Work covered by Change Order.
 2. Revise Schedule of Values to adjust Contract Price and submit with next Application for Payment.
 3. Revise progress schedule to reflect changes in Contract Times, if any, and to adjust times for other items of Work affected by change.
 4. Enter changes in Project record documents after completion of change related Work.
- F. In signing a Change Order, OWNER and CONTRACTOR acknowledge and agree that:
 1. Stipulated compensation (Contract Price or Contract Times, or both) set forth includes payment for (i) the Cost of the Work covered by the Change Order, (ii) CONTRACTOR's fee for overhead and profit, (iii) interruption of progress schedule, (iv) delay and impact, including cumulative impact, on other Work under the Contract Documents, and (v) extended overheads.
 2. Change Order constitutes full mutual accord and satisfaction for the change to the Work.
 3. Unless otherwise stated in the Change Order, all requirements of the original Contract Documents apply to the Work covered by the Change Order.

1.12 CORRELATION OF CONTRACTOR SUBMITTALS

- A. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Price.
- B. Promptly revise progress schedules to reflect any change in Contract Time, revise sub-schedules to adjust times for other items of work affected by the change, and resubmit.
- C. Promptly enter changes in Project Record Documents.

1.13 CLAIMS

- A. Include, at a minimum:
- B. Specific references including (i) Drawing numbers, (ii) Specification section and article/paragraph number, and (iii) Submittal type, Submittal number, date reviewed, ENGINEER's comment, as applicable, with appropriate attachments.
- C. Stipulated facts and pertinent documents, including photographs and statements.
- D. Interpretations relied upon.
- E. Description of (i) nature and extent of claim, (ii) who or what caused the situation, (iii) impact to the Work and work of others, and (iv) discussion of claimant's justification for requesting a change to price or times or both.

- F. Estimated adjustment in price or times or both claimant believes it is entitled to with full documentation and justification.
- G. Requested Change in Contract Times: Include at least (i) progress schedule documentation showing logic diagram for request, (ii) documentation that float times available for Work have been used, and (iii) revised activity logic with durations including sub-network logic revisions, duration changes, and other interrelated schedule impacts, as appropriate. See Section 01 33 00, Article 1.04 CONSTRUCTION PROGRESS SCHEDULES, for additional time extension requirements.
- H. Documentation as may be necessary as set forth above for Work Change Directive, and as ENGINEER may otherwise require.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 29 00
PROGRESS PAYMENT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Format and Preparation of Applications.
 - 2. Submittal Procedures.
 - 3. Substantiating Data.

1.02 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 00 52 00 – Agreement.
- C. Section 00 72 00 – General Conditions.
- D. Section 01 23 00 – Contract Considerations and Alternates.
- E. Section 01 26 00 – Contract Modification Procedures.
- F. Section 01 33 00 – Submittal Procedures.
- G. Section 01 77 00 – Closeout Procedures.

1.03 FORMAT AND PREPARATION OF APPLICATIONS

- A. Unless otherwise agreed to, use the CONTRACTOR's Application for Payment form provided: ENGINEERs Joint Contract Document Committee (EJCDC) Application for Payment Form (C-620, 2002 Edition).
- B. Preparation
 - 1. Present required information in typewritten form.
 - 2. Execute certification by signature of authorized officer.
 - 3. Use data from approved Bid Form.
 - 4. Include accepted schedule of values for each area of work, as appropriate.
 - 5. List each authorized Change Order and Written Amendment executed prior to date of submission as a separate line item on Continuation Sheet, listing Change Order number and dollar amount as for an original item of Work. Include itemized break down under each change order when accepted as time and materials basis.
 - 6. Complete the Stored Material Summary, as applicable, and any supporting information as may be requested by ENGINEER or OWNER.
 - 7. Round values to nearest dollar.
 - 8. Prepare Application for Final Payment as specified in Section 01 77 00.

1.04 SUBMITTAL PROCEDURES

A. Submittals

1. Three (3) copies of each Application for Payment.
2. Updated construction schedule with each Application for Payment.
3. Payment Periods: As stipulated in the Agreement.
4. Submit with transmittal letter as specified for Submittals in Section 01 33 00.
5. Administrative actions which must precede or coincide with submittal of final application for payment include:
 - a. Submit lien waivers, warranties and bonds, and project record documents with final application for payment.
 - b. Completion of all work not included in substantial completion as defined in General and Supplementary Conditions.
 - c. Completion of project closeout procedures as indicated in Section 01 77 00.
 - d. Removal of temporary facilities and services.
 - e. Removal of surplus materials, rubbish, or similar elements.
 - f. Final cleaning.
 - g. Transmittal of project construction record documents to OWNER and ENGINEER.
 - h. Consent of surety for final payment.

- B. The City of Fargo reviews payments once a month and payments are mailed out on Fridays. In order to be considered within a packet for payment on a given Friday, all recommended Payment Applications must be submitted by the ENGINEER to Fargo staff Thursday of the week before, or eight (8) days prior, to said Friday. To accommodate the payment schedule and to allow adequate time to review the monthly Payment Applications, it is recommended that the CONTRACTOR submit proposed Payment Application to the ENGINEER by the Tuesday prior to the Thursday deadline. If a Payment Application is not to the ENGINEER prior to said Tuesday, the Payment Application may be delayed.

1.05 SUBSTANTIATING DATA

- A. When ENGINEER requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one (1) copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.
- C. Provide copies of invoice(s) for payment of materials stored on-site. Payment will not be made for materials that are not stored on-site or within a bonded warehouse that has been approved by ENGINEER and OWNER.
- D. CONTRACTOR shall supply substantiating information in compliance with federal and state requirements for monthly utilization reports and weekly prevailing wage and labor rates for laborers on-site.

1.06 PAYMENT

- A. Progress Payments will be made on a monthly basis provided the CONTRACTOR submits the required documents as required for the City to include in their packet for payment indicated above.

1.07 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

- A. Payments will not be made for the following:
 - 1. Loading, hauling and disposing of rejected material.
 - 2. Quantities of material wasted or disposed of in manner not called for under the Contract Documents.
 - 3. Rejected loads of material, including material rejected after it has been placed by reason of failure of CONTRACTOR to conform to provisions of the Contract Documents.
 - 4. Material not unloaded from transporting vehicle.
 - 5. Defective work not accepted by OWNER.
 - 6. Material remaining on hand after completion of the Work.

1.08 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT

- A. Partial Payment:
 - 1. No partial payments will be made for materials and equipment delivered or stored unless shop drawings for the materials and equipment are acceptable to the ENGINEER. Acceptable shall mean the Shop Drawings have an Approved as Submitted or and Approved as Noted disposition.
 - 2. For materials and equipment, for which an Operation and Maintenance Manual is required, no partial payment will be made for materials and equipment stored or installed unless the preliminary Operation and Maintenance Manual has been submitted and accepted by the ENGINEER.
 - 3. No partial payment greater than 80% of the invoiced cost of the material and equipment stored or installed will be made until the final Operation and Maintenance Manual has been submitted and accepted by the ENGINEER.
- B. Final Payment will be made only for products incorporated into the work; remaining products, for which partial payments have been made, shall revert to CONTRACTOR unless otherwise agreed, and partial payments. made for these items will be deducted from final payment.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 31 13
PROJECT COORDINATION

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
1. Coordination and project conditions.
 2. Field engineering.

1.02 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Section 00 72 00 – General Conditions.
- C. Section 00 73 00 – Supplementary Conditions.
- D. Section 01 10 00 – Summary of Work.
- E. Section 01 29 00 – Payment Procedures.
- F. Section 01 33 00 – Submittal Procedures.
- G. Section 01 77 00 – Closeout Procedures.

1.03 COORDINATION AND PROJECT CONDITIONS

- A. General:
1. Coordinate scheduling, submittals, and Work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.
 2. Verify utility requirements and characteristics of operating equipment are compatible with building utilities. Coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
 3. Coordinate space requirements, supports, and installation of mechanical and electrical Work that are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
 4. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
 5. Coordinate completion and clean-up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for OWNER'S partial occupancy.

6. Coordinate access to site for correction of defective Work and Work not in accordance with Contract Documents, to minimize disruption of OWNER'S activities.

B. Responsibilities of the CONTRACTOR:

1. Afford other CONTRACTORS reasonable opportunity for the introduction and storage of their materials and equipment and the execution of their Work.
2. Connect and coordinate Work with other CONTRACTORS Work as required by the Contract Documents.
3. Allocate and coordinate use of Site for field offices and construction trailers and for access, traffic, and parking facilities.
4. Instruct and coordinate the use of temporary utilities and construction facilities.
5. Coordinate field engineering and layout Work.
6. Verify all shop drawing dimensions.
7. Coordinate the Work of the individual CONTRACTORS.
8. Submit (and revise) progress schedule in accordance with Section 01 33 00 – Submittal Procedures coordinating the entire project construction schedule.
9. Organize and submit Applications for Payment. Submit applications on EJCDC C-620 forms for review by ENGINEER.
10. Submit shop drawings, product data, and samples in accordance with Section 01 33 00 – Submittal Procedures.
11. Submit request for interpretation of Contract Documents and obtain instructions through ENGINEER.
12. Process requests for Change Orders through ENGINEER.
13. Organize all closeout submittals and preliminary inspection reports for transmittal to ENGINEER. Organize all record drawings and submit to ENGINEER. Review all drawings before submitting to ENGINEER.
14. Notify ENGINEER when all trades are ready for final inspection and organize Substantial and Final inspections.
15. Provide record drawing information to ENGINEER.
16. Ensure punch list items are completed prior to scheduling final inspection by ENGINEER.

1.04 FIELD ENGINEERING

- A. The OWNER and ENGINEER will provide control datum for construction is that shown on Drawings.
- B. CONTRACTOR shall locate and protect survey control and reference points.
- C. OWNER will provide services of a licensed surveyor in order to establish required elevations, lines and levels utilizing recognized engineering practices. The CONTRACTOR is required to install work per drawings dimensions and elevations.
- D. CONTRACTOR shall confirm Drawing dimensions and elevations. Notify ENGINEER concerning errors or ambiguities.

- E. Site service utilities are shown in their approximate locations on the Drawings. CONTRACTOR shall be responsible to field verify all utility locations as required to accommodate construction activities.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 31 19
PROJECT MEETINGS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Preconstruction meeting.
 - 2. Schedule finalization meeting.
 - 3. Site mobilization meeting.
 - 4. Progress meetings.
 - 5. Pre-installation meeting.

1.02 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 00
- C. Section 01 10 00 – Summary of Work.
- D. Section 01 31 13 – Project Coordination.
- E. Section 01 33 00 – Submittal Procedures.
- F. Section 01 77 00 – Closeout Procedures.
- G. Section 03 30 00 – Cast-In-Place Concrete.
- H. Section 04 20 01 – Masonry Veneer.
- I. Section 04 72 00 – Cast Stone Masonry.
- J. Section 09 91 13 – Exterior Painting.
- K. Section 31 62 16.13 - Sheet Steel Piles.
- L. Section 32 31 19 - Decorative Metal Fences and Gates.

1.03 GENERAL REQUIREMENTS

- A. Contractor will schedule and administer pre-construction meeting, regularly scheduled progress meetings, and specially called meetings throughout the progress of the Work:
 - 1. Prepare agenda for meetings including items requested by Owner and Contractor.
 - 2. Notify Owner and Contractor 4 days in advance of meeting date.
 - 3. Preside at meetings.
 - 4. Record the minutes; include all significant proceedings and decisions.

5. Reproduce and distribute copies of minutes within 5 days after each meeting:
 - a. To all participants in the meetings.
 - b. To Owner.
 - c. Furnish 3 copies of minutes to Contractor.
- B. Engineer may attend meetings.
- C. Owner may attend meetings.
- D. Representatives of contractors, subcontractors, and suppliers attending the meetings shall be qualified and authorized to act on behalf of the entity each represents.

1.04 PRECONSTRUCTION MEETING

- A. Contractor will schedule a preconstruction kick-off meeting after Notice of Award.
- B. Location: A central site, convenient for all parties.
- C. Attendance required by
 1. Contractor.
 2. Contractor's superintendent.
 3. Owner.
 4. Engineer and his professional consultants.
 5. Resident Project Representative.
 6. Major Subcontractor(s).
 7. Major Suppliers.
 8. Others as appropriate.
- D. Agenda:
 1. Contract Forms and Conditions of the Contract.
 2. Distribution of Contract Documents.
 3. Submission of list of Subcontractors, list of products, schedule of values, and progress schedule.
 4. Designation of personnel representing the parties in Contract, and the Engineer.
 5. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
 6. Scheduling.
 7. Critical work sequencing.
 8. Major equipment deliveries and priorities.
 9. Use of premises by Owner and Contractor.
 - a. Office, work and storage areas.
 - b. Owner's requirements.
 10. Temporary utilities provided by Owner.
 11. Survey and construction staking.
 12. Health and Safety Plans of Contractor, Owner and Engineer.
 13. Site security, public access, and mobility.
 14. Site housekeeping.
 15. Procedures for testing.

16. Inspection, testing, and acceptance of materials during construction.
 17. Procedures for maintaining record documents.
 18. Requirements of the primacy agencies (North Dakota Department of Environmental Quality and North Dakota State Water Commission).
- E. Contractor will record minutes and distribute copies after meeting within fourteen (14) days to participants and those affected by decisions made.

1.05 SCHEDULE FINALIZATION MEETING

- A. Contractor will schedule at least 10 days before submission of the first Application for Payment.
- B. Location: A central site convenient for all parties.
- C. Attendance:
1. Owner's representative.
 2. Engineer.
 3. Contractor.
 4. Others, as appropriate.
- D. Suggested Agenda:
1. Schedule of Values.
 2. Construction Schedule.
 3. Submittal Schedule.
 4. Equipment Delivery Schedule.

1.06 PROGRESS MEETINGS

- A. Contractor will:
1. Schedule and administer meetings at the Project site throughout progress of the Work at a maximum of biweekly intervals, or more frequent as deemed necessary by the nature of the work being performed.
 2. Make arrangements for hosting meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within seven (7) days to Engineer, Owner, participants, and those affected by decisions made..
- B. Location of the Meetings: The project field office of the Contractor, or other locations arranged for by Contractor, convenient to all parties.
- C. Attendance required by:
1. Contractor
 2. Contractor(s) Job Superintendent.
 3. Owner.
 4. Engineer, and his professional consultants as needed.
 5. Resident Project Representative as needed.
 6. Major Subcontractors and suppliers.
 7. Others as appropriate to agenda topics for each meeting.
- D. Agenda:
1. Review minutes of previous meetings.

2. Review unresolved issues from last meeting.
3. Review of Work progress.
4. Field observations, problems, conflicts and decisions.
5. Identification of problems which impede planned progress.
6. Review of submittals schedule and status of submittals.
7. Review of off-site fabrication and delivery schedules.
8. Maintenance of progress schedule.
9. Corrective measures to regain projected schedules.
10. Planned progress during succeeding Work period.
11. Coordination of projected progress.
12. Maintenance of quality and Work standards.
13. Effect of proposed changes on progress schedule and coordination.
14. Other business relating to Work.

1.07 PRE-INSTALLATION MEETING

- A. When required in individual Specification sections, convene a pre-installation meeting at the site prior to commencing Work of the section.
 1. Require attendance of parties directly affecting, or affected by, Work of the specific section.
 2. Notify Engineer seven (7) days in advance of meeting date.
 3. Prepare agenda and preside at meeting.
 4. Review conditions of installation, preparation and installation procedures.
 5. Review coordination with related Work.
- B. Contractor will record minutes and distribute copies within fourteen (14) days after meeting to participants and those affected by decisions made.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 33 00
SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Submittal Procedures.
 - 2. Submittal Schedules
 - 3. Construction Progress Schedules.
 - 4. Proposed Products List.
 - 5. Tabulation of Subcontractors.
 - 6. Tabulation of Suppliers.
 - 7. Product Data.
 - 8. Request for Interpretation
 - 9. Shop Drawings.
 - 10. Samples.
 - 11. Test Reports.
 - 12. Manufacturer's Certificates.
 - 13. Manufacturer's Instructions.
 - 14. Manufacturer's Field Reports.
 - 15. Excessive Shop Drawing Reviews.

1.02 RELATED SECTIONS

- A. This Article identifies sections of the project manual that are related to the work specified in this section. The following list is not all inclusive and represents items of work that are significant to the completion of the functioning systems. Refer to the sections listed for additional requirements for the work specified in this section.
- B. Division 00
- C. Section 01 25 00 – Substitution Procedures.
- D. Section 01 26 00 – Contract Modification Procedures.
- E. Section 01 29 00 – Progress Payment Procedures.
- F. Section 01 45 00 – Quality Control.
- G. Section 01 77 00 – Closeout Procedures.
- H. Section 01 78 23 – Operations and Maintenance Data.
- I. Divisions 2 through 40.

1.03 CONTRACTOR RESPONSIBILITIES

- A. Identify all submittals required by the Contract Documents
- B. Review and determine all materials and equipment needed to complete Work during the first six months of construction as well as materials and equipment

that are on the critical path of the overall construction schedule and require advanced planning due to delivery and procurement lead times.

- C. Review submittal data prior to submission for accuracy and completeness for each submission.
- D. Approve and stamp each submission before submitting it.
- E. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
 - 4. Conformance with specifications.
- F. Prior to each submission, carefully review and coordinate all aspects of each item being submitted.
- G. Verify that each item and the submittal for it conform in all respects with specified requirements of the Work and of the Contract Documents with respect to means, methods, techniques, sequences, and operations of construction, and safety precautions and programs incidental thereto.
- H. Make submissions promptly in accordance with Construction Schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.
- I. Limit requirements for expedited submittal review by Engineer to no more than 40 total submittals:
 - 1. Expedited submittal review period: no less than 14 calendar days. Failure of Engineer to review a submittal within the estimated review timeframe shall not be basis for the Contractor to request or receive additional Contract Price or Contract Time.
- J. Notify Engineer in writing, at time of submission, of any deviations in the submittals from Contract Document requirements:
 - 1. Identify and tabulate all deviations in transmittal letter.
 - 2. Indicate essential details of all changes proposed, including modifications to other facilities that may be a result of the deviation.
 - 3. Include required piping and wiring diagrams.
 - 4. Failing to identify a deviation in transmittal letter is cause for immediate return of submittal for correction without further review.
- K. Provide resubmissions within 14 calendar days following return of reviewed submissions for submittal items with disposition of either "Exceptions Noted - Submit Supplemental Data" or "Returned for Correction". Promptly make corrections noted, address noted Contract Document requirements, unresolved issues and all other comments of Engineer prior to resubmission.

1.04 SUBMITTAL PROCEDURES

- A. Make submissions far enough in advance of scheduled dates for installation to provide time required for reviews, for securing necessary approvals, for possible

revisions and resubmissions, and for placing orders and securing delivery.

- B. Transmit each submittal with Engineer accepted form.
- C. Sequentially number the transmittal form. Submit revised submittals with original number and a sequential alphabetic suffix.
- D. Contractor shall send each submittal in electronic format to be distributed by Engineer for review. Upon approval and prior to project completion, Contractor shall submit up to two (2) bound hard copies, containing all approved submittals, to be retained by Engineer and Owner.
- E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate.
- F. Contractor shall completely review all submittal materials prior to submission to Engineer. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
- G. Schedule submittals to expedite the Project, and deliver to Engineer at business address. Coordinate submission of related items.
- H. Engineer will attempt to complete a review of each submittal in a timely manner within 30 calendar days of receipt of each submittal. Failure of Engineer to review a submittal within the estimated review timeframe shall not be basis for the Contractor to request or receive additional Contract Price or Contract Time.
- I. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work.
Highlight and/or clearly designate specific product details and information so as to confirm product meets or exceeds Specifications.
- J. Provide space for Contractor and Engineer review stamps.
- K. When revised for resubmission, identify all changes made since previous submission.
- L. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements. Clearly transmit Engineer review comments to suppliers and subcontractors as required to minimize product delivery errors and miscommunications.
- M. Submittals not requested will not be recognized or processed.
- N. Engineer will review submittals in order received unless Contractor requests, in writing, a revised order of review. A revision in order may add to the length of review time required for previously submitted submittals.
- O. Submittal of more than three major submittals per week may add to the required length of review time. Engineer shall notify Contractor of submittal review scheduling conflicts.

- P. Shop Drawings—Drawings shall be legible and presented in a clear and thorough manner:
1. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
 2. Identify products and equipment by reference to name and tag number shown on Contract Drawings.
 3. Scale and Measurements: Make drawings accurate to a standard engineering or architectural scale (metric scales are not acceptable) with sufficient detail to show the kind, size, arrangement and function of component materials and devices.
 4. Illustrate construction and assembly of components and their connections to piping, equipment and Products.
 5. Indicate static and dynamic weights, torque and power requirements of products and equipment for the conditions and operating ranges specified.
 6. Illustrate and dimension the actual fabricated dimensions of assembled configuration.
 7. Illustrate and dimension required installation tolerances.
 8. Illustrate and dimension the minimum unrestricted area required to install, maintain and operate each assembly.
 9. Provide wiring, piping and control diagrams.
 10. Show external connections, anchorages, and supports required.
 11. Shop Drawing sheet size: 8-1/2 inch by 11 inch, 11 inch by 17 inch or 24 inch by 36 inch.
- Q. Fabrication Drawings—Drawings shall be legible and presented in a clear and thorough manner:
1. Identify details by reference to sheet and detail, schedule or room numbers shown on Contract Drawings.
 2. Identify equipment by reference to equipment name and tag number shown on Contract Drawings.
 3. Scale and Measurements: Make drawings accurate to a standard engineering or architectural scale (metric scales are not acceptable) with sufficient detail to show the kind, size, arrangement and function of component materials and devices.
 4. Illustrate construction and assembly of components and their connections to piping, equipment and Products.
 5. Illustrate and dimension the actual fabricated dimensions of each part and accessory as well as its assembled configuration showing supports and anchorage.
 6. Illustrate and dimension required installation tolerances.
 7. Illustrate and dimension the minimum unrestricted area required to install, maintain and operate each part and accessory.
 8. Show external connections, anchorages, and supports required.
 9. Provide wiring, piping and control diagrams.
 10. Provide sequential numbering for each fabricated item and accessory to reflect field assembly requirements. Sequential numbering on fabrication drawings shall match the number designated on and assigned to items and accessories delivered to the field.

11. Fabrication Drawing sheet size: 11 inch by 17 inch or 24 inch by 36 inch.

R. Product Data—Preparation:

1. All information shown on the submittal that is related to the performance of the work of this project shall be legible.
2. Clearly mark each copy to identify each product, accessory and model proposed to be incorporated into the work.
3. Identify each product and equipment assembly by reference to name and tag number shown on the P&ID's.
4. Catalog cut sheets: Cross-out or delete irrelevant data.
5. Show performance characteristics and capacities.
6. Show dimensions and clearances required for installation and maintenance.
7. Show wiring, piping and control diagrams.
8. Show external connections, anchorages, and supports required.
9. Indicate static and dynamic weights, torque and power requirements of products and equipment for the conditions and operating ranges specified.

S. Samples—Shall be of sufficient size, quality and quantity to clearly illustrate:

1. Functional characteristics of the product, with integrally related parts and attachment devices.
2. Full range of installed color, texture and pattern.
3. Comply with requirements identified in individual specification sections.

T. Manufacturer's standard schematic drawings and diagrams:

1. Modify drawings and diagrams to delete information which is not applicable to the Work by crossing out or omitting irrelevant data.
2. Supplement standard information to provide information specifically applicable to the Work.

U. Field samples and mock-ups:

1. Contractor shall erect, at the Project site, at a location acceptable to the Engineer.
2. Size or area: That specified in the respective specification section.
3. Fabricate each sample and mock-up complete and finished.
4. Remove mock-ups at conclusion of Work or when acceptable to the Engineer.

1.05 SCHEDULE OF SUBMITTALS

A. Within seven (7) calendar days after the effective date of Notice of Award and prior to execution of the Agreement, submit a complete submittal schedule and list of all items requiring submission in a matrix form, including:

1. A separate row for each submittal and submittal type required by the Contract Documents.
2. A separate column for each of the following organized horizontally from left to right in the order listed:
 - a. Submittal number.
 - b. Specification section.

- c. Submittal type.
 - d. Resubmittal.
 - e. Specification section title.
 - f. Description of the item with the name of manufacturer, trade name and model number.
 - g. Intended submission date.
 - h. Order release date.
 - i. Lead time to delivery.
 - j. Anticipated delivery date.
- 3. Highlight any items that require expedited review to meet the Project schedule.
 - 4. Provide decision dates for selection of finishes and samples.
 - 5. Present in tabular format with appropriately labeled columns acceptable to Engineer for both electronic and hard copy versions. Submit updated version to Engineer on monthly basis.

1.06 CONSTRUCTION PROGRESS SCHEDULES

A. Definitions:

- 1. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
- 2. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
- 3. Predecessor Activity: An activity that precedes another activity in the network.
- 4. Successor Activity: An activity that follows another activity in the network.
- 5. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- 6. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- 7. Event: The starting or ending point of an activity.
- 8. Float: The measure of leeway in starting and completing an activity.
 - a. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
 - b. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
 - c. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
 - d. No change orders (time or money) will be granted related to schedule delays until a delay occurs that is beyond the Contractor's control and which (i) impacts Project's critical path, (ii) consumes available float or contingency time, and (iii) extends work beyond contract time(s) listed in the Agreement or as subsequently modified per change order.

9. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.
- B. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- C. Arrange Construction Progress Schedule to be consistent with format and organization of the Schedule of Values and Specification Sections.
- D. Coordinate Contractor's construction schedule with the submittal schedule, progress reports, payment requests, and other required schedules and reports.
- E. Secure time commitments for performing critical elements of the Work from entities involved.
- F. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.
- G. Submit initial schedule in duplicate within fifteen (15) days after date of Owner-Contractor Agreement.
- H. Revise and resubmit as required.
- I. Submit revised schedules with each Application for Payment, identifying changes since previous version. Application for Payment will not be processed until updated construction schedule has been submitted.
- J. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first workday of each week as well as the proposed start and completion dates of each major portion of Work.
- K. Sheet Size: Minimum 11x17 inches. Larger sizes than 11x17 inches shall be in multiples of 8½x11 inches.
- L. Content
 1. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction. Indicate the early and late start, early and late finish, float dates, and duration.
 2. Identify each item by Specification section number.
 3. Identify Work of separate stages and other logically grouped activities.
 4. Provide sub-schedules to define critical portions of the entire schedule.
 5. Include conferences and meetings in schedule.
 6. Indicate estimated percentage of completion for each item of Work at each submission.
 7. Provide separate schedule of submittal dates for shop drawings, product data, and samples, and dates reviewed submittals will be required from Engineer. Allow sufficient time for review by Engineer. Indicate decision dates for selection of finishes.
 8. Coordinate content with schedule of values.
- M. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule.

N. Distribution

1. Distribute copies of reviewed schedules to Project Site file, Subcontractors, suppliers, and other concerned parties.
2. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

1.07 PROPOSED PRODUCTS LIST

- A. Within fifteen (15) days after date of Owner-Contractor Agreement, submit list of major Products proposed for use, with name of manufacturer, trade name, and model number of each Product.
- B. For products specified only by reference standards, give manufacturer, trade name, model or catalog designation, and reference standards.

1.08 TABULATION OF SUBCONTRACTORS

- A. Contractor shall submit a complete list of subcontractors who will provide work on the project.
- B. The submitted list shall include the following information for each subcontractor:
 1. Name
 2. Address
 3. Type of work to be provided
 4. Applicable specifications sections
 5. Contact person
- C. Contractor's use of specific subcontractors shall be subject to the requirements included in the specifications.

1.09 TABULATION OF SUPPLIERS

- A. Contractor shall submit a list of suppliers who will provide materials, equipment, or components, which are integral to the Work.
- B. The submitted list shall include the following information for each supplier:
 1. Name
 2. Address
 3. Type of work to be provided
 4. Applicable specifications sections
 5. Contact person
- C. Contractor's use of specific suppliers for providing equipment, materials, or components shall be subject to the requirements of the specifications.

1.10 REQUESTS FOR INTERPRETATION

- A. Contractor shall submit in writing all requests for interpretation or for information regarding the Contract Documents on the form provided by the Engineer.
- B. Engineer does not guarantee that a response can be provided in the amount of time requested, but Engineer shall respond in writing to Contractor's request within a reasonable amount of time given the extent of the request for

interpretation of information required.

1.11 PRODUCT DATA

- A. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
- B. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record document purposes described in Section 01 77 00.
- C. Submit the number of copies that the Contractor requires, plus the number of copies as specified in Paragraph 1.02.
- D. Mark each copy to identify applicable Products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- E. Indicate Product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service of functional equipment and appliances.

1.12 SHOP DRAWINGS

- A. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.
- B. After review, produce copies and distribute in accordance with SUBMITTAL PROCEDURES article above and for record document purposes described in Section 01 77 00.
- C. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- D. Submit in electronic format for Engineer's review. Upon approval and prior to project completion, Contractor shall submit up to two (2) bound hard copies, containing all approved submittals, to be retained by Engineer and Owner.
- E. All shop drawings shall be submitted through the Contractor in accordance with the procedures outlined in this specification. Shop drawings received from anyone other than through the Contractor will not be reviewed.
- F. Shop drawings shall include data and technical drawings prepared specifically for this Project, including where required, but not limited to the following:
 - 1. Fabrication drawings
 - 2. Installation drawings
 - 3. Shopwork manufacturing instructions
 - 4. Templates or patterns
 - 5. Coordination drawings
 - 6. Schedules

7. Design calculations
- G. Shop drawings shall contain complete detail showing conformance with the Contract Documents and such other specified information as required, including but not limited to the following
 1. Related work with applicable cross references
 2. Physical configuration
 3. Dimensional information, including any variations from actual conditions
 4. List of materials
 5. Structural construction and assemblies
 6. Anchor bolt details showing type, size, embedment, and locations
 7. Machinery and equipment details
 8. Auxiliary items to machinery and equipment
 9. Protective coatings and factory finishes
 10. Electrical information including motor sizes, wiring and circuit diagrams, and instrumentation
 11. Testing results
- H. Detail all connections required to complete the work.
- I. Approval of shop drawings by Engineer shall not relieve the Contractor from responsibility of deviations from drawings or specification, unless deviations or changes have been brought to Engineer's attention at time of submission, nor shall it relieve the Contractor from responsibility for errors or omissions in shop drawings.

1.13 SAMPLES

- A. Submitted to Engineer for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
- B. After review, produce duplicates and distribute in accordance with SUBMITTAL PROCEDURES article above and for record document purposes described in Section 01 77 00.
- C. Submit samples to illustrate functional and aesthetic characteristics of the Product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
- D. Include identification on each sample, with full Project information.
- E. Submit the number of samples specified in individual Specification sections; one (1) of which will be retained by Engineer.
- F. Reviewed samples that may be used in the Work are indicated in individual Specification sections.
- G. Samples will not be used for testing purposes unless specifically stated in the Specification section.

1.14 TEST REPORTS

- A. Submit for the Engineer's knowledge as Contract Administrator or for the Owner.
- B. Submit test reports for information for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.
- C. Retain one (1) copy of all test reports and results on-site in a location accessible to Engineer.

1.15 MANUFACTURER'S CERTIFICATES

- A. When specified in individual Specification sections, submit certification by the manufacturer, installation/application Subcontractor, or the Contractor to Engineer, in quantities specified for Product Data.
- B. Indicate material or Product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

1.16 MANUFACTURER'S INSTRUCTIONS

- A. When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, to Engineer for delivery to Owner in quantities specified for Product Data.
- B. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- C. Refer to Section 01 45 00 – Quality Control, Manufacturers' Field Services article.

1.17 MANUFACTURER'S FIELD REPORTS

- A. Submit reports for the Engineer's benefit as Contract Administrator or for the Owner.
- B. Submit report in duplicate within fifteen (15) days of observation to Engineer for information.
- C. Submit the manufacturer's field reports for the limited purpose of assessing conformance with information given and the design concept expressed in the Contract Documents.

1.18 DISPOSITION OF SUBMITTALS

- A. No Exceptions Noted
 - 1. Resubmission not required.
 - 2. Distribution:
 - 3. One copy sent to Owner.
 - 4. One copy sent to Resident Project Representative.
 - 5. One copy retained in Engineer's file.
 - 6. Remaining copies returned to Contractor for his use:

- a. A minimum of one copy to be kept on file at Contractor's office at job site.
- B. Exceptions Noted
 - 1. Resubmission not required.
 - 2. Comply with corrections or comments as noted on submittal and in transmittal letter.
 - 3. Work performed or products furnished to comply with exceptions noted on submittal.
 - 4. Copies of submittal data in operation and maintenance manuals to be revised according to exceptions.
 - 5. Distribution:
 - a. One copy sent to Owner.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to Contractor for his use:
 - 1) A minimum of one copy to be kept on file at Contractor's office at job site.
- C. Exceptions Noted – Submit Supplemental Data
 - 1. Submit Supplemental information to original submittal.
 - 2. Submit information as requested by Engineer's review letter.
 - 3. Work performed or products furnished to comply with exceptions noted on submittal.
 - 4. Copies of submittal data in operation and maintenance manuals to be revised according to exceptions.
 - 5. Distribution:
 - a. One copy sent to Owner.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to Contractor for his use:
 - 1) A minimum of one copy to be kept on file at Contractor's office at job site.
- D. Receipt Acknowledged
 - 1. Resubmission not required.
 - 2. Distribution:
 - a. One copy sent to Owner.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to Contractor for his use:
 - 1) A minimum of one copy to be kept on file at Contractor's office at job site.
- E. Returned for Correction
 - 1. Distribution:
 - a. One copy sent to Resident Project Representative.
 - b. One copy retained in Engineer's file.
 - c. Three copies, max, returned to Contractor for revision and resubmittal.
 - d. Remaining copies destroyed.

- e. Copy of transmittal letter sent to Owner.

1.19 DISPOSITION OF SAMPLES

A. No Exceptions Noted

1. Resubmission not required.
2. Distribution:
 - a. One sample sent to Owner.
 - b. One sample sent to Resident Project Representative.
 - c. One sample retained in Engineer's file.
 - d. Acknowledgment: Copy of transmittal letter sent to Contractor.

1.20 EXCEPTIONS NOTED

A. Do Not Resubmit.

B. Work performed or products furnished to comply with exceptions noted in acknowledgment.

C. Distribution:

1. One sample sent to Owner.
2. One sample sent to Resident Project Representative.
3. One sample retained in Engineer's file.
4. Acknowledgment: Copy of transmittal letter sent to Contractor.

D. Receipt Acknowledged

1. Resubmission not required.
2. Distribution:
 - a. One copy sent to Owner.
 - b. One copy sent to Resident Project Representative.
 - c. One copy retained in Engineer's file.
 - d. Remaining copies returned to Contractor for his use:
 - 1) A minimum of one copy to be kept on file at Contractor's office at job site.

E. Returned for Correction

1. Resubmission required.
2. Distribution:
 - a. One sample sent to Resident Project Representative.
 - b. One sample retained in Engineer's file.
 - c. One sample sent to Contractor for revision and resubmittal.
 - d. Copy of transmittal letter sent to Owner.

1.21 RESUBMISSION REQUIREMENTS

- A. Make any corrections or changes in submittals required by Engineer and resubmit until disposition not requiring resubmission or additional information is made.
- B. Transmit each resubmission under new letter of transmittal. Use number of original submittal followed directly by a capital letter corresponding to the number of times a submittal is resubmitted (i.e., 1, 1A, 1B, etc.).

- C. Revise initial Drawings or data and resubmit as specified for the initial submittal.
- D. Indicate any changes which have been made other than those requested by Engineer.
- E. Samples: Submit new samples as required for initial submittal.

1.22 EXCESSIVE SUBMITTAL REVIEWS

- A. The maximum number of submittal reviews for any one type of submittal required in a specification section shall be two (2).
- B. Compensation for third or subsequent reviews will be required as outlined below:
 - 1. Owner will compensate Engineer for "additional services".
 - 2. Owner will deduct amount of such compensation from payment to Contractor.
 - 3. Engineer's compensation shall be at Engineer's standard hourly rates, plus reimbursable expenses at cost.

1.23 ENGINEER'S DUTIES

- A. Review submittals with reasonable promptness provided that each submittal has been called for by the Contract Documents, is stamped by Contractor and complies with the requirements indicated above:
 - 1. No extensions of time are allowed due to Engineer's delay in reviewing submittals unless all the following criteria are met:
 - a. Contractor has notified Engineer in writing that an expedited review of particular submittal in question is critical to the progress of the Work and Contractor has identified the requested submittal return date.
 - b. Engineer has failed to return submittal within 21 days of receipt of the submittal or receipt of said notice, whichever is later.
 - c. Contractor demonstrates that delay in progress of the Work was directly attributable to Engineer's failure to return submittal within 21 days.
 - 2. No extensions of time are allowed due to delays in progress of the Work caused by rejection and/or subsequent resubmission of data, including multiple resubmissions.
- B. Review drawings and data submitted only for general conformity with Contract Documents:
 - 1. Engineer's review of drawings and data does not indicate a thorough review of all dimensions, quantities, and details of material, equipment device or items shown.
 - 2. Engineer's review does not relieve Contractor of responsibility for errors, omissions or deviations nor responsibility for compliance with the Contract Documents.
 - 3. Engineer's review shall not extend to means, methods, techniques, sequences, operations of construction, and safety precautions and programs incidental thereto. No information regarding these items will be reviewed whether or not included in submittals.

- C. Assume that none of the information in the submittal comprises a deviation to the Contract Documents unless Contractor advises Engineer otherwise in writing which is acknowledged by Engineer in writing:
 - 1. Consider and review only those deviations from the Contract Documents clearly identified as such in submittal and tabulated in the Letter of Transmittal and identified as an "Or Equal" to "Named" products.
 - 2. At the discretion of the Engineer, notify Contractor that review of specific deviations will be reviewed under provisions of a "Substitution"
- D. Return submittals to Contractor for distribution or for resubmission.
- E. Transmit, unreviewed, to Contractor copy of submittals received directly from suppliers, manufacturers and subcontractors.
- F. Transmit, unreviewed, to Contractor copy of submittals not called for by the Contract Documents or which have not been approved by Contractor.
- G. Engineer will not review uncalled-for shop drawings or product data except by special arrangement.
- H. Affix stamp and indicate approval for submittal or resubmission requirements.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 45 00
QUALITY CONTROL

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Quality Assurance - Control of Installation.
 - 2. Tolerances.
 - 3. References and Standards.
 - 4. Inspection and Testing Services.
 - 5. Manufacturers' Field Services.
- B. Related Sections include:
 - 1. Section 01 33 00 – Submittal Procedures.
 - 2. Section 01 75 00 – Starting and Adjusting.

1.02 QUALITY ASSURANCE - CONTROL OF INSTALLATION

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with Contract Documents, request clarification from ENGINEER before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Verify that field measurements are as indicated on Contract Drawings, shop drawings, or as instructed by the manufacturer.
- G. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.

1.03 TOLERANCES

- A. Monitor fabrication and installation tolerance control of Products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from ENGINEER before proceeding.
- C. Adjust Products to appropriate dimensions; position before securing Products in place.

1.04 REFERENCES AND STANDARDS

- A. For Products or workmanship specified by association, trade, or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. Neither the contractual relationships, duties, nor responsibilities of the parties in Contract or those of the ENGINEER shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.05 TESTING RESPONSIBILITIES

- A. CONTRACTOR's Responsibility:
 - 1. CONTRACTOR shall be responsible for all quality control testing or inspections including mill tests, factory tests, qualification tests, laboratory tests, and field tests unless specifically indicated to be OWNER responsibility.
 - 2. Quality control required by codes or ordinances, or by the plan approval authority, unless otherwise provided in the Contract Documents.
 - 3. CONTRACTOR's convenience testing.
 - 4. Coordinate with each independent agency to accommodate required services with minimum delay in progress of work, and to avoid moving or replacing work. Schedule times for quality control services.
 - 5. Cooperate with independent agencies performing required quality control services. Notify testing agency sufficiently in advance of operations to permit assignment of personnel. Provide auxiliary services as required, including, but not limited to the following:
 - a. Providing access to work
 - b. Taking samples or assistance with taking samples
 - c. Delivery of samples to testing laboratories
 - d. Security and protection of samples and test equipment at Site
- B. OWNER's Responsibility:
 - 1. OWNER responsible quality control shall be specifically indicated. If quality control measure is not indicated as OWNER responsibility it is the CONTRACTOR's responsibility.
- C. Retesting Responsibility:
 - 1. Where results of quality control prove unsatisfactory and do not indicate compliance with Contract Documents all costs associated with retesting is the CONTRACTOR's responsibility.
 - 2. The costs for retesting of OWNER responsible quality control shall be deducted from the Contract amount by supplemental agreement.

1.06 INSPECTION AND TESTING SERVICES

- A. CONTRACTOR shall appoint, employ, and pay for specified services of an independent firm to perform testing including:
 - 1. Bacteriological testing.

2. Weld Radiographs and Weld Inspection Report, including metal roof deck welding.
 3. All other tests and engineering data required for ENGINEER's review of materials and equipment proposed to be used in the Work.
CONTRACTOR shall obtain ENGINEER's acceptance of the testing firms before having services performed and shall pay all costs for these testing services. All costs for testing shall be incidental.
- B. The independent firm will perform tests and other services specified in individual specification sections and as required by the ENGINEER.
 - C. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the ENGINEER or the OWNER.
 - D. Reports will be submitted by the independent firm to the ENGINEER and CONTRACTOR, in duplicate, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.
 - E. CONTRACTOR shall select independent testing agency qualified in accordance with referenced ASTM standards and that is acceptable to the ENGINEER, if required for certain types of testing.
 - F. Comply with pertinent codes, regulations, and industry standards except when more stringent standards or tolerances are specified.
 - G. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage, safe access, and assistance by incidental labor as requested.
 1. Notify ENGINEER and independent firm 48 hours prior to expected time for operations requiring services.
 2. Make arrangements with independent firm and pay for additional samples and tests required for CONTRACTOR's use.
 - H. Testing does not relieve CONTRACTOR from performing Work according to contract requirements.
 - I. Re-testing required because of non-conformance to specified requirements shall be performed by the same independent firm on instructions by the ENGINEER. Payment for re-testing will be paid by the CONTRACTOR.

1.07 MILL TESTS

- A. Mill or shop tests shall be conducted, and test reports submitted where this type of test is specified.
- B. Mill or shop tests shall be accomplished by the manufacturer or fabricator of the materials. Mill tests may be conducted by an independent testing laboratory. These tests shall be performed in accordance with applicable ASTM standards.

1.08 FACTORY TEST

- A. Factory tests of process, mechanical, and electrical equipment relative to performance, capacity, rating, efficiency, or other such requirements shall be conducted in the factory or shop for each item supplied when this type of test is

specified.

- B. Factory testing shall be performed in accordance with applicable standards and test codes.
- C. Where factory tests are required or specified, reports of the test results shall be submitted to ENGINEER for approval prior to shipment. CONTRACTOR shall submit the number of test reports for approval required by the CONTRACTOR plus four (4) copies to be retained by the ENGINEER.
- D. Factory observation of fabrication procedures, materials used, and testing methods may be performed by a representative of the OWNER or ENGINEER. OWNER shall pay for factory observation.

1.09 MANUFACTURERS' INSTRUCTIONS

- A. Comply with manufacturer's instructions in full detail for storage, installation, assembly, installation, start-up, and adjustment. CONTRACTOR shall follow appropriate sequencing as recommended by manufacturer.
- B. Should manufacturer's instructions conflict with Contract Documents, CONTRACTOR shall request clarification from ENGINEER prior to proceeding.
- C. If required by individual product or equipment specification sections, CONTRACTOR shall submit manufacturer's printed instructions prior to assembly and installation.

1.10 MANUFACTURERS' CERTIFICATES

- A. Submit manufacturer's certificate indicating that equipment or products meet or exceed specified requirements where required in the individual specification sections.
- B. Certificates shall be submitted prior to shipment of equipment or products.

1.11 MANUFACTURERS' FIELD SERVICES

- A. When specified in individual specification sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment and other services as applicable, and to initiate instructions when necessary.
- B. Submit qualifications of observer to ENGINEER 30 days in advance of required observations. Observer subject to approval of ENGINEER.
- C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.
- D. Refer to Section 01 33 00.

1.12 QUALIFICATION TESTS

- A. Should a product, material, or method for assembly of unknown or questionable quality be proposed by the CONTRACTOR, additional tests may be required by

ENGINEER.

- B. Additional testing as required by the ENGINEER shall be used as a basis to establish acceptance or rejection.

1.13 LABORATORY TESTS

- A. Laboratory tests shall be conducted, and test reports shall be submitted where this type of test is specified. All laboratory tests shall be made by an independent laboratory approved by the ENGINEER. These tests shall be performed in accordance with applicable ASTM standards.
- B. Laboratory tests may be witnessed by representatives of the OWNER or ENGINEER.
- C. Submit two (2) copies of all laboratory tests to the ENGINEER for record.

1.14 PRODUCT FIELD TESTS

- A. Product field tests shall be set up and completed by the CONTRACTOR. CONTRACTOR shall provide all tools, equipment, instruments, personnel, and other facilities required for the completion of each test.
- B. Product field tests of process equipment, mechanical systems, electrical systems, piping systems, and similar facilities shall be conducted where this type of test is specified.
- C. Product field tests include the determination of performance, capacity, efficiency, function, tightness, leakage, and other special requirements. Product field tests shall be performed in accordance with applicable standards and test codes.
- D. Product field tests may be witnessed by representatives of OWNER and ENGINEER.
- E. Submit two (2) copies of all product field tests to the ENGINEER for record.

1.15 MATERIALS FIELD TESTS

- A. Routine tests of materials incorporated into the Project will be performed by an independent testing laboratory arranged and paid for by the OWNER and acceptable to the ENGINEER.
- B. Results of materials field testing shall be reported to the ENGINEER and CONTRACTOR.
- C. Material field tests may be witnessed by representatives of the OWNER, ENGINEER, and ENGINEER's subconsultant and such witnessing shall be paid for by the OWNER.
- D. The following inspections and testing shall be conducted by the independent testing laboratory hired and paid for by the OWNER and accepted by the ENGINEER with results being reported to the CONTRACTOR and ENGINEER. See Structural Special Inspection for additional requirements of building codes.

- 1. Excavating, Filling, and Grading Soil Compaction Testing:

Item	Requirement	Test Method	Frequency
Certified Moisture-Density Relationship	Each different type of on-site native soils and imported material provided to the project site	ASTM D698	one (1) certified moisture-density relationship test from each different type of on-site native soils and imported material provided to the project site.
Structural Backfill	98% of ASTM D698 maximum dry density & + 4% to 0% optimum moisture content for clays and +/- 3% for sands.	ASTM D6938	One (1) approved test per 50 lf with a minimum of two (2) approved density tests indicating soil bearing capacity as required per 8-inch lift.
Utility and Piping Trenches Beneath Roadways and Right-of-ways.	95% of ASTM D698 maximum dry density. Moisture shall be between optimum and +6% of optimum for earth backfill and between 4% of dry weight and optimum for gravel backfill.	ASTM D6938	One (1) approved test per 100 lf indicating soil bearing capacity as required per 12-inch lift.
Utility and Piping Trenches in Ditches, Berms and Lawn Areas	90% of ASTM D698 maximum dry density. Moisture shall be between optimum and +6% of optimum for earth backfill	ASTM D6938	One (1) approved test per 300 lf indicating soil bearing capacity as required per 24-inch lift.

	and between 4% of dry weight and optimum for gravel backfill.		
Utility and Piping in Cultivated Areas	90% of ASTM D698 maximum dry density. Moisture shall be between optimum and +6% of optimum for earth backfill and between 4% of dry weight and optimum for gravel backfill.	ASTM D6938	One (1) approved test per 300 lf indicating soil bearing capacity as required per 24-inch lift.
Subgrade for Paving	95% of ASTM D698 maximum dry density. Moisture shall be $\pm 3\%$ of optimum moisture content. Moisture content shall not exceed 30%.	ASTM D6938	One (1) approved test per 2000 sf indicating soil bearing capacity as required.
Subgrade for Levee Embankment	95% of ASTM D698 maximum dry density + 1% below to 3% above optimum moisture content.	ASTM D6938	One (1) approved test per 100 lf indicating soil bearing capacity as required.
Structural Backfill within Levees	95% of ASTM D698 maximum dry density + 1% below to 3% above optimum moisture content.	ASTM D6938	One (1) approved test per 50 if with a minimum of two (2) approved density tests indicating soil bearing

			capacity as required per 8-inch lift.
Utility and Pipe Trench Impervious Backfill within Levees	95% of ASTM D698 maximum dry density + 1% below to 3% above optimum moisture content.	ASTM D6938	One (1) approved test per 100 if indicating soil bearing capacity as required per 8-inch lift.
Impervious Levee Inspection Trench Impervious Levee Embankment	95% of ASTM D698 maximum dry density + 1% below to 3% above optimum moisture content.	ASTM D6938	One (1) approved test per 100 if indicating soil bearing capacity as required per 8-inch lift.

2. Granular Materials Testing:

Item	Parameter	Test Method	Frequency
Structure Aggregate Base / Pipe Bedding Material / Road Aggregate Base	Sieve Analysis	ASTM C136	One (1) per 1,000 CY or 1,500 tons of Material

3. Concrete Specimens:

- a. Cast four (4) cylinders per set – one (1) at 7 days, two (2) at 28 days, and one (1) for 54 days.
- b. Cast one set of cylinders for five (5) cubic yards or larger per unit or structure. Cast an additional set of cylinders for each additional 150 cubic yards of cast-in-place concrete or masonry grout.
- c. Cylinders (2 per set) shall be field cured.
- d. Standard tests to be performed on fresh concrete each time cylinders are cast are slump, air content, and temperature.
- e. Concrete temperature shall be tested hourly, and recorded, when air temperature is 40 degrees F and below, and when 80 degrees F and above.
- f. See Drawings for or Code Required Special Inspections for additional requirements.

PART 2 - PRODUCTS

2.01 NOT USED

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual specification sections.
- D. Verify that utility services are available, of the correct characteristics, and in the correct locations.

3.02 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

END OF SECTION

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SECTION 01 52 00
CONSTRUCTION FACILITIES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Construction Trailers and Sheds.
2. First Aid Facilities.
3. Sanitary Facilities.
4. Temporary Housing.
5. Progress Cleaning and Waste Removal.
6. Removal of Construction Facilities.

1.02 CONSTRUCTION AND SHEDS

- A. Construction trailers or sheds: At CONTRACTOR's option. Coordinate locations with OWNER.
- B. Locate Field Offices and construction trailer or shed a minimum distance of 30 feet from existing and new structures. OWNER's approval of location is required.
- C. CONTRACTOR responsible for Temporary Utilities to feed Construction Facilities.

1.03 TEMPORARY SANITARY FACILITIES

- A. CONTRACTOR shall provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide from time of project mobilization to final completion.

1.04 FIRST AID FACILITIES

- A. First aid facilities shall be provided and maintained by the CONTRACTOR in accordance with all federal, state, and local laws and regulations.

1.05 TEMPORARY HOUSING

- A. OWNER will not allow temporary housing on-site.

1.06 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipes, excavations, work areas, and other closed or remote spaces, prior to enclosing the space.
- C. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.
- D. CONTRACTOR shall maintain site clean and free of obstructions that may cause injuries or otherwise prevent staff (OWNER, ENGINEER, CONTRACTORS, etc.) from performing their job effectively.

1.07 REMOVAL OF CONSTRUCTION FACILITIES

- A. Remove temporary utilities, equipment, facilities, and materials, prior to Final Application for Payment inspection.
- B. Remove underground installations as required. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 54 00
CONSTRUCTION AIDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Construction Aids.
 - 2. Protection of Installed Work.
 - 3. Temporary Construction Protection.

1.02 GENERAL

- A. Provide and maintain required construction aids, remove upon completion of work.
- B. Modify or remove as required to accommodate each construction phase and as independent components of project are completed.
- C. Comply with all Federal, State, and Local codes and regulations.
- D. Nothing in the specification shall be interpreted as contrary to minimum safety requirements of OSHA and other regulatory authorities. In case of conflict the strictest regulation shall govern. CONTRACTOR shall provide the appropriate design of construction aids to facilitate work and meet the actual required conditions for the work.

1.03 CONSTRUCTION AIDS

- A. Provide construction aids and equipment required by personnel and to facilitate the execution of the Work: scaffolds, staging, shoring and bracing, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes, and other such facilities and equipment.
- B. Maintain all facilities and equipment in an operable, clean and fully functional condition.
- C. Store and protect construction aids when not in direct use for the Work.

1.04 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at pipe openings, manholes, and all structures.
- D. Protect roadways, access drives, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon finished subgrade or areas with restored topsoil surfaces.

F. Prohibit traffic from landscaped areas.

1.05 TEMPORARY CONSTRUCTION PROTECTION

- A. CONTRACTOR shall provide and maintain temporary supports, shoring, and bracing as required for protection of work.
- B. CONTRACTOR shall assure the adequacy of all temporary shoring and bracing.
- C. Repair or replace damaged work occasioned by inadequate temporary supports, shoring, or bracing.
- D. Leave temporary supports, shoring, and bracing in place until permanent construction is complete to point where installed work is properly supported.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 55 00
VEHICULAR ACCESS AND PARKING AREAS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Parking.
 - 2. Temporary Access Roads.
 - 3. Traffic Control.
 - 4. Entrance Road.
 - 5. Haul Routes.

1.02 COORDINATION

- A. CONTRACTOR shall coordinate parking, access roads, traffic control, entrance roads and haul routes with on-site and nearby construction projects.

1.03 PARKING

- A. CONTRACTOR and personnel shall park all personal vehicles in an area acceptable to OWNER and applicable property OWNERS.
- B. CONTRACTOR shall provide and maintain a surface suitable for parking vehicles.

1.04 ACCESS ROADS

- A. Maintain access roads leading into Site and parking areas.
- B. Provide means of removing mud from vehicle wheels before entering streets and roads.
- C. Construct and maintain temporary roads accessing public roads to serve construction areas.
- D. Temporary construction entrances shall be constructed as indicated in the specifications or contract drawings.

1.05 TRAFFIC CONTROL

- A. CONTRACTOR shall maintain two-way traffic at all times on all impacted roadways.
- B. CONTRACTOR shall provide and maintain signs, warning lights, and barricades to adequately protect warn and protect the public from hazardous protrusions, materials, excavations, and equipment resulting directly or indirectly from construction activities.
- C. All traffic control devices including signs, warning lights, and barricades shall conform to the requirements of the North Dakota Manual on Uniform Traffic Control Devices.

- D. Traffic control setup and layout shall conform to requirements of the manual for Traffic Control Zone Layouts (field manual) and shall be the sole responsibility of the CONTRACTOR.
- E. CONTRACTOR shall give OWNER and ENGINEER at least 48 hours' notice prior to a partial blockage or closure of any street or public right of way. When working in the right of way of county roads, CONTRACTOR shall be responsible for acquiring the necessary permits for working in a right-of-way.
- F. Traffic control devices shall be inspected daily. Warning lights should be checked for proper operation and cleaned as required. All broken or ineffective traffic control devices shall be replaced immediately.
- G. CONTRACTOR shall designate an individual and one alternate to have responsible charge of proper installation and maintenance of the traffic control devices. These individuals shall be available on a 24-hour on call basis.

1.06 ENTRANCE ROAD

- A. The CONTRACTOR shall coordinate site construction entrance with OWNER and active on-going construction projects at the wastewater treatment plant.

1.07 HAUL ROUTES

- A. The CONTRACTOR shall take whatever steps are necessary to ensure that no overloading is done and road restrictions are followed by all suppliers and Sub-CONTRACTORS. This will insure that no city, township, county, state or other restrictions are violated. It shall be the responsibility of the CONTRACTOR to familiarize himself with all local regulations before starting construction. Any road damaged by the CONTRACTOR shall be repaired to the original condition at the CONTRACTOR's expense, to the satisfaction of the ENGINEER.

1.08 REMOVAL OF ACCESS FACILITIES

- A. Remove temporary facilities and materials, prior to Final Application for Payment inspection.
- B. Clean and repair damage caused by installation or use of temporary work.
- C. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 55 29
STAGING AREAS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Staging Areas.
 - 2. Stockpile Areas

1.02 STAGING AREAS

- A. CONTRACTOR shall coordinate and utilize only areas within the construction limits for construction facilities, storage of materials and equipment, parking, and staging operations.
- B. The areas and grounds utilized shall be left clean and restored to original condition.
- C. CONTRACTOR shall be responsible for coordination of construction, staging, and temporary stockpile activities with OWNER.

1.03 STOCKPILE AREAS

- A. CONTRACTOR shall stockpile excess material from excavations in locations acceptable to OWNER.
- B. CONTRACTOR shall make arrangements to stockpile materials within areas of the Construction limits.
- C. CONTRACTOR shall coordinate construction, staging, and stockpile activities and OWNER shall not be responsible for any additional charges due to moving of staging and/or stockpile materials multiple times.
- D. Temporary and final stockpiles shall be maintained during construction and protected from erosion.
- E. The areas and grounds utilized shall be left clean and restored to original condition.

1.04 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. Prohibit traffic from landscaped areas.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 56 00
TEMPORARY BARRIERS AND ENCLOSURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Temporary Fencing.
 - 2. Temporary Barriers.
 - 3. Temporary Enclosures.
 - 4. Temporary Construction Protection.
 - 5. Security.

1.02 TEMPORARY FENCING

- A. Provide fencing around open excavation areas.

1.03 TEMPORARY BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for OWNER's use of site, and to protect existing facilities and adjacent properties from damage from construction operations.
- B. Provide protection for plants designated to remain. Replace damaged plants.
- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.04 TEMPORARY ENCLOSURES

- A. Not Used.

1.05 TEMPORARY CONSTRUCTION PROTECTION

- A. Shoring and Bracing:
 - 1. CONTRACTOR shall provide and maintain temporary supports, shoring, and bracing as required for safety and protection of work.
 - 2. CONTRACTOR shall assure the adequacy of all temporary shoring and bracing.
 - 3. Repair or replace damaged work occasioned by inadequate temporary supports, shoring, or bracing.
 - 4. Leave temporary supports, shoring, and bracing in place until permanent construction is complete to point where installed work is properly supported.

1.06 SECURITY

- A. Provide security and facilities to protect Work, and existing facilities, and OWNER's operations from unauthorized entry, vandalism, or theft.
- B. Upon completion of this Work, CONTRACTOR shall ensure doors and gates are locked and secure. No claims shall be made against ENGINEER or OWNER for any act of an employee or trespasser, and CONTRACTOR shall make good on

any damage to OWNER's property, resulting from CONTRACTOR's failure to provide sufficient security in the absence of the ENGINEER and OWNER.

- C. CONTRACTOR to discuss security with his employees and sub-CONTRACTORS and advise them to immediately report anything suspicious which could be a security issue.

1.07 REMOVAL OF TEMPORARY BARRIERS AND ENCLOSURES

- A. Remove temporary barriers and enclosures, prior to Final Application for Payment inspection.
- B. Remove underground installations as required. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 57 00
TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Temporary Erosion and Sediment Control.
2. Storm Water Pollution Control.
3. Environmental Control
4. Tree Protection.

1.02 TEMPORARY EROSION AND SEDIMENT CONTROL

A. Storm Water Permits

1. CONTRACTOR shall obtain all necessary permits from Watershed Districts, OWNER, and/or responsible regulatory agencies for temporary erosion control measures.
2. CONTRACTOR shall obtain an NPDES storm water permit for construction disturbing more than one acre of area in conjunction with the OWNER.
3. CONTRACTOR shall provide and maintain all best management practices necessary for erosion prevention, sediment control, dewatering and basin draining, and pollution prevention management measures at the Site in accordance with the requirements of the NPDES Storm Water permit and associated storm water pollution prevention plan (SWPPP) or erosion control plan to be submitted to the NDDEQ following award of the contract and prior to beginning construction.
4. The following paragraphs outline general best management practices that will be included in the SWPPP submitted to the NDDEQ prior to construction. The SWPPP and NPDES shall be located at the site at all times during the construction. CONTRACTOR shall meet the general requirements as outlined below and any additional requirements required as a part of the review and approval of the NPDES storm water permit and SWPPP.

B. Erosion Prevention Practices:

1. CONTRACTOR shall schedule construction activities and conduct operations so as to minimize erosion of soils.
2. CONTRACTOR shall phase construction activities to minimize the amount of disturbed areas at one time. Provide temporary seeding, vegetative buffer strips, mulch or wood fiber blanket, and/or sod stabilization in disturbed areas not being actively worked and not yet ready for final grading and stabilization. The permit limits the amount of time soils can remain unstabilized:
 - a. Slopes steeper than 3:1 – within 7 days.
 - b. Slopes from 10:1 to 3:1 – within 14 days.
 - c. Slopes flatter than 10:1 – within 21 days.
3. Temporary sediment control basins may also be necessary for steep slope areas or high erodible soils. CONTRACTOR shall construct

temporary sediment control basins as necessary to meet additional requirements following review and approval of the NPDES storm water permit and associated SWPPP.

C. Sediment Control Practices:

1. Provide temporary measures such as silt fencing, berms, dikes, and turf establishment to prevent erosion. Construct drainage facilities and turf establishment concurrently with earthwork operations.
2. Incorporate erosion control measures at the earliest practical time during construction. Provide erosion control measures as directed prior to the disturbance of in-place ground cover in critical areas which area tributary to public waters.
3. CONTRACTOR shall maintain all temporary erosion control measures throughout the duration of the project and remove them upon completion of permanent erosion control measures and turf establishment.
4. Protect all existing and new storm drain inlets.
5. Control temporary soil stockpiles.
6. Control vehicle tracking with stone pads, concrete, steel wash racks, or equivalent.
7. Provide gravel construction entrances at field entrances to the Site.
8. Remove sediment tracked onto streets within 24 hours of detection.

D. Inspections and Maintenance of SWPPP:

1. Shall be conducted by OWNER, CONTRACTOR, or designee.
2. Occur every seven days.
3. Occur within 24 hours of ½" storm.
4. Be routinely recorded and kept with the SWPPP.
5. Occur once a month on final stabilized area.
6. Ensure integrity and effectiveness of erosion prevention and sediment control measures.
7. Repair or replace nonfunctional best management practices or erosion control measures.
8. Drain and remove sediment from basins.
9. Inspect surface waters, drainage ditches and conveyance systems for sediment.
10. Remove sediment deposits and stabilize any exposed soil during sediment removal.
11. Inspect and clean vehicle exits.
12. Ensure infiltration areas are protected.

1.03 STORM WATER POLLUTION CONTROL

- A. The minimum requirements are set forth by the North Dakota Department of Environmental Quality. They insure that minimal environmental degradation occurs as a result of construction or related work which has the potential to affect the waters of the State of North Dakota. All activities will be designed and implemented to restrict the losses or disturbances of soil, vegetative cover, and pollutants (chemical, physical, or biological) from the Site.
- B. Pollution Prevention Management Measures:

1. CONTRACTOR shall provide proper collection and disposal of solid waste. All construction debris and solid waste shall be contained in dumpsters or roll off boxes. All dumpsters and roll off boxes shall be located behind erosion control devices and a minimum of 10 feet from any catch basin structure.
 2. All construction material shall be stored in an orderly manner.
 3. All chemicals on site shall be kept in sealed containers with their original labeling and Material Safety Data sheets available.
 4. All appropriate agencies shall be notified of any spill of fuel, oil, or other hazardous chemicals immediately upon detection.
 5. Establish a specific truck washing site.
 6. There shall be no on site engine degreasing.
- C. Protection of Surface Waters:
1. All construction which directly or indirectly impacts on aquatic systems will be managed to minimize impacts. All attempts will be made to prevent the contamination of water at construction sites from fuel spillage, lubricants, and chemicals, by following safe storage and handling procedures. Stream bank and stream bed erosion and disturbances will be controlled to minimize and/or prevent silt movement, nutrient upsurges, plant dislocation, and any physical, chemical, or biological disruption. The use of pesticides or herbicides in or near these systems is forbidden without approval from the appropriate governing agency.

1.04 ENVIRONMENTAL CONTROL

A. Dust Control:

1. CONTRACTOR shall be responsible for dust control throughout the duration of the Project.
2. Work shall be executed by methods to minimize raising dust from construction operations.
3. Provide appropriate dust control measures as required to prevent excessive dust from dispersing into the air.
4. The use of petroleum products is prohibited.

B. Noise Control:

1. CONTRACTOR shall be responsible for noise control throughout the duration of the Project.
2. Avoid the use of tools and equipment, which produce harmful noise. Provide personal hearing protection devices as necessary for CONTRACTOR's and OWNER's personnel.
3. Restrict the use of noise making tools and equipment to required hours of construction, if required by OWNER or Drawings.

1.05 PROGRESS CLEANING AND WASTE REMOVAL

- A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
- B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

- C. Broom and vacuum daily and mop weekly. Clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust. If OWNER is not satisfied with CONTRACTOR's cleaning efforts, OWNER reserves the right to charge Liquidated Damages for charges from a 3rd Party to appropriately clean the facilities.
- D. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.
- E. CONTRACTOR shall maintain site clean and free of obstructions that may cause injuries or otherwise prevent staff (OWNER, ENGINEER, CONTRACTORS, etc....) from performing their job effectively.

1.06 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

- A. Remove temporary utilities, equipment, facilities, and materials, prior to Final Application for Payment inspection.
- B. Remove underground installations as required. Grade site as indicated.
- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to original condition. Restore permanent facilities used during construction to specified condition.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 61 00
COMMON PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Products.
 - 2. Transportation and Handling.
 - 3. Storage and Protection.
 - 4. Product Options.
 - 5. Substitutions.
- B. Related Sections include, but are not limited to:
 - 1. Section 00 21 13 – Instructions to Bidders.
 - 2. Section 00 72 00 – General Conditions.
 - 3. Section 00 73 00 – Supplementary Conditions.
 - 4. Section 01 45 00 – Quality Control.

1.02 PRODUCTS

- A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying, and erection of the Work. Products may also include existing materials or components designated for re-use.
- B. All products that may come into contact with water intended for use in a public water system shall meet American National Standards Institute (ANSI)/National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each product.
- C. Do not use materials and equipment removed from existing premises, except as specifically permitted by the Contract Documents.
- D. Provide interchangeable components of the same manufacturer for components being replaced.

1.03 TRANSPORTATION AND HANDLING

- A. Transport and handle Products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to ensure that Products comply with requirements, quantities are correct, and Products are undamaged.
- C. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.04 STORAGE AND PROTECTION

- A. Store and protect Products in accordance with manufacturers' instructions.

- B. Store with seals and labels intact and legible.
- C. Store sensitive Products in weather tight, climate controlled, enclosures in an environment favorable to Product.
- D. For exterior storage of fabricated Products, place on sloped supports above ground.
- E. Provide bonded off-site storage and protection when site does not permit on-site storage or protection.
- F. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of Products.
- G. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- H. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage.
- I. Arrange storage of Products to permit access for inspection. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition.
- J. CONTRACTOR shall be responsible to arrange for, receive, inspect, and unload all shipments of materials or equipment. CONTRACTOR shall provide haul route information to shipping companies.

1.05 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only: Any Product meeting those standards or description.
- B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. Products Specified by Naming One or More Manufacturers with an option for an "Or Equal" or "Approved Equivalent" or "Prior Approved Equivalent" Manufacturer: Submit a request for the "or equal/approved equivalent" in accordance with the following substitutions article. Requests and ENGINEER's acceptance of "Or Equal" or "Approved Equal" or "Prior Approved Equivalent" Manufacturers is allowed during bidding only.

1.06 SUBSTITUTIONS

- A. See Specification Section 01 25 00 Substitution Procedures.
- B. "Or-Equal" or "Approved Equivalent" or "Acceptable" or "Prior Approved Equivalent" products will be considered only if written request is made at least 10 days prior to Bid opening.
- C. Substitutions will be considered when a Product becomes unavailable through no fault of the CONTRACTOR.

- D. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- E. A request constitutes a representation that the CONTRACTOR:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to OWNER.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse OWNER and ENGINEER for redesign services associated with re-approval by authorities.
- F. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- G. Substitution Submittal Procedure:
 - 1. Submit two (2) copies of request for consideration. Limit each request to one proposed Substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 - 3. Fully identify the substitutions effects on all facets of the Work and construction schedule.
 - 4. The ENGINEER will notify CONTRACTOR in writing of decision to accept or reject request.
 - 5. Accepted substitutions will be listed by addendum.

PART 2 - PRODUCTS

2.01 UNIFORMITY

- A. For any type of similar equipment, i.e., motors, drive units, etc., provide equipment of the same manufacturer.
- B. Inform all subCONTRACTORS and suppliers of the selected manufacturers to ensure equipment uniformity.
- C. Obtain each separate type of product from the same manufacturer.

2.02 TOOLS

- A. For any equipment or equipment components requiring special tools, the CONTRACTOR shall supply the OWNER with such tools to allow for the maintenance and removal/replacement of equipment components.

2.03 CONSUMABLES

- A. Provide OWNER with all consumable items that are required during start-up and initial operation (90 days minimum) of all Project components including, but not limited to; coolant, fluids, oil, grease, other lubricants, filters, bulbs, batteries, etc.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install all equipment in full compliance with the manufacturer's recommendations.
- B. Obtain services of qualified and approved factory representatives to install, check, and approve the installation of all equipment.
- C. Service representative:
 - 1. Present for the start-up and initial operation of all equipment.
 - 2. Certify in writing that:
 - a. Equipment is properly installed and ready for operation.
 - b. Equipment properly aligned.
 - c. Direction of rotation checked.
 - d. Lubrication is proper.
 - e. Unit is free from undue stress from connecting pipe or anchorage.
 - f. Unit has operated at full load conditions.
 - g. Unit has operated in full compliance with the project specifications and the manufacturer's recommendations.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING

PART 1 - GENERAL

1.01 SUMMARY

- A. This Section includes:
 - 1. Requirements and limitations for cutting and patching of Work.
- B. Related Sections include:
 - 1. Section 01 10 00 – Summary of Work.
 - 2. Section 01 33 00 – Submittal Procedures.
 - 3. Section 01 61 00 – Common Product Requirements.
 - 4. Individual Product Specification Sections:
 - a. Cutting and patching incidental to Work of this Section.
 - b. Advance notification to other Sections of openings required in Work of those Sections.

1.02 SUBMITTALS

- A. Submit written request in advance of cutting or alteration that affects:
 - 1. Structural integrity of any element of Project.
 - 2. Integrity of weather exposed or moisture resistant element.
 - 3. Efficiency, maintenance, or safety of any operational element.
 - 4. Visual qualities of sight exposed elements.
 - 5. Work of Owner or separate contractor(s).
- B. Include in request:
 - 1. Identification of Project.
 - 2. Location and description of affected Work.
 - 3. Necessity for cutting or alteration.
 - 4. Description of proposed Work and Products to be used.
 - 5. Alternatives to cutting and patching.
 - 6. Effect on work of Owner or separate contractor(s).
 - 7. Written permission of affected separate contractor(s).
 - 8. Date and time Work will be executed.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Those required for original installation.
- B. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 61 00 – Common Product Requirements.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.
- B. After uncovering existing Work, assess conditions affecting performance of Work.
- C. Understand and become familiar with required coating systems, application requirements, and spatial concerns, issues, and dimensions required to perform the Work.
- D. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

- A. Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- B. Provide protection from elements for areas that may be exposed by uncovering Work.
- C. Maintain excavations free of water.
- D. Verify that all materials are clean and free from defects.

3.03 CUTTING

- A. Execute cutting and fitting to complete the Work.
- B. Uncover work to install improperly sequenced Work.
- C. Remove and replace defective or non-conforming Work.
- D. Remove samples of installed Work for testing, when requested.
- E. Coordinate openings in the Work for penetration of process, mechanical and electrical Work.
- F. Employ original installer of new Work to perform cutting for weather exposed and moisture resistant elements, and sight-exposed surfaces. Employ experienced personnel or original supplier for applying specialized coating systems.
- G. Cut rigid materials, masonry, prestressed concrete, and concrete using masonry saw or core drill. Pneumatic tools not allowed without prior approval. Protect finished water reservoirs from materials produced during saw cutting and core drilling.

3.04 PATCHING

- A. Execute patching to complement adjacent Work.
- B. Fit Products together to integrate with other Work.
- C. Execute Work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- D. Employ original installer of new Work to perform patching for weather and moisture resistant elements, and sight-exposed surfaces.

- E. Restore Work with new Products in accordance with requirements of Contract Documents.
- F. Fit Work airtight and water tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- G. Maintain integrity of wall, ceiling, or floor construction; completely seal voids.
- H. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
- I. Identify any hazardous substance or condition exposed during the Work to the Architect/Engineer for decision or remedy.

3.05 ALTERATION PROJECT PROCEDURES

- A. Materials: As specified in Product sections; match existing Products and Work for patching and extending Work.
- B. Employ skilled and experienced installer to perform alteration Work.
- C. Close openings in exterior surfaces to protect existing Work from weather and extremes of temperature and humidity.
- D. Remove, cut, and patch Work in a manner to minimize damage and to provide means of restoring Products and finishes to original or specified condition.
- E. Refinish existing visible surfaces to remain in renovated rooms and spaces, to renewed condition for each material, with a neat transition to adjacent finishes.
- F. Where new Work abuts or aligns with existing, provide a smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.
- G. When finished surfaces are cut so that a smooth transition with new Work is not possible, terminate existing surface along a straight line at a natural line of division and submit recommendation to Engineer for review.
- H. Where a change of plane of 1/4 inch or more occurs, submit recommendation for providing a smooth transition; to Engineer for review request instructions from Engineer.
- I. Patch or replace portions of existing surfaces that are damaged, lifted, discolored, or showing other imperfections.
- J. Finish surfaces as specified in individual Product Sections.

END OF SECTION

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SECTION 01 77 00
CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Closeout Procedures.
2. Substantial Completion.
3. Final Completion.
4. Final Cleaning.
5. Project Record Documents.
6. Spare parts and Maintenance Products.
7. Warranties and Bonds.
8. Maintenance Service.
9. Final Adjustment of Accounts.

B. Related Sections include:

1. Section 00 72 00 – General Conditions.
2. Section 00 73 00 – Supplementary Conditions.
3. Section 01 31 13 – Project Coordination.
4. Section 01 50 00 – Temporary Facilities and Controls.
5. Section 01 75 00 – Starting and Adjusting.
6. Section 01 78 23 – Operation and Maintenance Data.

1.02 CLOSEOUT PROCEDURES

- A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for ENGINEER's review.
- B. Provide submittals to ENGINEER that are required by governing or other authorities.
- C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.
- D. OWNER will occupy all portions of the Project.

1.03 SUBSTANTIAL COMPLETION

- A. Prior to substantial completion CONTRACTOR shall review Contract Documents for items which are not complete or need to yet be completed including submittal of all manuals, and testing reports. CONTRACTOR shall make a list of incomplete work, a value of the incomplete work, and reasons why work is incomplete. CONTRACTOR shall complete all items required to be completed as part of substantial completion.
- B. CONTRACTOR shall provide a written notice to ENGINEER that the work, or specific portions of the work, is substantially complete and ready for review. If there are any items remaining to be corrected or completed CONTRACTOR shall

submit a list of these items along with the notice of substantial completion. Along with the list of items the CONTRACTOR should provide a written explanation of why these items are not considered necessary for substantial completion.

- C. Upon receipt of CONTRACTOR'S notice of substantial completion, ENGINEER will proceed with inspection for substantial completion.
- D. Following the substantial completion inspection by the ENGINEER and ENGINEER'S subconsultants, ENGINEER will either prepare certificate of substantial completion, or notify the CONTRACTOR in writing that substantial completion has not been meant listing the various reasons.
- E. CONTRACTOR shall promptly complete the items required to meet substantial completion and submit a second notice of substantial completion to the ENGINEER.
- F. ENGINEER will review the work a second time to determine the status of substantial completion.
- G. When ENGINEER considers the project to be substantially complete, ENGINEER will prepare the preliminary certificate of substantial completion along with a substantial completion punch list of items to be completed prior to final payment. ENGINEER will deliver preliminary certificate and punch list to OWNER and consider any objections by the OWNER as provided in the Conditions of the Contract.
- H. Upon agreement by OWNER and ENGINEER of substantial completion and punch list items, ENGINEER will execute and deliver to the CONTRACTOR and OWNER a final certificate of substantial completion along with substantial completion punch list of items to be completed prior to final payment.
- I. A maximum of two (2) reviews of substantially complete work will be completed by ENGINEER and ENGINEER'S subconsultants for any one portion of work under the Contract. Should a third or subsequent reviews be necessary the following requirements will be met:
 - 1. OWNER will compensate ENGINEER for additional reviews.
 - 2. OWNER will deduct the amount of compensation paid to the ENGINEER for additional reviews from the payment to the CONTRACTOR.
 - 3. Compensation shall be at ENGINEER'S standard hourly rates plus actual cost of reimbursables.

1.04 FINAL COMPLETION

- A. Following substantial completion CONTRACTOR shall complete remaining work and items to be corrected as part of substantial completion punch list as well as final cleaning and transferring site to OWNER.
- B. When CONTRACTOR considers that all work is complete, CONTRACTOR shall provide written notice of final completion to ENGINEER.
- C. Following receipt of final completion certification, ENGINEER and ENGINEER'S subconsultants shall review the work to verify that the requirements for final

completion have been met.

- D. Upon review of work for final completion ENGINEER will either request the CONTRACTOR to make closeout submittals or will notify CONTRACTOR that the work is not complete with a list of incomplete or defective work. CONTRACTOR shall promptly take steps to correct all listed deficiencies and incomplete work before sending a second written notice of final completion certification to ENGINEER.
- E. If final completion was not met following first review, ENGINEER will review work a second time to determine if the requirements for final completion have been met.
- F. A maximum of two (2) reviews of final complete work will be completed by ENGINEER and ENGINEER'S subconsultants for any one portion of work under the Contract. Should a third or subsequent reviews be necessary the following requirements will be met:
 - 1. OWNER will compensate ENGINEER for additional reviews.
 - 2. OWNER will deduct the amount of compensation paid to the ENGINEER for additional reviews from the payment to the CONTRACTOR.
 - 3. Compensation shall be at ENGINEER'S standard hourly rates plus actual cost of reimbursables.
- G. When ENGINEER considers all work to be complete in accordance with the Contract Documents, ENGINEER shall request the CONTRACTOR to make closeout submittals.

1.05 FINAL CLEANING

- A. Execute final cleaning prior to final project assessment.
- B. Clean debris from gutters and drainage systems.
- C. Clean site; sweep paved areas, rake clean landscaped surfaces.
- D. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.06 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 - 1. Drawings.
 - 2. Specifications.
 - 3. Addenda.
 - 4. Change Orders and other modifications to the Contract.
 - 5. Reviewed Shop Drawings, Product Data, and Samples.
 - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling current and future reference by OWNER and ENGINEER.
- C. Store record documents separate from documents used for construction.

- D. Record information concurrent with construction progress.
 - E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 - 1. Manufacturer's name and product model and number.
 - 2. Product substitutions or alternates utilized.
 - 3. Changes made by Addenda and modifications.
 - F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 - 1. Measured depths of foundations in relation to finish first floor datum.
 - 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
 - 4. Field changes of dimension and detail.
 - 5. Details not on original Contract drawings.
 - G. Submit documents to ENGINEER with claim for final Application for Payment.
- 1.07 SPARE PARTS AND MAINTENANCE PRODUCTS
- A. Provide spare parts, maintenance, and extra Products in quantities specified in individual specification sections.
 - B. Deliver to Project site and place in location as directed by OWNER; obtain receipt prior to final payment.
- 1.08 WARRANTIES AND BONDS
- A. Provide duplicate notarized copies.
 - B. Execute and assemble transferable warranty documents from SubCONTRACTORS, suppliers, and manufacturers.
 - C. Provide Table of Contents and assemble in D size three ring binders with durable plastic cover.
 - D. Submit prior to final Application for Payment.
 - E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within 10 days after acceptance.
- 1.09 MAINTENANCE SERVICE
- A. Furnish service and maintenance of components during the warranty period.
 - B. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.
 - C. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

- D. Maintenance service shall not be assigned or transferred to any agent or SubCONTRACTOR without prior written consent of the OWNER.

1.10 FINAL ADJUSTMENT OF ACCOUNTS

- A. CONTRACTOR shall submit a final statement of accounting to ENGINEER. Statement shall reflect all adjustments to the contract sum and include the following:
 - 1. Original contract sum.
 - 2. Additions and deductions resulting from:
 - a. All previous change orders
 - b. Allowances
 - c. Unit prices
 - d. Deductions for uncorrected work
 - e. Penalties and bonuses
 - f. Deductions for liquidated damages
 - g. Deductions for multiple reviews
 - h. Other adjustments
 - 3. Total contract sum as adjusted.
 - 4. Previous payments.
 - 5. Sum remaining due.
- B. ENGINEER will prepare a final change order, reflecting approved adjustments to the contract sum which were not previously made by change orders.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Quality Assurance.
 - 2. Format.
 - 3. Contents of Each Volume.
 - 4. Manual for Equipment and Systems.
 - 5. Instruction of OWNER's personnel.
 - 6. Submittals.
- B. Related Sections include:
 - 1. Section 01 33 00 – Submittal Procedures.
 - 2. Section 01 45 00 – Quality Control.
 - 3. Section 01 77 00 – Closeout Procedures.

1.02 QUALITY ASSURANCE

- A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.03 FORMAT

- A. Prepare data in the form of an instructional manual. Arrange data in numerical format.
 - 1. Binders:
 - a. Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers.
 - b. 2 inch maximum ring size.
 - c. When multiple binders are used, correlate data into related consistent groupings.
 - 2. Cover; Identify:
 - a. Each binder with typed title OPERATION AND MAINTENANCE INSTRUCTIONS.
 - b. Title of Project.
 - c. Subject matter of contents.
 - d. Volume number.
 - e. Year of construction.
 - 3. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
- B. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
- C. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages. Folded paper should be unfoldable without removal from binder.

- D. Contents: Prepare a Table of Contents for each volume, with each Product or system description identified, in three parts as follows:
1. Part 1: Directory, listing names, addresses, and telephone numbers of ENGINEER, CONTRACTOR, SubCONTRACTORS, and major equipment suppliers.
 2. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of SubCONTRACTORS and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 3. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Certificates.
 - c. Photocopies of warranties.
 - d. Bonds.
- E. Flash Drive:
1. A flash drive shall be provided with all documents included with an index, tabs, and labels as previously required for the binders.

1.04 CONTENTS OF EACH VOLUME

- A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of ENGINEER, Subconsultants, and CONTRACTOR with name of responsible parties; schedule of products and systems, indexed to content of the volume.
- B. For Each Product or System: List names, addresses and telephone numbers of SubCONTRACTORS and suppliers, including local source of supplies and replacement parts.
- C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
- D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
- E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- F. Warranties: Prepare and submit per Section 01 77 00 – Closeout Procedures.
- G. Bonds: Prepare and submit per Section 01 77 00 – Closeout Procedures.
- H. Flash Drive: A flash drive shall be provided with all volume contents in electronic format or scanned to a portable document file (.pdf). The documents shall be

placed as required under the appropriate tabs and labels as previously required for the compact discs. Each file shall be adequately labeled to identify the contents without opening the document.

1.05 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Each Item of Equipment and Each System: Include description of unit or system, and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- B. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- C. Provide servicing and lubrication schedule, and list of lubricants required.
- D. Include manufacturer's printed operation and maintenance instructions.
- E. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- F. Provide CONTRACTOR's coordination drawings, with color coded piping diagrams as installed.
- G. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- H. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage, and local sources of supply.
- I. Additional Requirements: As specified in individual Product specification sections.
- J. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.
- K. Flash Drive: A flash drive shall be provided with all manuals in electronic format or scanned to a portable document file (.pdf). The documents shall be placed as required under the appropriate tabs and labels as previously required for the compact disc. Each file shall be adequately labeled to identify the contents without opening the document.

1.06 INSTRUCTION OF OWNER PERSONNEL

- A. Before final inspection, instruct OWNER's designated personnel in operation, adjustment, and maintenance of products, equipment, and systems, at agreed upon times.
- B. For equipment requiring seasonal operation, perform instructions for other seasons within six months.

- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with personnel in detail to explain all aspects of operation and maintenance.
- D. Prepare and insert additional data in Operation and Maintenance Manual when need for such data becomes apparent during instruction.

1.07 SUBMITTALS

- A. Submit electronic copies of preliminary draft or proposed formats and outlines of contents before Substantial Completion. ENGINEER will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by OWNER, submit documents within ten days after acceptance.
- C. Submit electronic copies of completed volumes fifteen (15) working days prior to final inspection. One (1) copy will be returned after final inspection, with ENGINEER comments. Revise content of all document sets as required prior to final submission.
- D. Submit two (2) sets of revised final volumes in final form within ten (10) days after final inspection.
- E. Submit a minimum of two (2) complete copies of the flash drives with final documents in electronic format within then (10) days after final inspection.

PART 2 - PRODUCTS

2.01 NOT USED.

PART 3 - EXECUTION

3.01 NOT USED.

END OF SECTION

SECTION 01 79 50
FINAL INSPECTION AND ACCEPTANCE

Contractor: _____

Address: _____

Project: Fargo WWTP Flood Protection Improvements
 FEMA PROJECT No. PDMC-PJ-08-ND-2018-023
 City of Fargo Project No. WW1707
 Fargo, ND

Contract: _____

On this date, _____, 20____, a final inspection of the project as constructed has been made.

The CONTRACTOR hereby certifies that the construction has been performed in accordance with the plans and specifications, approved Change Orders, and terms of the contract. The CONTRACTOR further certifies that there are no unpaid bills or labor disputes in connection with this contract and that the amount of \$ _____ shown on the final estimate is the total amount due for all Work completed for the project.

The OWNER does hereby agree that all construction and engineering Work on the project is complete and does satisfy all terms of appropriate construction or engineering agreements.

The Project ENGINEER has observed the construction and to the best of his or her knowledge the construction has been performed in accordance with the plans, specifications, approved change orders, and terms of the contract and that the facility has been inspected and approved by all agencies having jurisdiction.

OWNER and CONTRACTOR do hereby acknowledge that the one year correction period will begin on _____, 20____.

The undersigned give approval of acceptance of the Work construction under the conditions and guarantee of the contract.

AE2S

Project Engineer

By: _____

Date: _____

Contractor

By: _____

Date: _____

City of Fargo

Owner

By: _____

Date: _____

END OF SECTION

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DIVISION 02 EXISTING CONDITIONS

SECTION 02 06 14
GEOTECHNICAL DATA REPORT

SEE ATTACHED REPORT

- 1.01 **GEOTECHNICAL EVALUATION REPORT - FARGO WWTP FLOOD PROTECTION
LEVEE PREPARED BY BRAUN INTERTEC CORPORATION DATED APRIL 14, 2015**
- 1.02 **GEOTECHNICAL TECHNICAL MEMORANDUM - FARGO WWTP FLOOD
PROTECTION 30% DESIGN REVIEW, PREPARED BY BRAUN INTERTEC
CORPORATION DATED OCTOBER 16, 2017.**
- 1.03 **STOCKPILE SUITABILITY LETTER – FARGO RWRF FLOOD PROTECTION
PREPARED BY BRAUN INTERTEC CORPORATION DATED DECEMBER 13, 2023**

END OF SECTION

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Geotechnical Evaluation Report

Fargo WWTP Flood Protection Levee
North Broadway
Fargo, North Dakota

Prepared for

**Advanced Engineering and
Environmental Services, Inc.**

Professional Certification:

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



Nathan L. McKinney, PE
Principal / Senior Engineer
Registration Number: PE - 6735
April 14, 2015



Project B14-02674

Braun Intertec Corporation

April 14, 2015

Project B14-02674

Mr. Dustin Dale
Advanced Engineering and Environmental Services, Inc.
3101 South Frontage Road
Moorhead, MN 56560

Re: Geotechnical Evaluation Report
Fargo WWTP Flood Protection Levee
North Broadway
Fargo, North Dakota


Dear Mr. Dale:

We are pleased to present this Geotechnical Evaluation Report for the Fargo WWTP Flood Protection Levee located at North Broadway in Fargo, North Dakota. The purpose of our evaluation was to assist Advanced Engineering and Environmental Services, Inc. in the design of the proposed flood risk management project. A detailed summary of our results and recommendations are included in the attached report.

Thank you for teaming with Braun Intertec on this project. If you have questions about this report, please call Nate McKinney or Debashis Sikdar at 701.232.8701.

Sincerely,

BRAUN INTERTEC CORPORATION


Debashis Sikdar, PE
Project Engineer


Nathan L. McKinney, PE
Principal / Senior Engineer

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Appendices

- A. Subsurface Results
- B. Laboratory Test Results
- C. Photos
- D. Flood Hydrograph
- E. Analytical Summary
- F. Analyses

A. Introduction

A.1. Project Description

Braun Intertec was retained by Advanced Engineering and Environmental Services, Inc. (AE2S), to provide geotechnical assistance in designing a proposed levee around the Fargo waste water treatment plant (WWTP) located on North Broadway in Fargo, North Dakota. A plan view of the proposed levee is illustrated in Appendix A. The proposed levee will tie into high ground on the north and south sides of the plant. We understand the levee will be placed over several existing utilities, but the location and depth of all utilities is not known.

The proposed levee will rise to an elevation of 901.5 feet which will typically rise above the existing grades by about 8 feet, except in the bowl in the southwest end of the site where it will rise about 17 feet above grade. The levee segments will generally have a 10 foot top width and side slopes of 3:1 (horizontal: vertical).

We understand that the levee will not be certified by FEMA, however, our geotechnical evaluation was completed in general accordance with stability and performance criteria established by FEMA for Riverine Structures.

A.2. Purpose

The purpose of our geotechnical evaluation is to characterize the subsurface geotechnical conditions and evaluate their impact on the design and construction of the proposed levee.

A.3. Background Information and Reference Documents

To aid in our evaluation, we were provided with and/or reviewed the following documents:

- *2014 Flood Protection Plan*, prepared by AE2S, Inc., dated May 22, 2014 (AE2S Project No. P000803-2014-05).
- *Record Drawings, CR20 Force Mains & Incidentals*, prepared by AE2S, Inc., dated, Aug, 2007 and modified on July, 2010 (AE2S Project No. P000803-2007-52).

- *Report of Soil Investigation Proposed Waste Water Treatment Plant Expansion*, Prepared By Midwest Testing Laboratory, Inc., Project No. 4943, dated, February 20, 1990.
- 100-year design flood elevation provided by AE2S.
- Cross sections through the proposed levee with existing ground topography provided by AE2S.
- Consolidated-undrained triaxial shear strength tests that were performed for the adjacent City of Fargo Ridgewood Addition Flood Control Project.
- *Design and Construction of Levees*, Engineer Manual EM 1110-2-1913, dated April 30, 2000, by the USACE.
- *Geology under the Fargo-Moorhead Region*, North Dakota-Minnesota, 2002, by the Department of Geosciences, North Dakota State University.

A.4. Organization of This Report

This report contains a number of appendices whose contents are intended to help illustrate the project scope, geologic conditions, flood characteristics, and the impact of these items on our analyses. The appendices are organized as follows:

- A. **Subsurface Results** – Soil Boring Location Sketch, Levee Alignment, Log of Boring Sheets, Fence Diagram, Descriptive Terminology
- B. **Laboratory Test Results** – Consolidated Undrained Triaxial Shear Tests, p' - q' plots of triaxial data.
- C. **Photos** – taken during reconnaissance on May 23, 2014.
- D. **Flood Hydrograph** – based on flood elevations provided by AE2S and extended out as interpolated from nearby projects.
- E. **Analytical Summary**
- F. **Analyses** – Cross Sections # 1, 2, 3, & 4.

A.5. Scope of Services

Our scope of services was outlined in our February 11, 2014, Proposal to you. Our scope of services was performed under the terms of our September 01, 2013, General Conditions. Tasks associated with our scope of services are described below.

A.5.a. Reconnaissance

We performed a reconnaissance at the project site. We looked for evidence of deep seated and surface instability along slopes near the proposed levee as well as surface drainage impacts near the levee. We also evaluated equipment access to prospective exploration locations. A few slope and drainage features of the project site that were observed during our site reconnaissance and pertinent to our slope stability analyses are presented in Appendix C.

A.5.b. Exploration Staking and Surveying

We staked prospective exploration locations and cleared them of existing underground utilities. AE2S surveyed the exploration locations and determined surface elevations.

A.5.c. Exploratory Borings

We explored subsurface conditions with four penetration test borings, ST-01 through ST-04, the locations of which are shown on the Soil Boring Location Sketch in Appendix A. Boring ST-01 was extended to a depth of 106 feet. Borings ST-02, ST-03 and ST-04 were terminated at a depth of 41 feet below the existing grade. The purpose of the deep boring was to characterize the soil at greater depth and delineate the transition to the glacial deposit. The shallower borings were drilled to determine the depth of existing fill (if any) and characterize the near surface soils along the proposed levee. Penetration test samples were obtained at 2 ½- or 5-foot intervals. Thin-walled tube samples were also collected from the borings. The borings were grouted upon completion. The log of soil borings performed for this project are attached in Appendix A.

A.5.d. Sample Review and Laboratory Testing

The penetration test and thin-walled tube samples collected from our borings were visually classified and logged by a geotechnical engineer, and most of the samples were subject to pocket penetrometer testing. To help classify and estimate or measure directly the physical properties of the materials encountered, we also performed 42 moisture content tests, 6 Atterberg limit tests, 12 unit density measurements, 4 organic content tests, and 3 consolidated-undrained (CU) triaxial shear tests with pore water pressure measurements. The soil index properties obtained from the laboratory tests are presented in the "Notes" column of the respective boring logs.

The triaxial test results performed for the project are included in Appendix B. The zero-cohesion friction angles (ϕ) for the soil layers were derived from the CU stress paths plotted from available CU triaxial shear test data, the graphical representation of the stress paths are also attached in Appendix B.

A.5.e. Seepage, Deformation and Stability Analyses

Following FEMA procedures, we evaluated structure stability under end-of-construction, flood stage, post-flood drawdown, steady-state, and earthquake conditions, as applicable. FEMA procedures also involve an evaluation of seepage, piping and uplift potential due to flooding, a demonstration of bearing capacity, and an evaluation of settlement. FEMA minimum factors of safety for structure stability are 1.4 for steady-state (no flood), 1.3 for end-of-construction, 1.4 for flood stage, 1.0 to 1.2 for post-flood drawdown, and 1.0 for earthquake conditions.

We evaluated the stability and performance of the flood protection system at four (4) cross sections. The plan and profile view of each cross section is included in Appendix A.

We evaluated the structure stability under end-of-construction, steady-state (no flood), flood stage, and post-flood drawdown conditions, and evaluated the potential for seepage, piping and uplift, in general accordance with DHS-FEMA requirements and the Engineering Manual 1110-2-1913, *Design and Construction of Levees*, published by the US Army Corps of Engineers April, 2000. We also evaluated structure settlement.

To facilitate our evaluation, computer analyses were performed on selected levee cross sections using GeoStudio 2012 by Geo-Slope International. GeoStudio contains finite element seepage and stability programs that allow in-situ stress/strain and hydraulic conditions to be contoured on a structured mesh, which can then be subjected to external structure, earth or hydraulic loads on a static (single time step) or transient (multiple time step) basis. The response of the mesh to the external loads (in terms of stability, seepage or deformation), and the timing of that response, is determined by the stress/strain and hydraulic properties assigned to the subsurface geologic materials present in the vicinity of each mesh node. The programs also accommodate variations in the strength/deformation and hydraulic properties of the materials present in the geologic profile.

End-of-construction and steady state stability during periods of no flooding were analyzed using limit equilibrium methods available in the GeoStudio program Slope/W. Stability was determined based on both force and moment equilibrium, and incorporated an estimated hydrostatic groundwater surface based on information obtained from our reconnaissance and borings.

We used the GeoStudio program Seep/W to model the advance and withdrawal of seepage “fronts” during the flood stage and under post-flood rapid drawdown conditions. During the flood stage, a steady state seepage model was used that included a boundary condition for the design flood elevation on the river side of the levee, and potential seepage review points on the landward levee slope and landward ground surface. Drawdown was controlled with regression functions based on the 100-year flood

hydrograph illustrated in Appendix D. Profiles of the seepage “fronts,” whose advance and withdrawal were governed by hydraulic conductivity and volumetric water content functions assigned to the levee and foundation materials, were obtained for several time steps over the course of the post-flood drawdown.

Levee stability during the flood stage and post-flood drawdown was determined with Slope/W. Factors of safety were determined for each of the flood stage and post-flood rapid drawdown time steps. The analyses were again performed using both force and moment equilibrium methods of analysis. Landside seepage, uplift and piping potential, were also evaluated at this time.

We did not perform analyses to determine factors of safety under earthquake conditions. FEMA’s National Earthquake Hazards Reduction Program (NEHRP) maps indicate that the project is located in an area of limited seismicity, and not likely to experience unfavorable ground accelerations. Furthermore, according to Corps of Engineers Regulation ER 1110-2-1806, *Earthquake Design Analysis for Corps of Engineers Projects*, the region near Fargo, North Dakota is located within earthquake Seismic Risk Zone 0 which does not require evaluations of embankment, slope, and/or foundation susceptibility to liquefaction or excessive deformation when subjected to ground motions.

Sigma/W was used to estimate structure settlement. The structure loads were applied to the in-situ stress/strain conditions, and mesh deformation determined using elastic plastic (Young’s Modulus and Poisson’s Ratio) stiffness parameters that incorporated pore water pressure changes. In this manner, settlement was estimated based on the contribution of both vertical and horizontal load-induced compression.

A.5.f. Reporting

The results of our work were used to develop an opinion regarding the overall feasibility of the project and develop geotechnical recommendations for the completion of the project plans and specifications in regards to levee construction.

B. Results

B.1. Site Review

During our visit to the site, much of the area where the levee is proposed is relatively flat and unremarkable as shown in Photographs #3 & 4. We did note, however, an existing embankment on the north end of the plant. The embankment was not vegetated at the time of our site visit as shown on the

attached Photograph #2. At the time our drill rig advanced a boring through this embankment, the material could not support the weight of the drill rig jack stands, indicating it is in a soft condition.

The slopes of the lower bowl area in the southwest corner of the site did not exhibit signs of instability. Our discussions with on-site staff indicated that the northern and western slopes were built out over the life of the plant primarily with street sweepings that were spread over the slope and not compacted. This process is illustrated in Photograph #1.

B.2. Subsurface Geology

B.2.a. Geology

Geologically, the area is dominated by lacustrine (lake-deposited) soils consisting mainly of fat clay that are strength sensitive and compressible. These soils are underlain at great depth by glacial till, also consisting mainly of clay but of greater strength and limited compressibility.

The lacustrine soils, from the ground surface down, are generally associated with the Sherack, Brenna, and Argusville Formations. Occasionally, the Poplar Ridge Formation is encountered between the Sherack and Brenna. These soils in this area are locally overlain with existing fill from historic grading and construction. While consisting mainly of fat clay, the lake-deposited soils also consist locally of silt which is often prevalent near the lower boundary of the Sherack Formation, helping reveal the boundary between the Sherack and the underlying Brenna.

The uppermost lacustrine layers, typically the Sherack and the upper portion of the Brenna Formations, are generally over-consolidated, while the deeper layers, including the lower portion of the Brenna and the Argusville, are normally consolidated. Shear strength typically falls to a minimum below the zone of over-consolidation but rises again with depth. The soils are typically saturated or nearly so, even above the hydrostatic groundwater surface, and possess low to very low hydraulic conductivities.

B.2.b. Local Subsurface Geologic Profile

The four penetration test borings performed for this project revealed a subsurface geologic profile that is similar to the geology described above. Boring ST-01 was drilled on a fill embankment and encountered about 4 feet of fill over buried topsoil that extended to 9 feet. Boring ST-03 encountered 8 ½ feet of fill that we were told by on-site staff was typically placed from street sweepings and could locally be up to 20 to 30 feet deep. Boring ST-04 encountered 13 feet of fill that was likely associated with backfill of nearby utilities. The existing fill in this area consisted of fat clay that was occasionally slightly organic. Below the fill and topsoil, all the borings encountered predominantly lacustrine deposits of fat clay to the termination depths between 41 to 106 feet. At all of the boring locations, a 6 to 11 ½-foot thick silt layer

was encountered at depths beginning at 13 to 19 feet below grade. Also in Borings ST-01 and ST-02 a 5 to 6-foot thick silty clay layer was encountered following the silt layers.

As anticipated, moisture contents and dry densities varied with depth with moisture contents typically increasing and dry densities decreasing with increase in depth. Based on our visual observations and the results of our laboratory test data we derived the soil formation boundaries that are illustrated by the attached analysis figures in Appendix F. The Sherack layer ranges in thickness from approximately 33 to 37 feet with N-values in the range of 3 to 10 BPF. The Brenna layer is about 52 feet thick with initial N-values in the range of 2 to 4 BPF, but quickly transitioning to a very soft material with N-values of 'WH' to 1. The Argusville is estimated to be about 23 feet thick with N-values of 2 to 5. Our deep boring was extended to a depth of 106 feet below the existing grade and still did not encounter the glacial deposit at termination. The depth of glacial soil was estimated based on our previous soil borings performed in the vicinity.

B.2.c. Groundwater

Groundwater in this area typically rises up and away from river alignments to within about 10 to 20 feet of the surrounding ground surface. Groundwater was not observed in any of the borings during drilling. However, it is likely that the relatively short time it took to complete the borehole was not sufficient enough for the groundwater to rise to its hydrostatic level in the borehole. For our analyses, we assumed the groundwater was about 5 feet below the bowl area, or approximate elevation of 876.

B.3. Material Properties

Results of our laboratory strength tests are included in Appendix B. Some of the notable results are discussed below. The material properties assigned to each soil layer are listed in the table in Appendix E. The colors assigned to the cells in the table match those displayed in the analytical graphics, helping to identify the materials.

B.3.a. Shear Strength

Consolidated-undrained (CU) triaxial shear testing was performed on the lacustrine clays considered more critical to stability determinations, namely the Sherack and Brenna formations. The CU triaxial shear tests generated variable drained post-peak (15 percent strain) friction angles with measurable and variable cohesion intercepts. Normalized for zero cohesion (consistent with how CU triaxial shear tests have been processed for similar projects by the USACE), these results translate into equivalent zero cohesion drained post-peak friction angles of 28 degrees for the fill, 21 degrees for the Sherack Formation, and 32 degrees for the silt from the Poplar Ridge Formation. The p'-q' plots used to evaluate

the normalized drained post-peak friction angles are provided in Appendix B. Ultimately, we reduced the shear strength of the fill in our analyses to 24 degrees to account for variability inherent with fill.

B.3.b. Hydraulic Conductivity

Laboratory testing we have performed on our previous projects has shown that the hydraulic conductivity of levee fill is typically as rapid as 1E-2 feet per day (ft/day). The conductivity of the Sherack, Brenna and Argusville formations is one to two orders of magnitude slower, averaging approximately 1E-4 ft/day vertically (as determined from our laboratory tests) and 1E-3 ft/day horizontally (as determined through the in-situ monitoring of pore water pressure dissipation on local embankment construction projects). These hydraulic conductivities obtained from our previous projects have been used for the analysis of this project as shown on the table in Appendix E.

B.3.c. Deformation

Estimates of Young's Modulus were initially made based on empirical correlations to material types and SPT results as well as correlations made by instrumentation and monitoring of local embankment construction projects. The values used as part of our analyses are tabulated in Appendix E.

B.4. Structure Stability

B.4.a. Cross Sections

Based on the project plan and site topography we selected four (4) cross sections to evaluate structure stability. Cross sections 1 and 2 were selected to represent the typical embankment on the relatively flat portion of the site. Cross sections 3 and 4 were selected in order to analyze the levee on the north and east sides of the lower bowl area on the southwest end of the site.

The graphics in Appendix F illustrate the geometry and subsurface geologic profile assigned to each of these cross sections. The flood stage, end-of-construction and long term stability graphics show existing or steady-state hydraulic conditions. Subsequent rapid drawdown graphics show transient groundwater conditions (seepage "fronts") for the post-flood drawdown conditions for times when factors of safety were their lowest.

B.4.b. Hydrograph

The graphic in Appendix D represents the 100-year flood hydrograph which was prepared based on an available flood hydrograph from a nearby project and adjusted to the 100 year flood elevation for this site. In our models, we extended the hydrograph out approximately 5 months post-flood to a low flow (50% flow) condition, which we understand is about river surface elevation 861.8 at this location.

B.4.c. Computed Factors of Safety

Levee stability was analyzed under end-of-construction, long-term steady state (no flood), 100-year flood stage, and 100-year post-flood rapid drawdown conditions. As indicated on the spreadsheet in Appendix E, factors of safety for all conditions met or exceeded FEMA minimums. Factors of safety for the end-of-construction condition exceeded 1.7 (1.3 being the FEMA minimum); factors of safety for the steady state (no flood) condition exceeded 1.8 (1.4 being the FEMA minimum); factors of safety for the flood stage exceeded 1.4 (1.4 being the FEMA minimum); factors of safety under post-flood rapid drawdown conditions exceeded 1.3 (1.0 to 1.2 being the range of FEMA minimums).

B.4.d. Foundation Bearing Capacity

The stability analyses also demonstrated adequate bearing for the levee.

B.5. Phase 1 Structure Performance

B.5.a. Levee Settlement

Based on our calculations, the majority of the levee is predicted to settle less than 5 inches. The exception is the portion of the levee located within the lower bowl area where settlement of up to 10 to 11 inches is expected. Note that the predicted settlement will not occur rapidly and is expected to occur over a period of many years. Higher amounts of settlement can be expected over areas of poorly placed utility backfill.

B.5.b. Seepage, Uplift and Piping Commentary

Flood-induced seepage, piping or uplift is not likely to impact the land sides of the new levees given the relatively short duration the flood waters will be against the levee relative to the permeability of the levee and foundation material. Flood water is more likely to only seep from the flood sides of the new levees, and from grades below the flood side toes of the new levee, during post-flood drawdown. While this seepage may cause some erosion or minor sloughing of the flood-side slopes, it is not considered a threat to overall levee integrity. We did, however, evaluate a conservative condition in which the phreatic surface would develop through the levee in a steady-state condition. In this case, we calculated the factor of safety against the critical hydraulic gradient. In all cases, the factor of safety was greater than 3, which was considered acceptable for this project.

C. Conclusions and Recommendations

C.1. Overall Findings

Finite element and force/moment equilibrium analyses of the levee cross sections generated factors of safety in general compliance with DHS-FEMA criteria. Furthermore, our analyses indicated that the potential for instability due to seepage, uplift or piping above, at or beyond the landside levee toe is considered minimal. This indicates that from a stability and seepage perspective the levee is favorably designed.

From a utility crossing perspective, the levee design will still need to be evaluated in accordance with the criteria shown in Section 8-1 of USACE Engineering Manual 1110-2-1913. Part of this evaluation includes geotechnical considerations and we should be evaluated when the final levee configuration and location is decided and the utility locations and depths are known.

C.2. Levee Construction

C.2.a. Preparatory Excavations and Inspection Trench Construction

We recommend stripping vegetation and topsoil from beneath the proposed levee footprint. To provide lateral support to excavation backfill and additional required fill, we recommend oversizing (widening) the excavations 1 foot horizontally beyond the projected toes of the levee banks for each foot the excavations extend below the bank toe elevations.

Below the stripped subgrade, we recommend completing an inspection trench parallel to and below the levee centerline. The trench should extend to a depth below the stripped surface that is equal to the height of the levee above existing grades, with a maximum depth of 6 feet below the stripped ground surface, OR, to a depth at least 1 foot below any existing fill, whichever provides the greatest depth. The bottom of the trench should be a minimum of 4 feet wide, but also wide enough to accommodate compaction equipment. The side slopes of the trench should be sloped per OSHA requirements to facilitate observation of the trench. Generally, slopes of 1:1 or flatter should be anticipated.

We recommend removing groundwater from the excavations. We anticipate the majority of the excavations will be made in low-permeable silt- and clay-rich soils, in which case sumps and pumps can be considered.

Prior to backfilling the trench, it should be inspected for seepage channels or other undesirable material. If seepage channels or undesirable material are present, they should be excavated and removed with a trench that is wide enough to accommodate compaction equipment. The trenches should be backfilled and compacted as recommended in the following subsection.

C.2.b. Selection, Placement and Compaction of Backfill and New Levee Fill

We recommend inspection trench backfill and levee fill consist of material meeting the requirements of the City of Fargo Specification 2000, Part 2.2 for Impervious Fill with the modification that the gradation shall not have less than 55% material by weight passing the No. 200 sieve. We recommend placing the material within 1 percent below to 3 percent above the optimum moisture content.

We recommend spreading levee fill in loose lifts of 6 to 12 inches thick. We recommend compacting levee fill, and the finished levee slopes, to at least 95 percent of the materials' maximum standard Proctor dry densities according to ASTM D 698.

C.2.c. Levee Slope Finishing and Protection

We recommend that levee slopes be surface compacted to at least 95 percent of the exposed soils' maximum standard Proctor dry densities. We have assumed that others will evaluate the ability of or need for conventional embankment vegetation to limit surface erosion, localized scour and sloughing, and develop specifications for vegetation or other forms of surface protection (erosion control mats or revetment).

C.2.d. Post-Construction Grade Adjustments

We recommend overbuilding the majority of the levee by 5 inches, except for the portion of the levee in the lower bowl area which we recommend overbuilding by 11 inches to accommodate post-construction settlement.

C.3. Construction Quality Control

C.3.a. Excavation Observations

We recommend that excavation operations in particular be observed continuously so that the consistency in the composition and presumed quality of the exposed foundation materials – including relative density or stiffness, strength and hydraulic conductivity – can be confirmed.

C.3.b. Materials Testing

We recommend density tests be taken in the inspection trench backfill and additional levee fill.

C.3.c. Cold Weather Precautions

If site grading and construction is anticipated during cold weather, all snow and ice should be removed from structure subgrades prior to placing excavation backfill or additional required fill. No backfill or fill should be placed on frozen subgrades. No frozen soils should be used as backfill or fill.

D. Procedures

D.1. Penetration Test Borings

D.1.a. Drilling Methods and Procedures

The penetration test borings were drilled with a truck-mounted core-and-auger drill equipped with hollow-stem auger. The borings were performed in accordance with ASTM D 1586. Sample intervals and type are shown on the boring logs.

D.1.b. Boring Log Preparation

Strata boundaries shown on the Log of Boring sheet were inferred from changes in the penetration test samples and the auger cuttings. Because sampling was not performed continuously, the strata boundary depths are only approximate. The boundary depths likely vary away from the boring locations, and the boundaries themselves may also occur as gradual rather than abrupt transitions.

Geologic origins assigned to the materials shown on the logs and referenced within this report were based on: (1) a review of the background information and reference documents cited above, (2) visual classification of the various geologic material samples retrieved during the course of our subsurface exploration, (3) penetration resistance testing performed for the project, (4) laboratory test results, and (5) available common knowledge of the geologic processes and environments that have impacted the site and surrounding area in the past.

D.2. Material Classification and Testing

The geologic materials encountered were visually and manually classified in accordance with ASTM Test Method D 2488. A chart explaining the classification system is attached. Samples were sealed in jars or bags and returned to our facility for review and storage. The results of the laboratory tests performed on geologic material samples are noted on or follow the appropriate attached exploration logs. The tests were performed in general accordance with ASTM procedures.

D.3. Groundwater Measurements

Groundwater measurements were made as indicated on the Log of Boring sheets. The boreholes were grouted after auger withdrawal.

E. Qualifications

E.1. Variations in Subsurface Conditions

E.1.a. Material Strata

Our evaluation, analyses and recommendations were developed from a limited amount of site and subsurface information. Strata boundaries can be expected to vary in depth, elevation and thickness away from the boring locations explored or reviewed for this project.

Variations in subsurface conditions present between exploration locations may not be revealed until additional exploration work is completed, or construction commences. If any such variations are revealed, our recommendations should be re-evaluated. Such variations could increase construction costs, and a contingency should be provided to accommodate them.

E.1.b. Groundwater Levels

Groundwater elevations were inferred from recent and past observations on the project sites and nearby sites. Groundwater levels can be expected to fluctuate in response to rainfall, flooding, irrigation, seasonal freezing and thawing, river modifications and other seasonal and annual factors.

E.2. Continuity of Professional Responsibility

E.2.a. Plan Review

This report is based on a limited amount of information, and a number of assumptions were necessary to help us develop our recommendations.

It is recommended that our firm review the geotechnical aspects of the designs and specifications, and evaluate whether the design is as expected, if any design changes have affected the validity of our recommendations, and if our recommendations have been correctly interpreted and implemented in the designs and specifications.

E.2.b. Construction Observations and Testing

It is recommended that we be retained to perform observations and tests during construction. This will allow correlation of the subsurface conditions encountered during construction with those encountered by the borings, and provide continuity of professional responsibility.

E.3. Use of Report

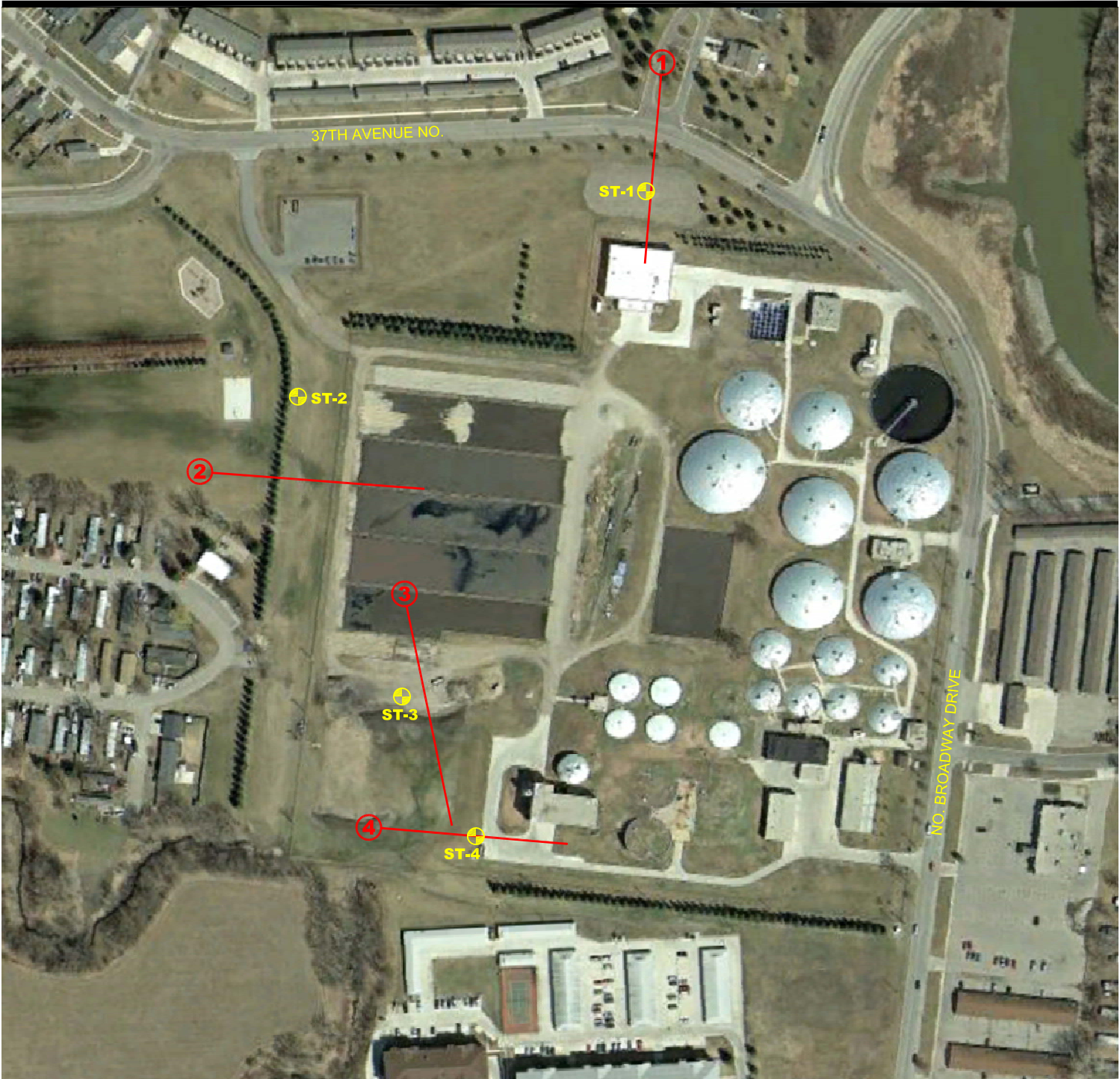
This report is for the exclusive use of the parties to which it has been addressed. Without written approval, we assume no responsibility to other parties regarding this report. Our evaluation, analyses and recommendations may not be appropriate for other parties or projects.

E.4. Standard of Care

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

Appendix A

Subsurface Results



 **DENOTES APPROXIMATE LOCATION OF
STANDARD PENETRATION TEST BORING**



SCALE: 1"= 250'

Sheet of Fig:	Project No:	B1402674
	Drawing No:	B1402674
	Scale:	1"= 250'
	Drawn By:	BJB
	Date Drawn:	8/12/14
	Checked By:	DS
	Last Modified:	3/2/15

SOIL BORING LOCATION SKETCH
GEOTECHNICAL EVALUATION
WWTP FLOOD PROTECTION
NO. BROADWAY DRIVE
FARGO, NORTH DAKOTA

**BRAUN
INTERTEC**

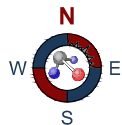
11001 Hampshire Avenue So.
Minneapolis, MN 55438
PH. (952) 995-2000
FAX (952) 995-2020



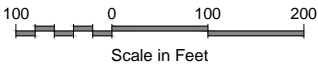
ELEVATION 899.49' = RIVER GAGE 45'

LEGEND

PROPOSED LEVEE



* ELEVATIONS BASED ON NAVD88



PRELIMINARY

2014 FLOOD PROTECTION PLAN
WASTE WATER TREATMENT PLANT
FARGO, NORTH DAKOTA

45' GAGE FLOOD PROTECTION PLAN

CITY OF
FARGO
PROJECT

DRAWING TYPE

DRAFTER

SLS

CHECKED / APPROVED

DD

DATE

MAY 22, 2014

PROJECT NUMBER

P00803-2014-05

SHEET

1 of 1

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(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota						BORING: ST-01 LOCATION: See Sketch.			
DRILLER: J. Brooks		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/27/14		SCALE: 1" = 4'			
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes	
893.3	0.0								
891.8	1.5	FILL	FILL: Fat Clay, gray and black, wet.	4					
889.3	4.0	FILL	FILL: Fat Clay, trace Sand and Gravel, brown and gray, wet.	3					
886.3	7.0	CH	FAT CLAY, with roots, Organic, trace Sand and Silt, black, wet. (Buried Topsoil)	12		29		OC=9%	
884.3	9.0	CH	FAT CLAY, Organic, Sand and Silt, black, wet. (Buried Topsoil)	11		28		OC=6%	
		CH	FAT CLAY, with Silt lenses, gray, wet, rather stiff. (Lacustrine Deposit)	TW		36		MC=36% WD=112pcf, DD=83pcf	
878.3	15.0		-brown and moist below 12 3/4 feet.	10		26	3		
874.3	19.0	CH	FAT CLAY, with Silt seams, brown with iron-staining, wet, medium to rather stiff. (Lacustrine Deposit)	10		34	2 3/4		
				7		41	1 3/4		
868.6	24.8	ML	SILT, brown with iron-staining, wet, loose. (Lacustrine Deposit)	TW		35		MC=35% WD=121pcf, DD=90pcf	
				9		27			
863.6	29.8	CL-ML	SILTY CLAY, gray, wet, rather soft. (Lacustrine Deposit)	5		37			
		CH	FAT CLAY, trace Silt, gray, wet, rather soft. (Lacustrine Deposit)	4		38	1/4	LL=59, PL=19, PI=40	

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota						BORING: ST-01 (cont.) LOCATION: See Sketch.			
DRILLER: J. Brooks			METHOD: 3 1/4" HSA, Autohammer		DATE: 5/27/14		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes	
861.3	32.0		FAT CLAY, trace Silt, gray, wet, rather soft. (Lacustrine Deposit) <i>(continued)</i>						
859.3	34.0	CH	FAT CLAY, scattered slickensides, gray, wet, very soft to rather soft. (Lacustrine Deposit)	3		74	1/4	LL=112, PL=27, PI=85	
				TW		72		MC=72% WD=99pcf, DD=58pcf LL=117, PL=39, PI=78	
				4					
				4					
				4					
				TW		67		MC=67% Switched to Mud Rotary Drilling Methods at 61 feet. WD=101pcf, DD=61pcf	

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota					BORING: ST-01 (cont.)				
					LOCATION: See Sketch.				
DRILLER: J. Brooks		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/27/14		SCALE: 1" = 4'			
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes	
829.3	64.0		FAT CLAY, scattered slickensides, gray, wet, very soft to rather soft. (Lacustrine Deposit) <i>(continued)</i>	2			1/4		
				WH			1/4		
				1			1/4		
				1			1/4		
				2			1/4		
				2			1/4		
				2			1/4		
				2			1/4		
				2			1/4		
				2			1/4		

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota				BORING: ST-02 LOCATION: See Sketch.				
DRILLER: J. Brooks		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/28/14		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes
893.0	0.0	Symbol	(Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)					
892.7	0.3	CH	FAT CLAY, with roots and Sand, brown, wet. (Topsoil)	10				
		CH	FAT CLAY, trace Sand and Silt, brown, wet, rather stiff. (Lacustrine Deposit)	10			3	
888.3	4.8	CH	FAT CLAY, with Silt seams, brown with iron-staining, wet, soft to medium. (Lacustrine Deposit)	11			3 1/4	
				7			2	
				6		41	3/4	
879.8	13.3	ML	SILT, brown with iron-staining, wet, loose. (Lacustrine Deposit)	3		46	3/4	
				TW		43		MC=43% WD=106pcf, DD=74pcf P200=99%
				6		28		
			-gray, waterbearing at 20 1/4 feet.	8		30		
870.3	22.8	CL-ML	SILTY CLAY, trace Sand and Silt, gray, wet, rather soft to medium. (Lacustrine Deposit)	6		33	3/4	
				5		38		
865.0	28.0	CH	FAT CLAY, scattered slickensides, gray, wet, soft. (Lacustrine Deposit)					
				TW		52		MC=52% WD=107pcf, DD=71pcf

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota						BORING: ST-02 (cont.) LOCATION: See Sketch.				
DRILLER: J. Brooks			METHOD: 3 1/4" HSA, Autohammer		DATE: 5/28/14		SCALE: 1" = 4'			
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes		
861.0	32.0		FAT CLAY, scattered slickensides, gray, wet, soft. (Lacustrine Deposit) <i>(continued)</i>							
				3		61				
852.0	41.0			2						
			END OF BORING.							
			Water not observed with 39 1/2 feet of hollow stem auger in the ground.							
			Boring then backfilled.							

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota					BORING: ST-03 LOCATION: See Sketch.			
DRILLER: J. Brooks		METHOD: 3 1/4" HSA, Autohammer			DATE: 5/28/14		SCALE: 1" = 4'	
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes
894.0	0.0	FILL	FILL: Fat Clay, trace Sand, Graven, slightly Organic, brown and gray, wet.	6				
				4		31		OC=3%
				6		27		OC=4%
885.5	8.5	CH	FAT CLAY, with Silt seams, brown with iron-staining, wet, medium. (Lacustrine Deposit)	8				
				TW		35		MC=35% WD=116pcf, DD=86pcf
880.0	14.0	ML	SILT, with Fat Clay seams, brown with iron-staining, wet, very loose to loose. (Lacustrine Deposit)	6			1 1/4	
				4				
				5				
				TW		39		WD=115pcf, DD=83pcf P200=99%
			-6 1/2 inch PEAT layer from 22 1/2 to 23.2 feet.	5				
868.5	25.5	CH	FAT CLAY, with Silt seams, gray, wet, rather soft. (Lacustrine Deposit)	4			1 1/2	
866.0	28.0	CH	FAT CLAY, scattered slickensides, gray, wet, soft. (Lacustrine Deposit)					
				TW		79		MC=79% WD=97pcf, DD=54pcf

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2014\02674.GPJ BRAUN_V8_CURRENT.GDT 8/5/14 15:36

Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota						BORING: ST-04		LOCATION: See Sketch.		
DRILLER: J. Brooks			METHOD: 3 1/4" HSA, Autohammer			DATE: 5/28/14		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes		
892.0	0.0									
891.8	0.3	FILL	FILL: Fat Clay, with roots, Sand and Gravel, brown and black, wet.	6		31		WD=118pcf, DD=91pcf		
		FILL	FILL: Fat Clay, trace Sand and Gravel, brown and gray, wet.	8		26				
				TW		30				
				5		25				
				8		29				
879.0	13.0	CH	FAT CLAY, with Silt seams, brown with iron-staining, wet, medium. (Lacustrine Deposit)	6		46	1 1/2	WD=107pcf, DD=78pcf P200=99%		
				TW		37				
875.0	17.0	ML	SILT, brown with iron-staining, wet, very loose to loose. (Lacustrine Deposit)	3		36		MC=36% WD=116pcf, DD=86pcf		
				7		32				
			-gray below 22 1/2 feet.	6		31				
868.0	24.0	CH	FAT CLAY, trace Silt, gray, wet, rather soft. (Lacustrine Deposit)	TW		36		LL=71, PL=20, PI=51		
				5		40	1 1/2			

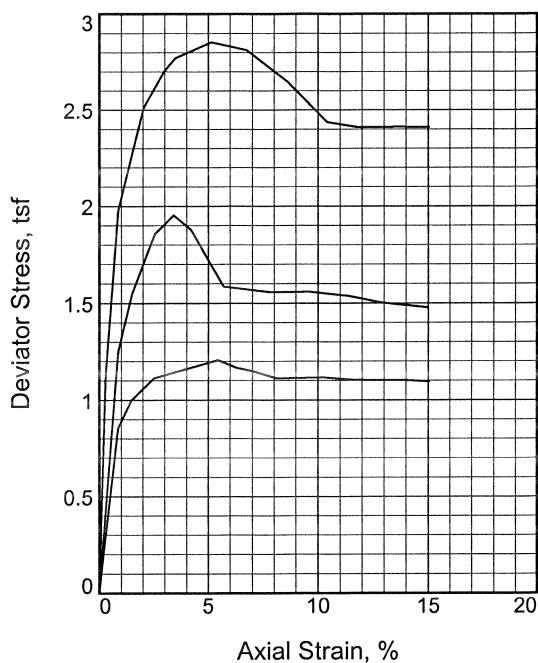
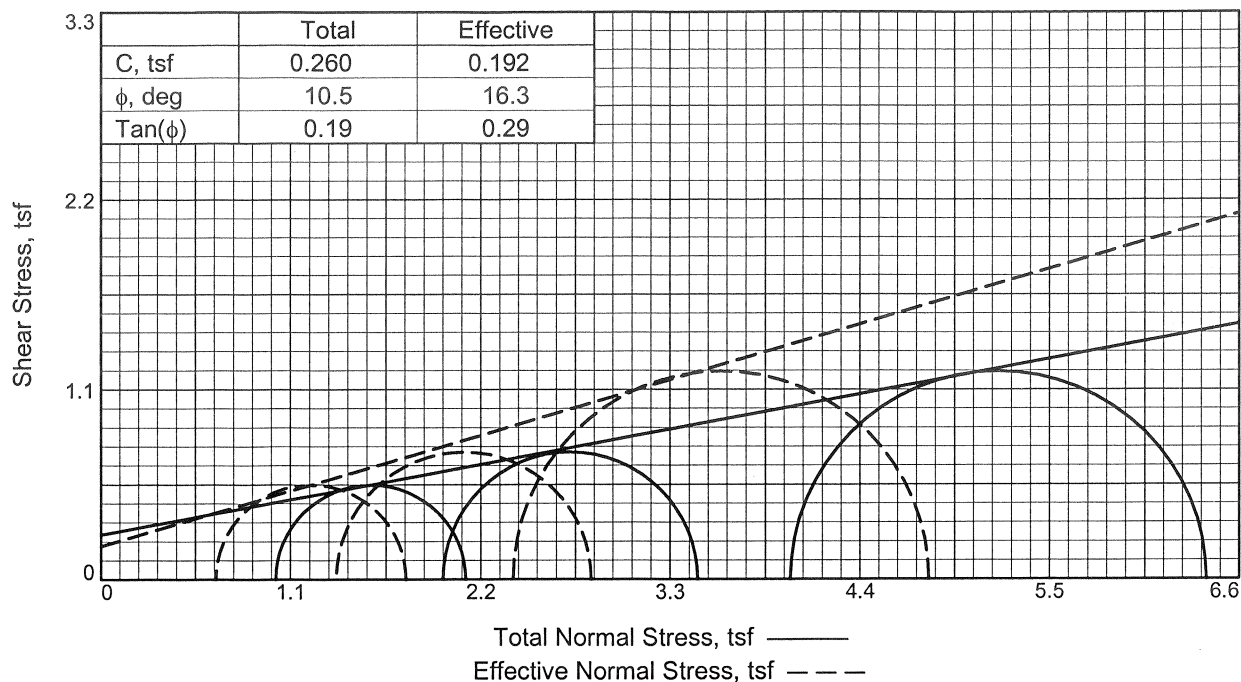
(See Descriptive Terminology sheet for explanation of abbreviations)

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Braun Project B14-02674 Geotechnical Evaluation WWTP Flood Protection North Broadway Fargo, North Dakota					BORING: ST-04 (cont.) LOCATION: See Sketch.				
DRILLER: J. Brooks		METHOD: 3 1/4" HSA, Autohammer		DATE: 5/28/14		SCALE: 1" = 4'			
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes	
860.0	32.0								
858.0	34.0	CH	FAT CLAY, trace Silt, gray, wet, rather soft. (Lacustrine Deposit) <i>(continued)</i>						
			FAT CLAY, scattered slickensides, gray, wet, soft. (Lacustrine Deposit)	2		70		LL=109, PL=25, PI=84	
851.0	41.0			2		65		LL=96, PL=26, PI=70	
			END OF BORING.						
			Water not observed with 39 1/2 feet of hollow stem auger in the ground.						
			Boring then backfilled with bentonite grout.						

Appendix B

Laboratory Test Results



Sample No.		1	2	3
Initial	Water Content, %	37.2	44.7	46.8
	Dry Density, pcf	83.5	75.9	74.5
	Saturation, %	98.5	98.9	100.0
	Void Ratio	1.0194	1.2215	1.2624
	Diameter, in.	1.438	1.437	1.431
	Height, in.	2.796	2.795	2.795
At Test	Water Content, %	37.4	44.4	44.1
	Dry Density, pcf	83.9	76.7	77.0
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.0086	1.1977	1.1900
	Diameter, in.	1.435	1.432	1.416
	Height, in.	2.791	2.785	2.765
Pore Pressure Parameter B		1.0	1.0	1.0
Consolidation Pressure, tsf		1.02	1.98	4.00
Back Pressure, tsf		6.14	5.13	3.12
Cell Pressure, tsf		7.16	7.11	7.12
Peak Deviator Stress, tsf		1.21	1.95	2.85
Total Pore Pr., tsf		6.67	6.15	4.91
Ultimate Deviator Stress, tsf		1.10	1.48	2.41
Total Pore Pr., tsf		6.49	5.75	4.73
Maj. Eff. Stress at Ultimate, tsf		1.76	2.84	4.80
Min. Eff. Stress at Ultimate, tsf		0.67	1.36	2.39

Type of Test:

CU with Pore Pressures

Sample Type: Thinwall

Description: FAT CLAY, brown (CH)

Assumed Specific Gravity= 2.70

Remarks: Rate of strain is 0.001 in/min. Failure criteria is based on the ultimate stress which occurs at 15% strain. Samples were saturated for 10 days and consolidated for 3 days.

Figure CU Triax ASTM D 4767

Client:

Project: WWTP Flood Protection

North Broadway, Fargo, ND

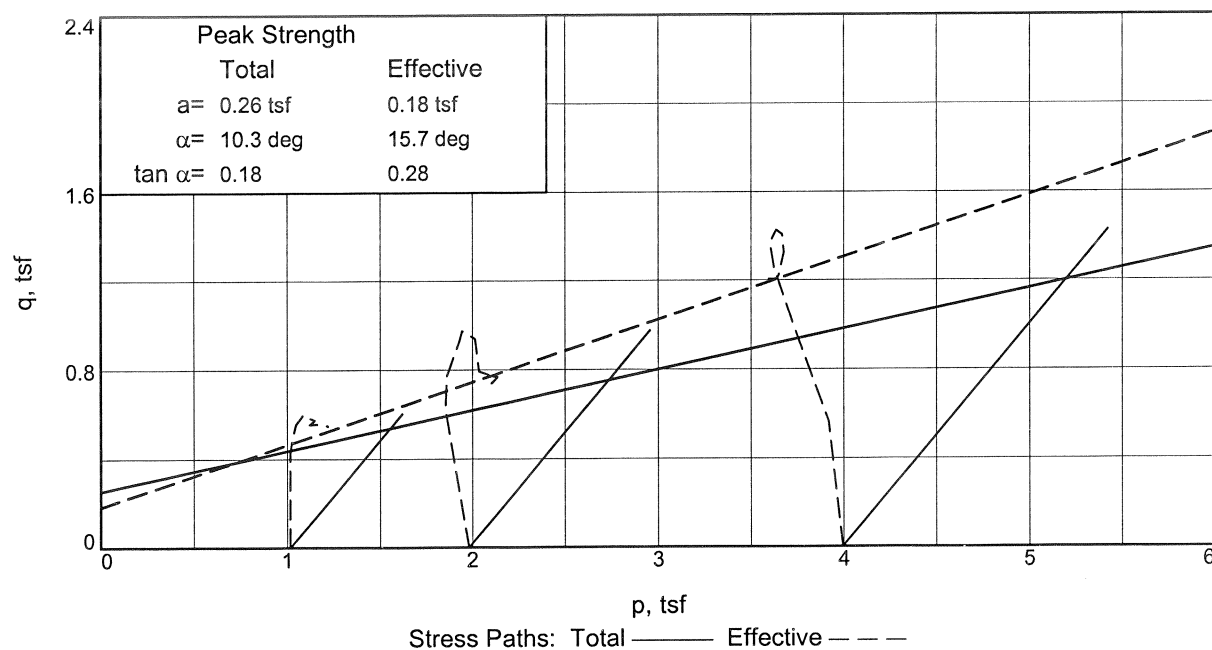
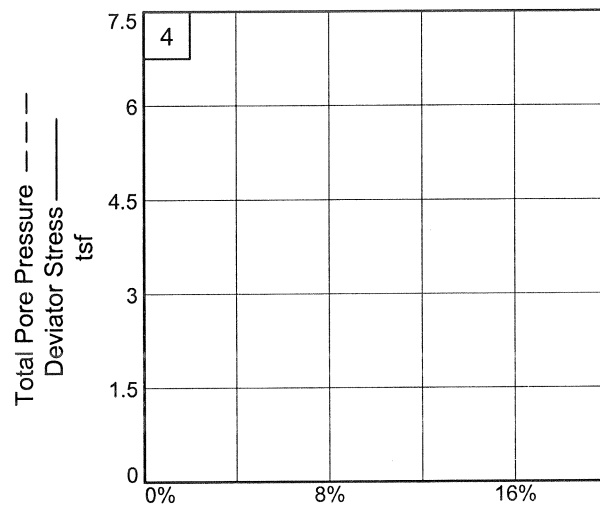
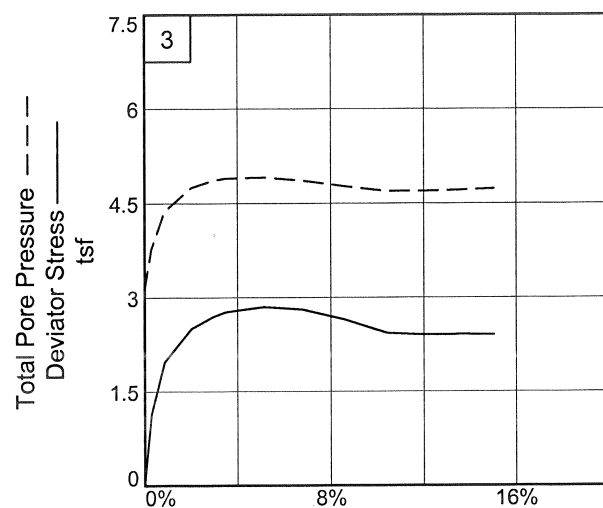
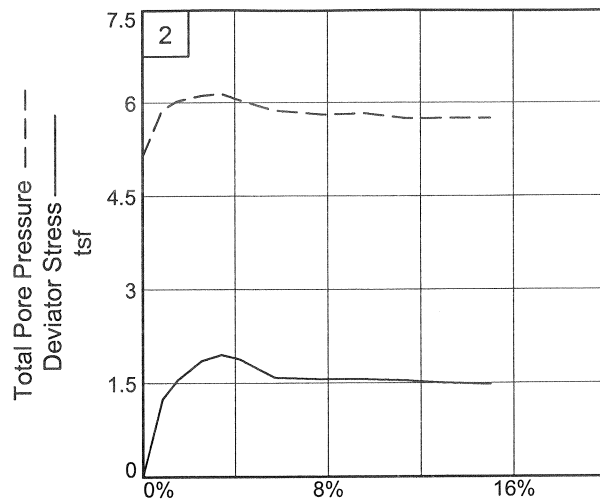
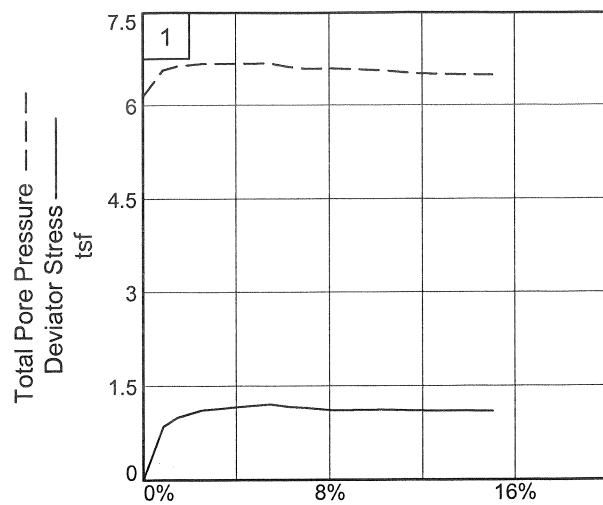
Sample Number: ST-4

Depth: 14-16'

Proj. No.: B14-02674

Date Sampled:

BRAUN
INTERTEC



Client:

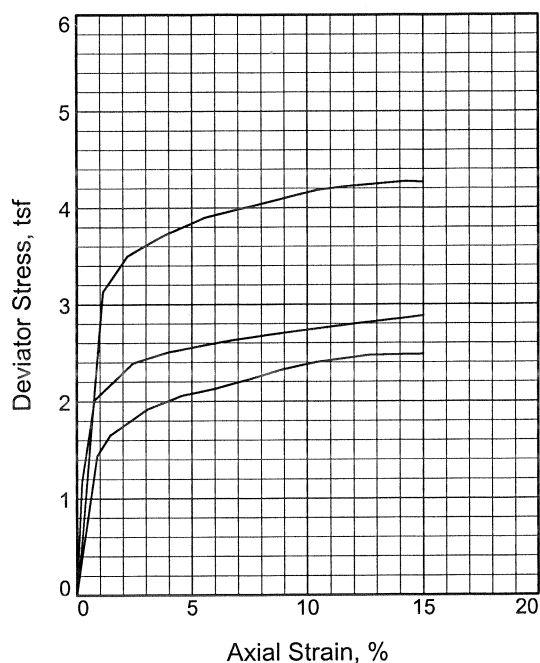
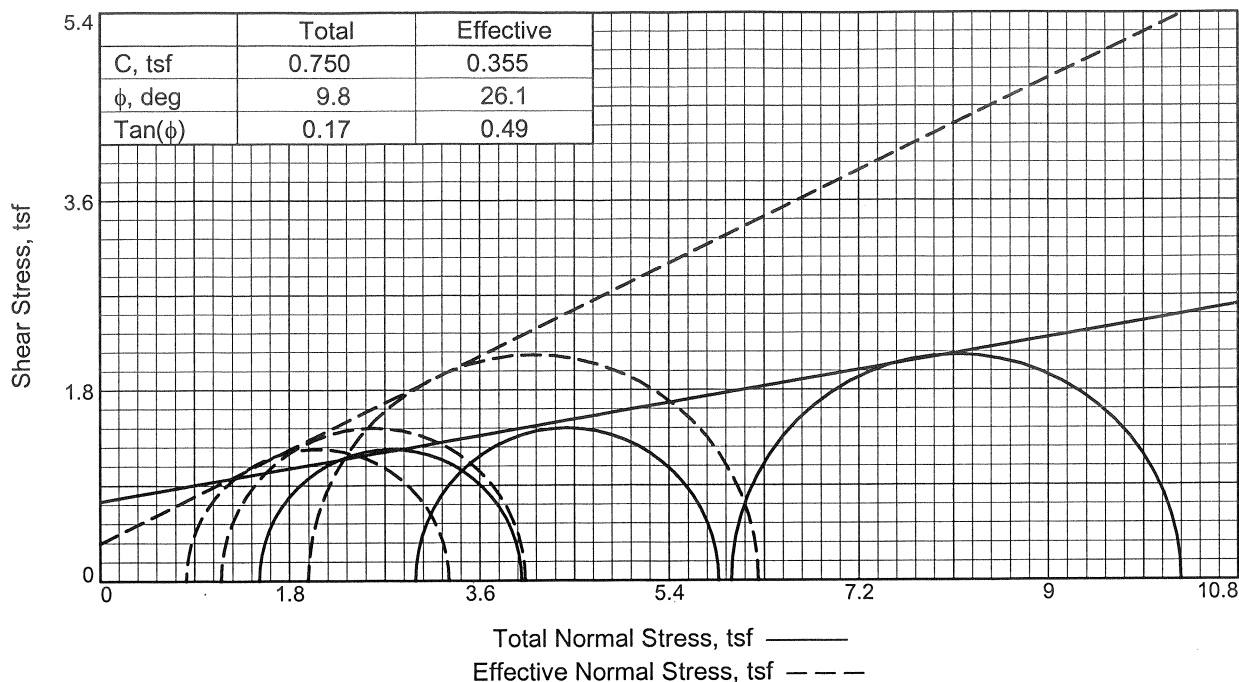
Project: WWTP Flood Protection

Depth: 14-16' Sample Number: ST-4

Project No.: B14-02674

Figure _____

Braun Intertec



Sample No.		1	2	3
Initial	Water Content, %	38.5	38.8	39.6
	Dry Density, pcf	83.2	83.0	82.0
	Saturation, %	99.6	100.0	99.5
	Void Ratio	1.0634	1.0681	1.0942
	Diameter, in.	1.419	1.425	1.419
	Height, in.	2.783	2.781	2.778
At Test	Water Content, %	37.9	36.4	37.3
	Dry Density, pcf	84.1	85.8	84.7
	Saturation, %	100.0	100.0	100.0
	Void Ratio	1.0413	1.0017	1.0268
	Diameter, in.	1.414	1.410	1.404
	Height, in.	2.773	2.751	2.748
Pore Pressure Parameter B		1.0	1.0	1.0
Consolidation Pressure, tsf		1.51	2.98	5.99
Back Pressure, tsf		5.63	4.14	1.13
Cell Pressure, tsf		7.14	7.12	7.12
Peak Deviator Stress, tsf		2.48	2.88	4.27
Total Pore Pr., tsf		6.32	5.97	5.16
Ultimate Deviator Stress, tsf		2.48	2.88	4.27
Total Pore Pr., tsf		6.32	5.97	5.15
Maj. Eff. Stress at Ultimate, tsf		3.30	4.03	6.24
Min. Eff. Stress at Ultimate, tsf		0.82	1.15	1.98

Type of Test:

CU with Pore Pressures

Sample Type: Thinwall

Description: FAT CLAY, brown (CH)

Assumed Specific Gravity= 2.75

Remarks: Rate of strain is 0.001 in/min. Failure criteria is based on the ultimate stress which occurs at 15% strain. Samples were saturated for 10 days and consolidated for 3 days.

Figure CU Triax ASTM D 4767

Client:

Project: WWTP Flood Protection

North Broadway, Fargo, ND

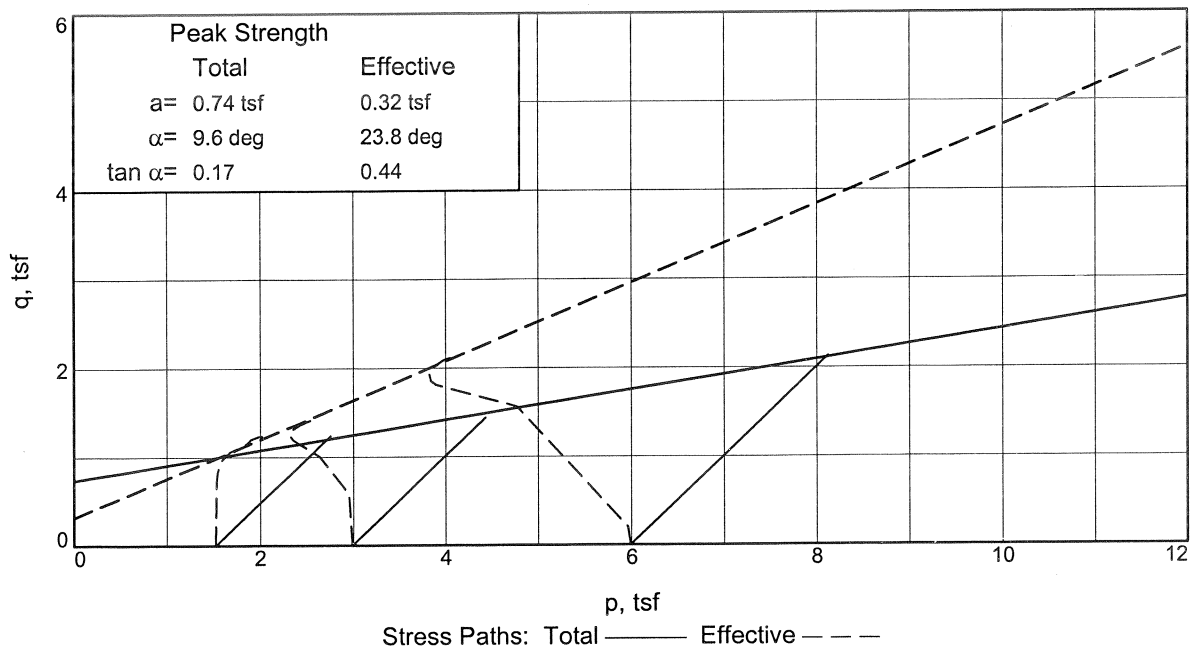
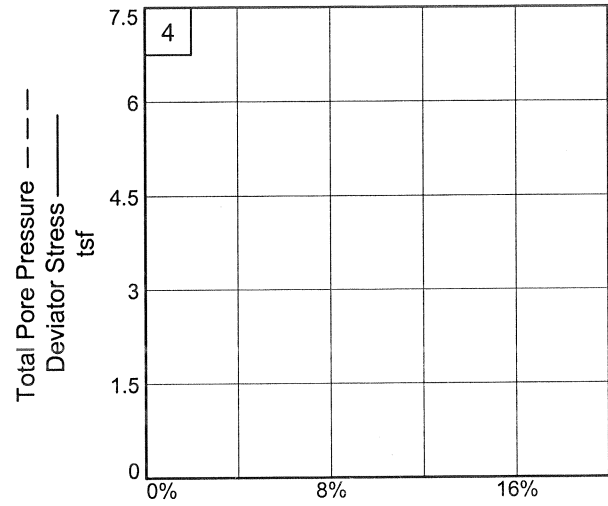
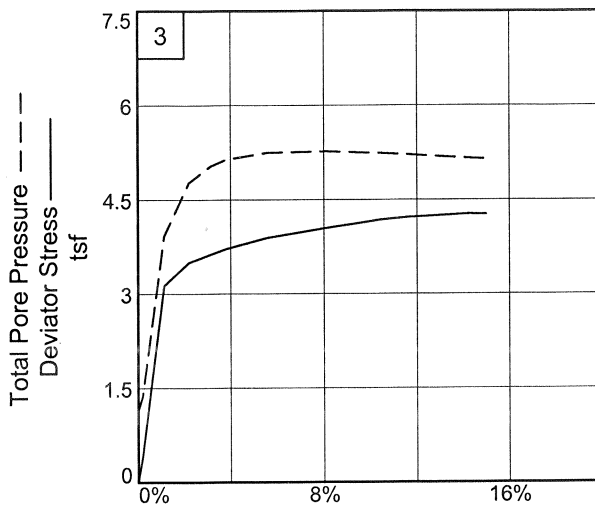
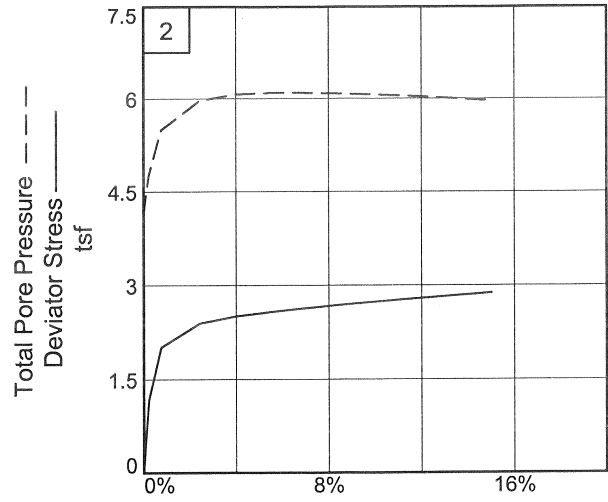
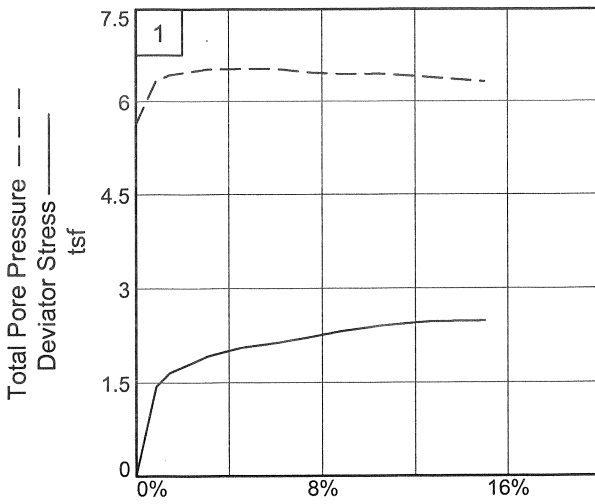
Sample Number: ST-3

Depth: 19-21'

Proj. No.: B14-02674

Date Sampled:

BRAUNSM
INTERTEC



Client:

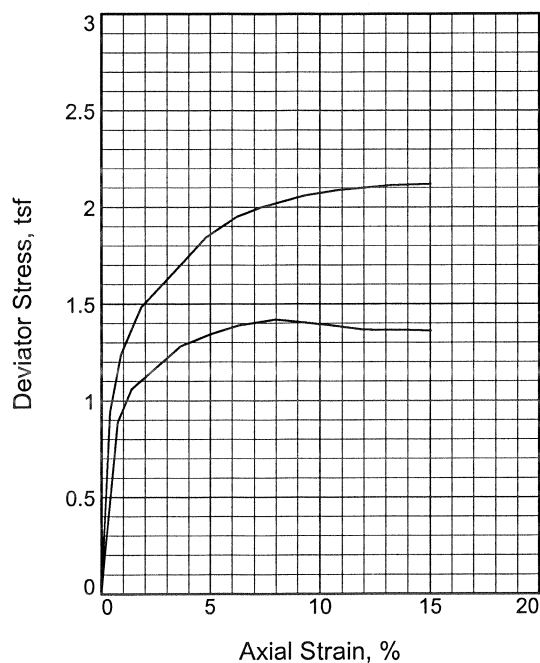
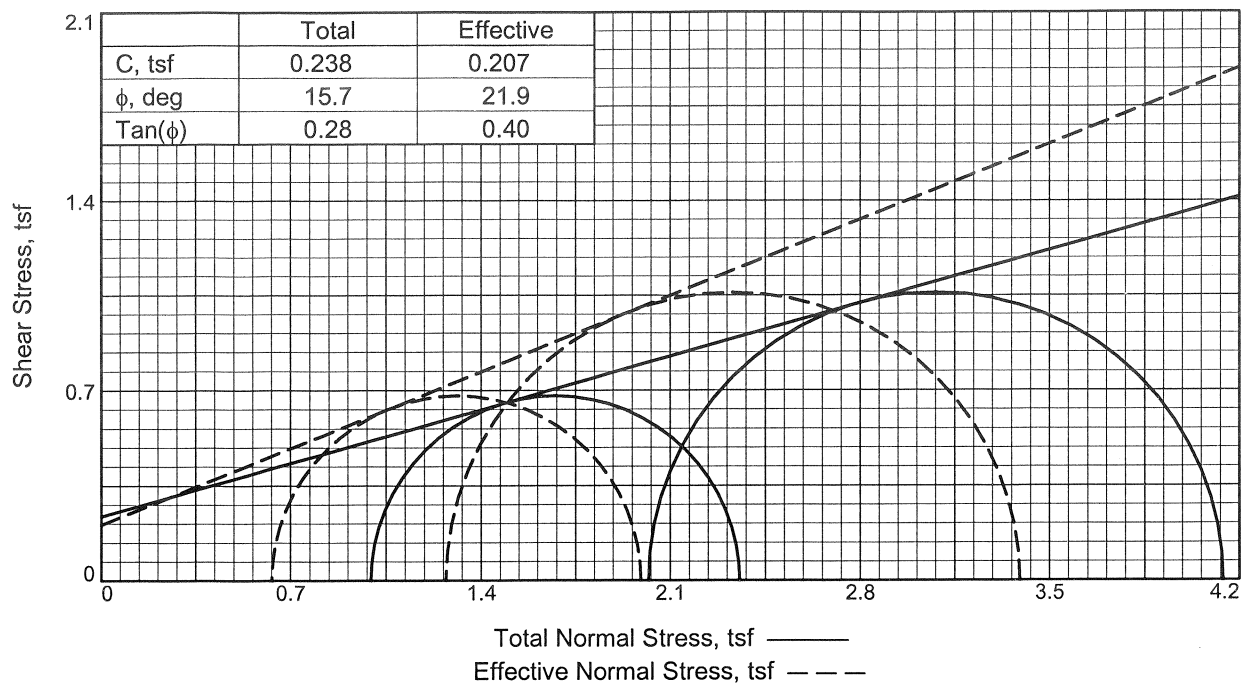
Project: WWTP Flood Protection

Depth: 19-21' Sample Number: ST-3

Project No.: B14-02674

Figure _____

Braun Intertec



Sample No.		1	2
Initial	Water Content, %	31.1	28.3
	Dry Density, pcf	88.9	93.1
	Saturation, %	93.7	94.3
	Void Ratio	0.8955	0.8106
	Diameter, in.	1.407	1.428
	Height, in.	2.798	2.798
At Test	Water Content, %	33.2	29.7
	Dry Density, pcf	88.9	93.6
	Saturation, %	100.0	100.0
	Void Ratio	0.8955	0.8009
	Diameter, in.	1.407	1.425
	Height, in.	2.798	2.793
Pore Pressure Parameter B		1.0	1.0
Consolidation Pressure, tsf		1.00	2.02
Back Pressure, tsf		6.13	5.10
Cell Pressure, tsf		7.13	7.12
Peak Deviator Stress, tsf		1.42	2.12
Total Pore Pr., tsf		6.56	5.85
Ultimate Deviator Stress, tsf		1.36	2.12
Total Pore Pr., tsf		6.50	5.85
Maj. Eff. Stress at Ultimate, tsf		1.99	3.39
Min. Eff. Stress at Ultimate, tsf		0.63	1.27

Type of Test:

CU with Pore Pressures

Sample Type: Thinwall

Description: FAT CLAY, brown (CH)

Assumed Specific Gravity= 2.70

Remarks: Rate of strain is 0.001 in/min. Failure criteria is based on the ultimate stress which occurs at 15% strain. Samples were saturated for 10 days and consolidated for 3 days.

Figure CU Triax ASTM D 4767

Client:

Project: WWTP Flood Protection

North Broadway, Fargo, ND

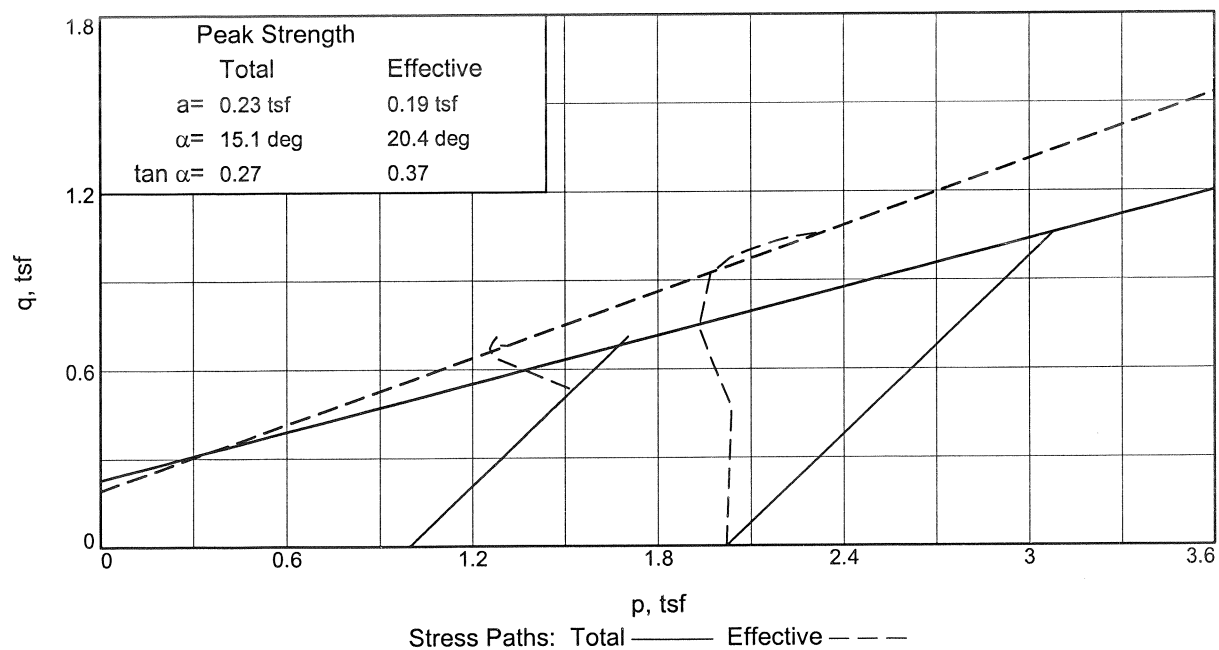
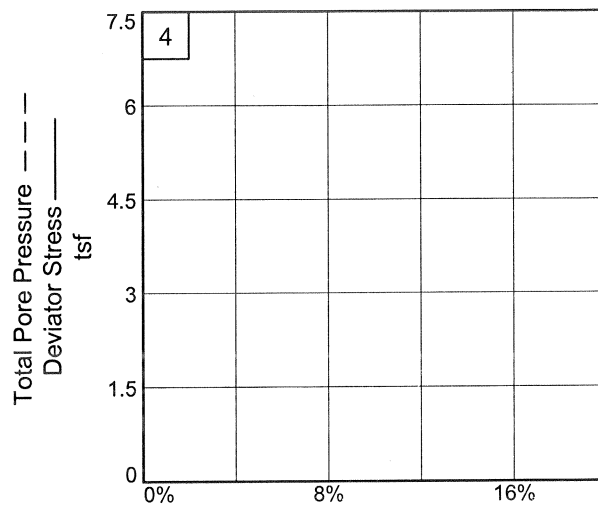
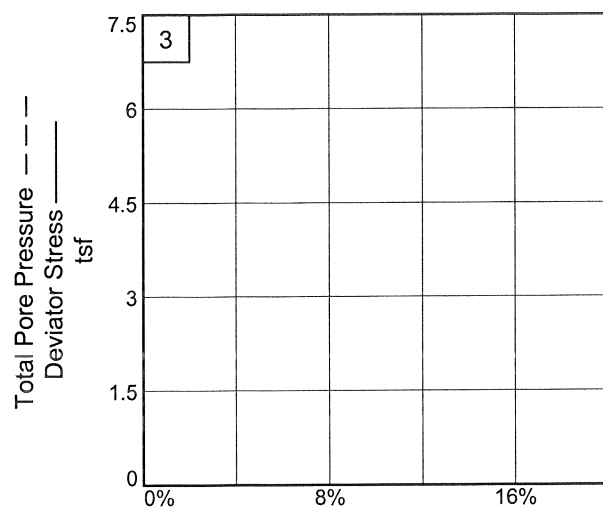
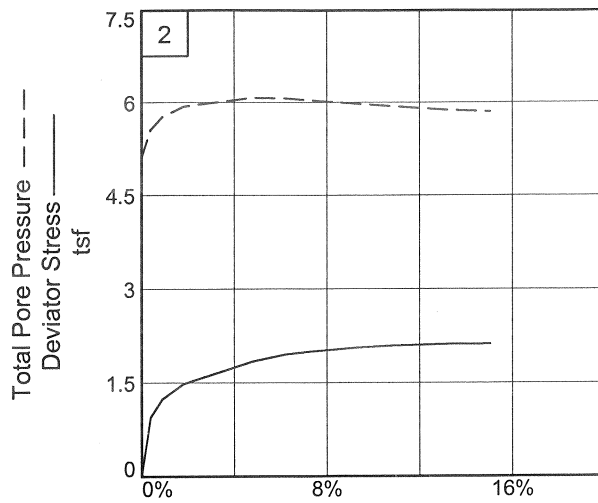
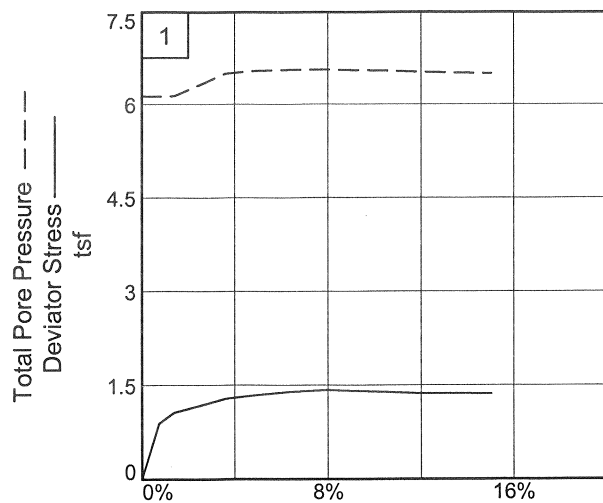
Sample Number: ST-4

Depth: 4-6'

Proj. No.: B14-02674

Date Sampled:

BRAUN
INTERTEC



Client:

Project: WWTP Flood Protection

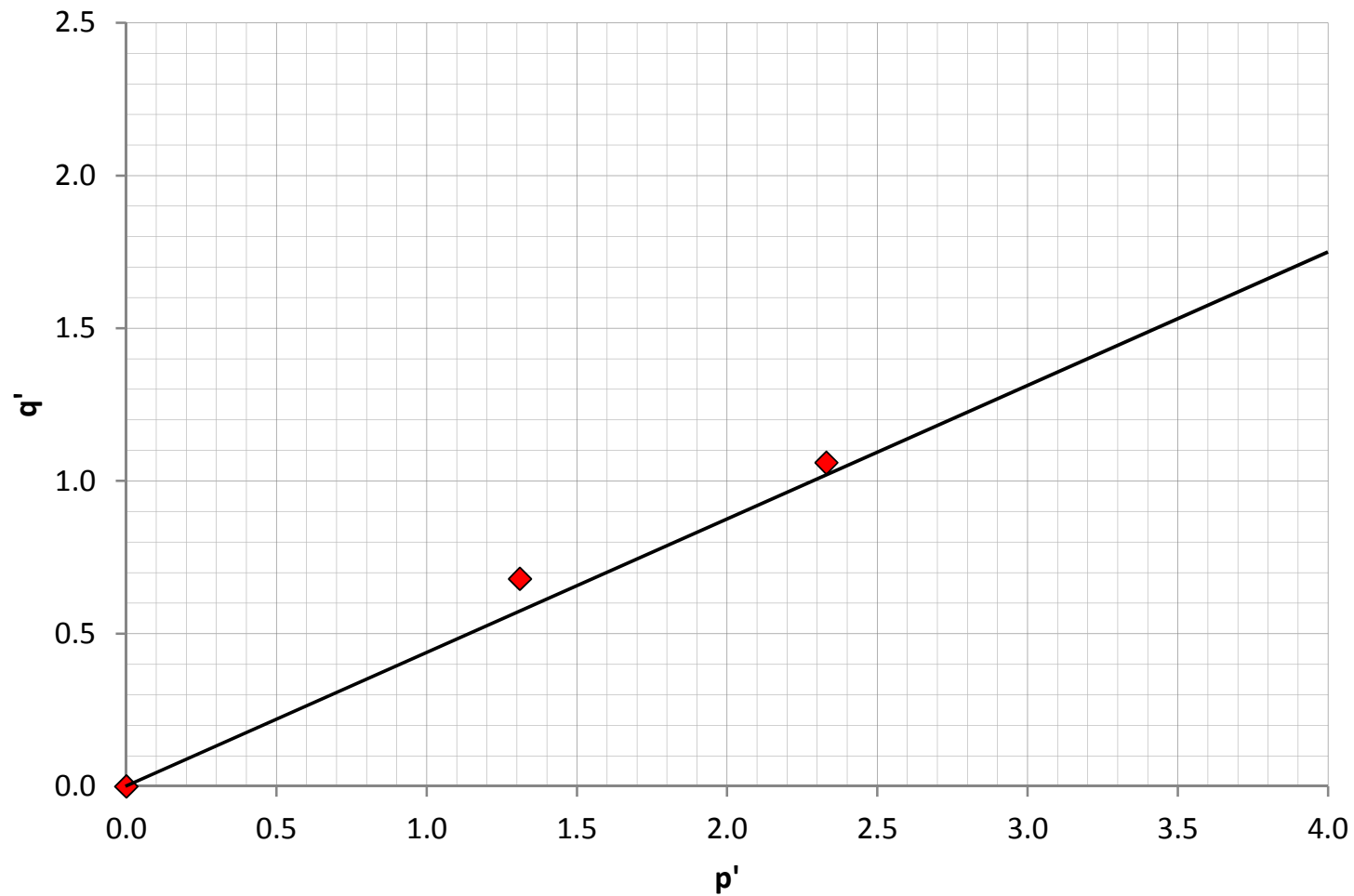
Depth: 4-6' Sample Number: ST-4

Project No.: B14-02674

Figure _____

Braun Intertec

B14-02674: WWTP Flood Protection, North Broadway, Fargo, ND
Triaxial Shear Strength of Fat Clay (Fill Formation)

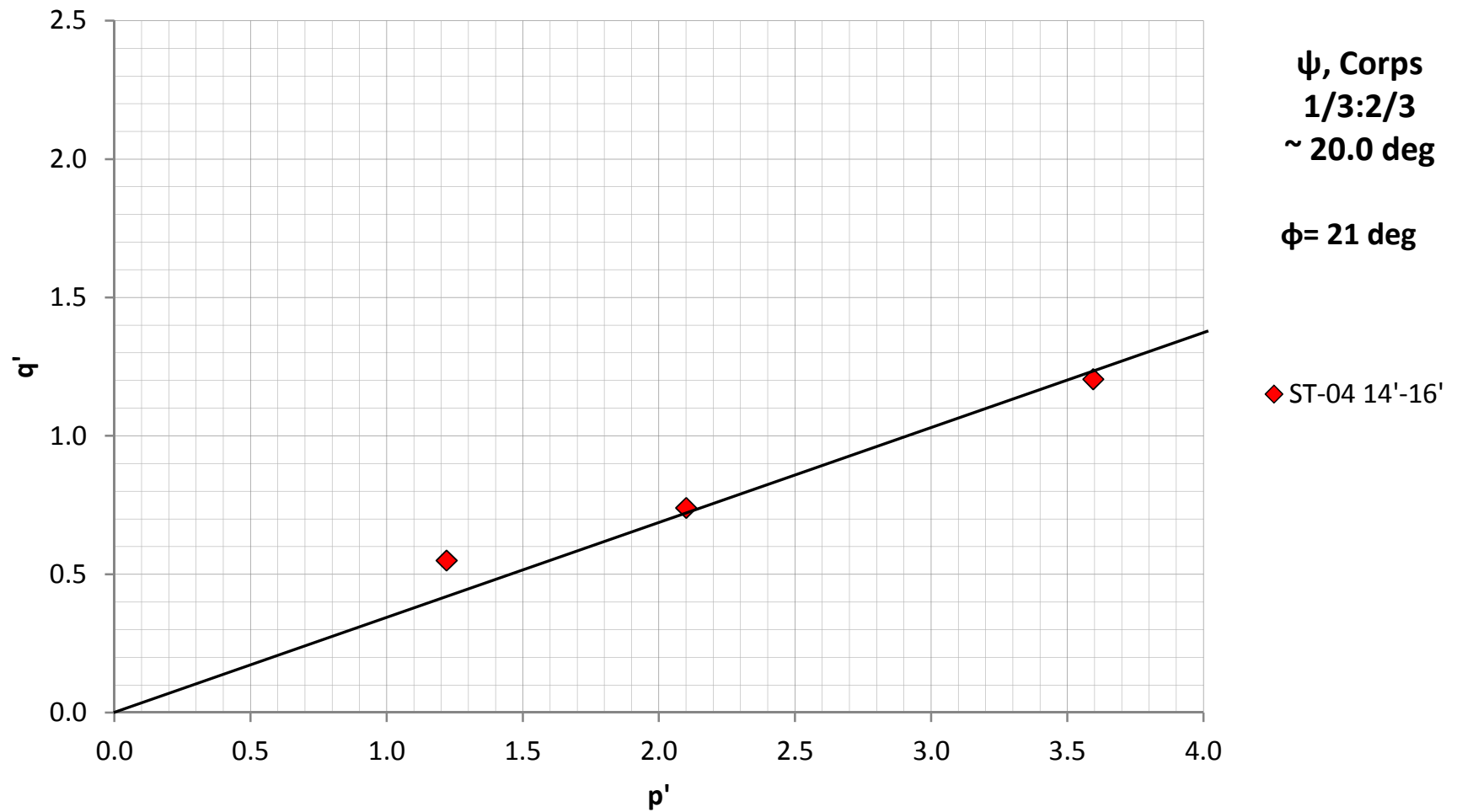


ψ , Corps
1/3:2/3
~ 25.0 deg

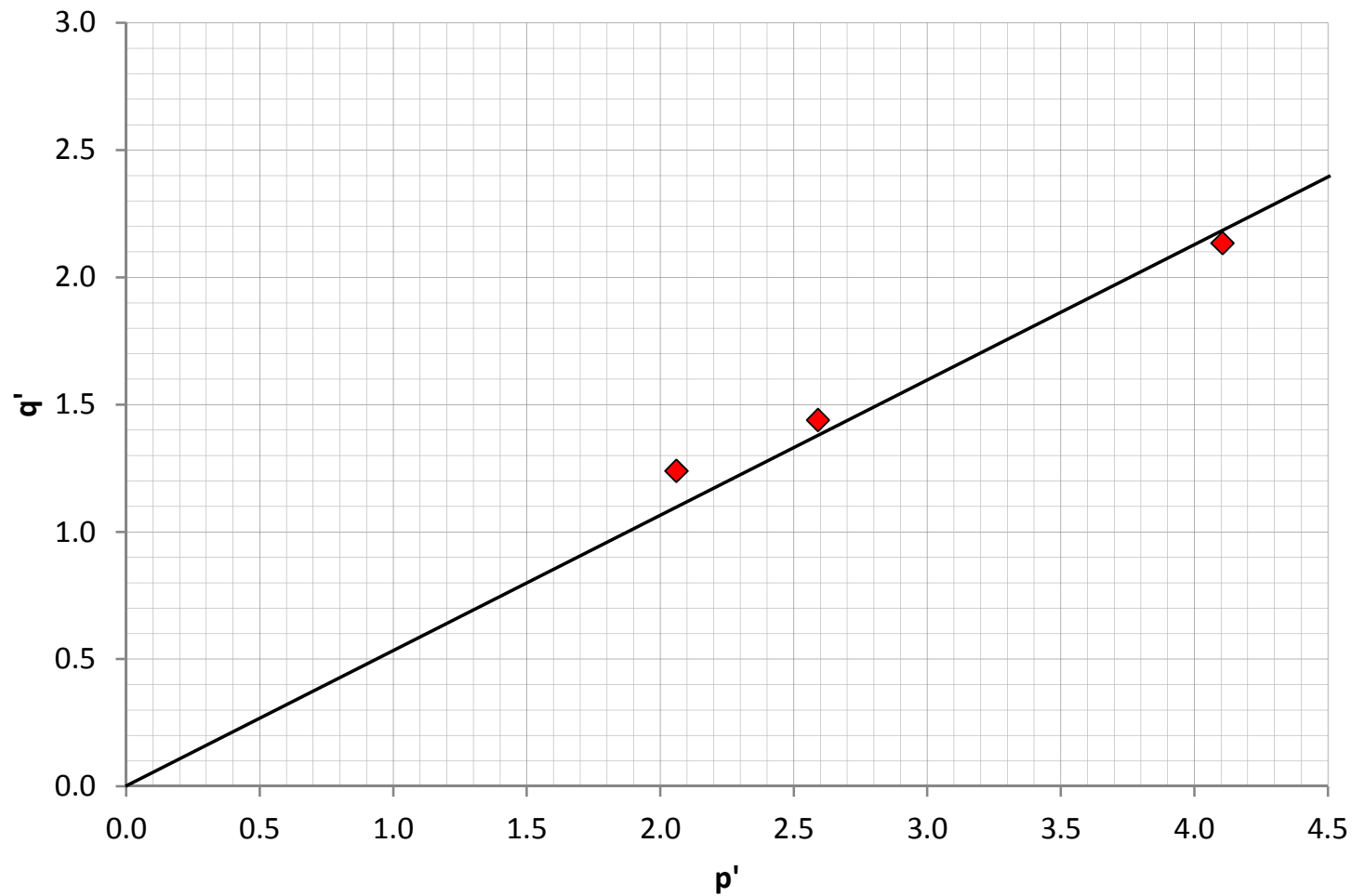
$\phi = 28$ deg

◆ ST-04 4'-6'

B14-02674: WWTP Flood Protection, North Broadway, Fargo, ND
Triaxial Shear Strength of Fat Clay (Sherack Formation)



B14-02674: WWTP Flood Protection, North Broadway, Fargo, ND
Triaxial Shear Strength of Silt (Sherack Formation)



ψ , Corps
1/3:2/3
~ 28.0 deg

$\phi = 32.0$ deg

◆ ST-03 19'-21'

Appendix C

Photos



Photograph #: 1

Date: May 23, 2014

Direction: North

Subject: East slope of bowl area, note street sweeping placement on North slope

B14-02674

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Photograph #: 2

Date: May 23, 2014

Direction: East

Subject: Existing embankment North of plant, mostly un-vegetated

B14-02674

BRAUN
INTERTEC



Photograph #: 3
 Date: May 23, 2014
 Direction: West
 Subject: Existing ground for Northern portion of proposed levee, mostly flat

B14-02674

BRAUN
INTERTEC



Photograph #: 4
 Date: May 23, 2014
 Direction: South
 Subject: Existing ground for Western portion of proposed levee, mostly flat

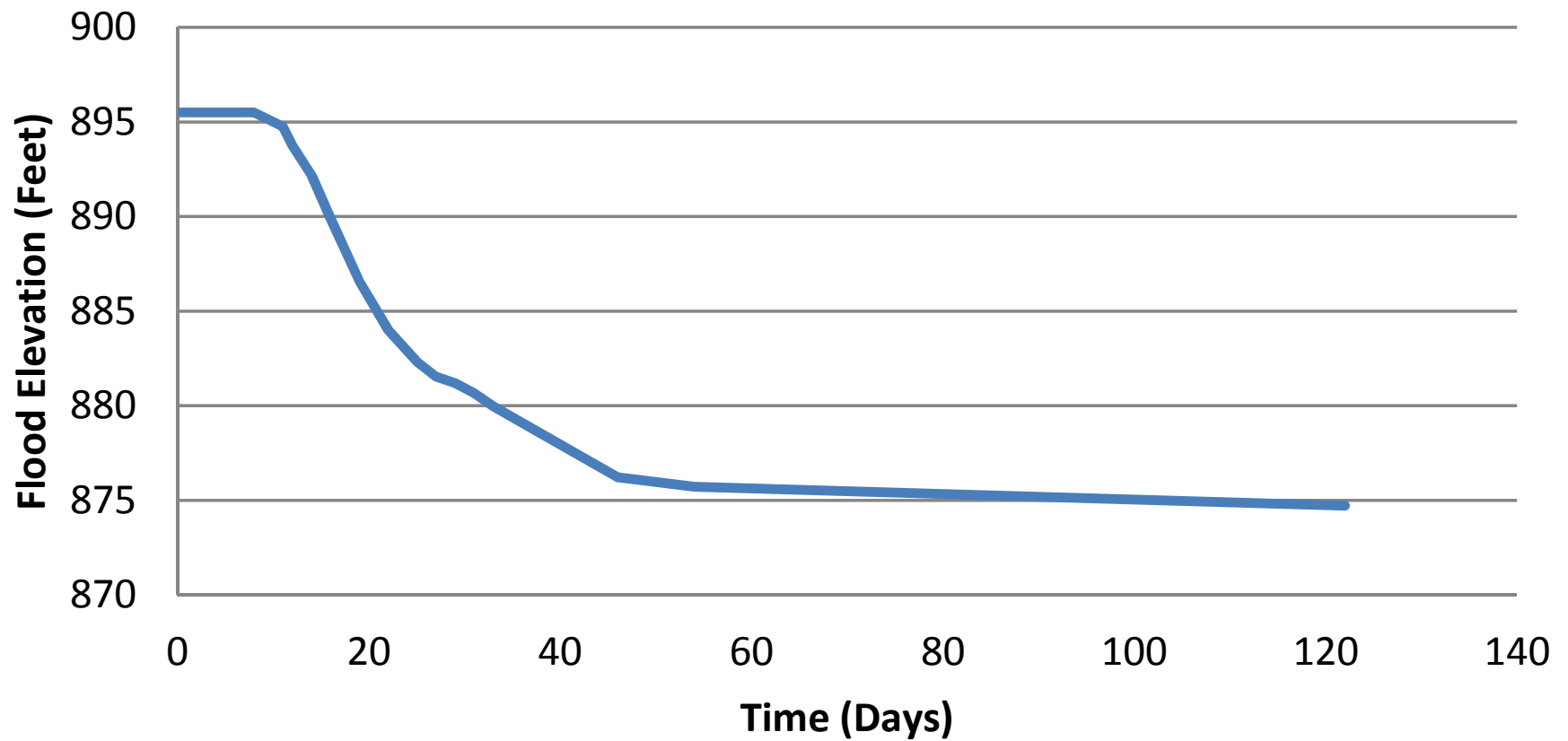
B14-02674

BRAUN
INTERTEC

Appendix D

Flood Hydrographs

100 Year Flood Hydrograph



Appendix E

Analytical Summary

B14-02674: Waste Water Treatment Plant, North Broadway, Fargo, ND

Shear Strength Parameters

Formation	Unit Weight	Effective Stress Analyses ^A		Total Stress Analyses ^B	
		Ø, Post-Peak	C	Ø	C
Existing Fill	118 pcf	24 deg	0 psf	0 deg	650 psf
New Fill	120 pcf	26 deg	0 psf	0 deg	1000 psf
Sherack	116 pcf	22 deg	0 psf	0 deg	750 psf
Brenna	99 pcf	13 deg	0 psf	0 deg	600 psf
Argusville	106 pcf	14 deg	0 psf	0 deg	700 psf
Glacial Till	130 pcf	30 deg	0 psf	0 deg	2000 psf

Hydraulic Parameters

Formation	k _v	k _h	k _v /k _h
Existing Fill	.01 ft/day	.01 ft/day	1.0
New Fill	.01 ft/day	.01 ft/day	1.0
Sherack	.0001 ft/day	.001 ft/day	0.1
Brenna	.0001 ft/day	.001 ft/day	0.1
Argusville	.0001 ft/day	.001 ft/day	0.1
Glacial Till	.0001 ft/day	.001 ft/day	0.1

Deformation Parameters

Formation	E	Poisson's Ratio
Existing Fill	100,000 psf	0.33
New Fill	100,000 psf	0.33
Sherack	100,000 psf	0.37
Brenna	80,000 psf	0.43
Argusville	80,000 psf	0.43
Glacial Till	200,000 psf	0.33

Structure Stability and Performance

Location	End of Construction	Long-Term Steady State, No Flood	Factor of Safety ^C		Settlement ^D
			Steady State Seepage, FEMA 100-Year Flood Level	FEMA 100-Year Rapid Drawdown	
Sec. #1 (Sta. 1+21.49)	4.30	4.32	1.57	2.27	< 5 inches
Sec. #2 (Sta. 12+00)	4.16	4.00	1.41	2.46	< 5 inches
Sec. #3 (Sta. 19+00)	2.12	2.30	1.46	1.47	< 10 inches
Sec. #4 (Sta. 21+25.55)	1.71	1.85	1.61	1.39	< 11 inches

^A Used in Long-Term Steady-State, Flood Stage and Drawdown Analyses

^B Used in End-of-Construction Analysis

^C DHS-FEMA Minimums per Riverine Structures Form and/or Provisions of USACE Engineer Manual EM 1110-2-1913:

End-of-Construction = 1.3

Long-Term Steady-State = 1.4

Flood Stage = 1.4

Drawdown = 1.0-1.2

^D 3.0 considered minimum for Project

^E Estimated future total settlement

Background colors assigned to the geologic materials above match the colors/materials on the analytical cross sections.

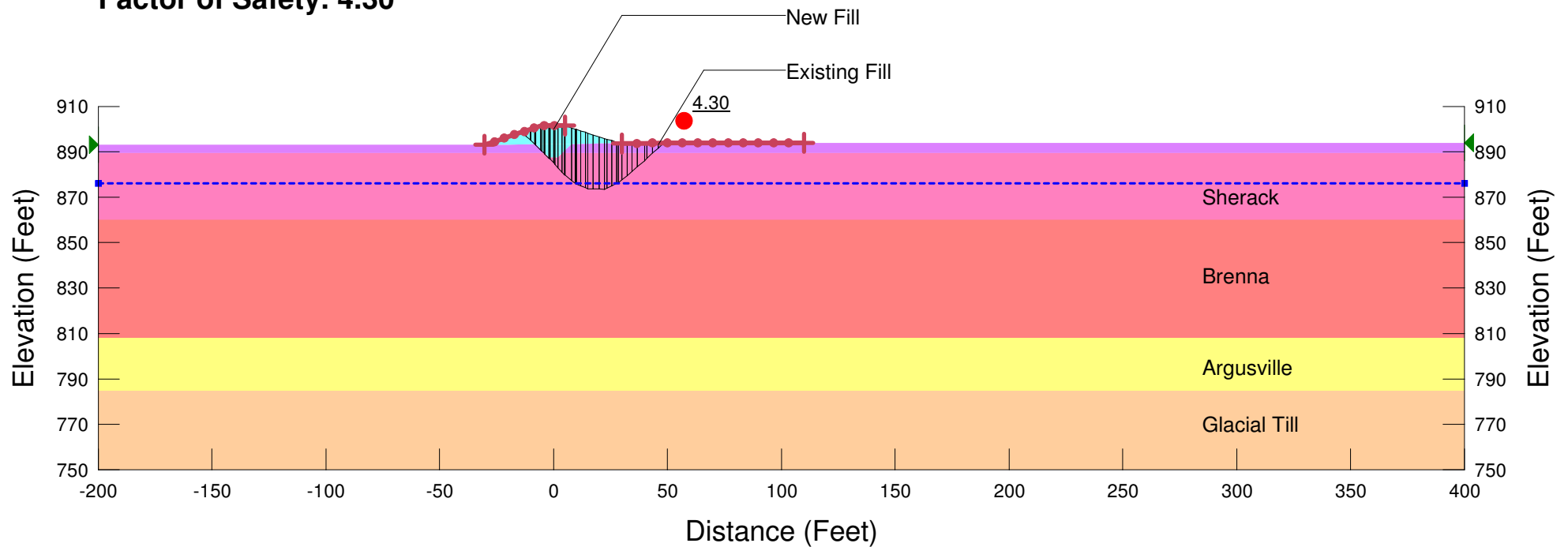
Appendix F

Analyses

B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #1 (Sta. 1+21.49)

End of Construction Stability
Undrained Analysis, Optimized Failure

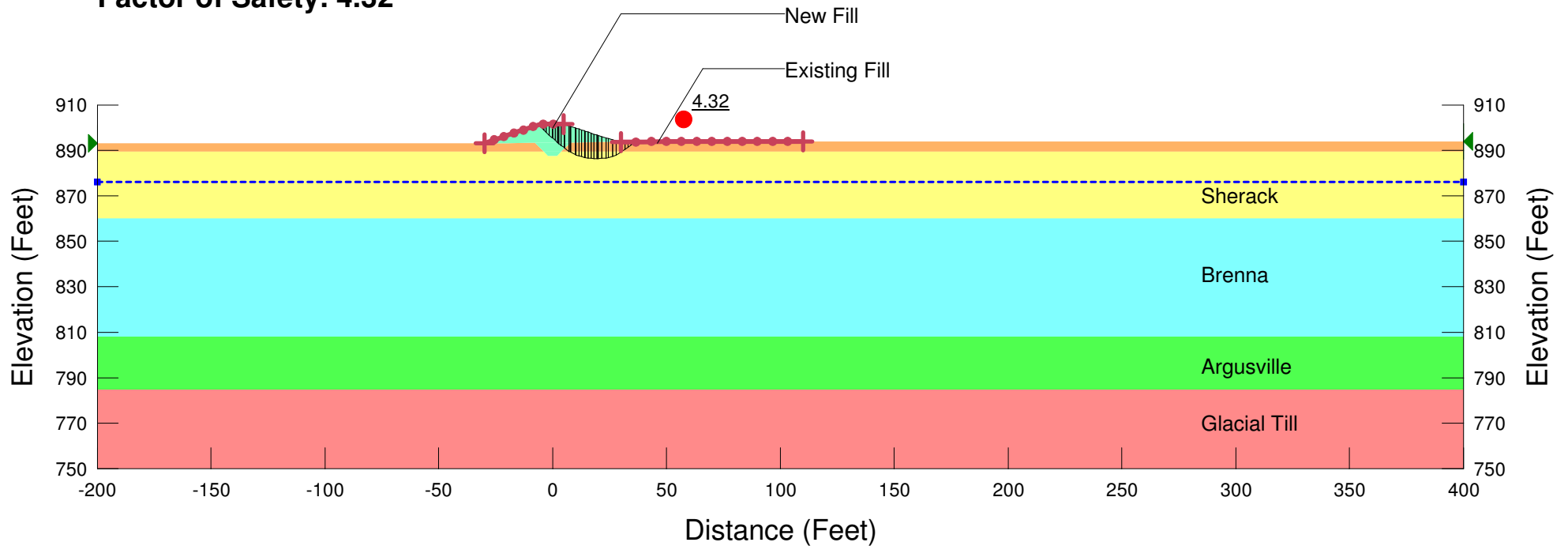
Factor of Safety: 4.30



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #1 (Sta. 1+21.49)

Long Term Steady State Stability
Drained Analysis, Optimized Failure

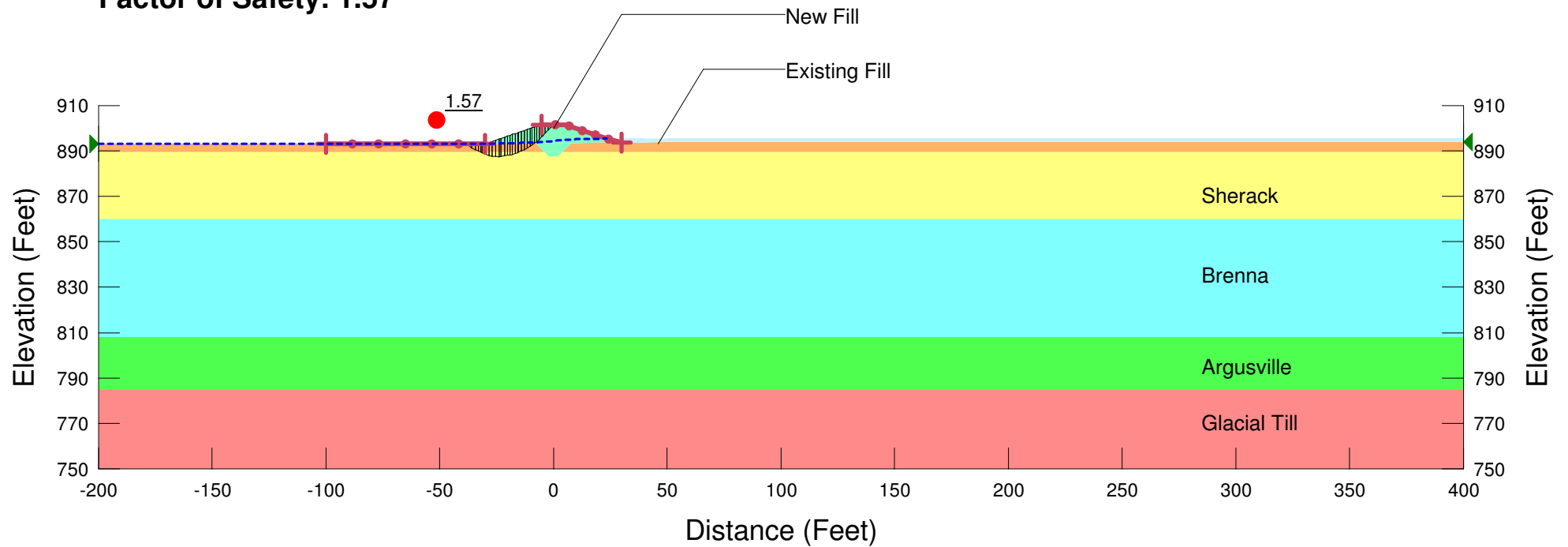
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B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #1 (Sta. 1+21.49)

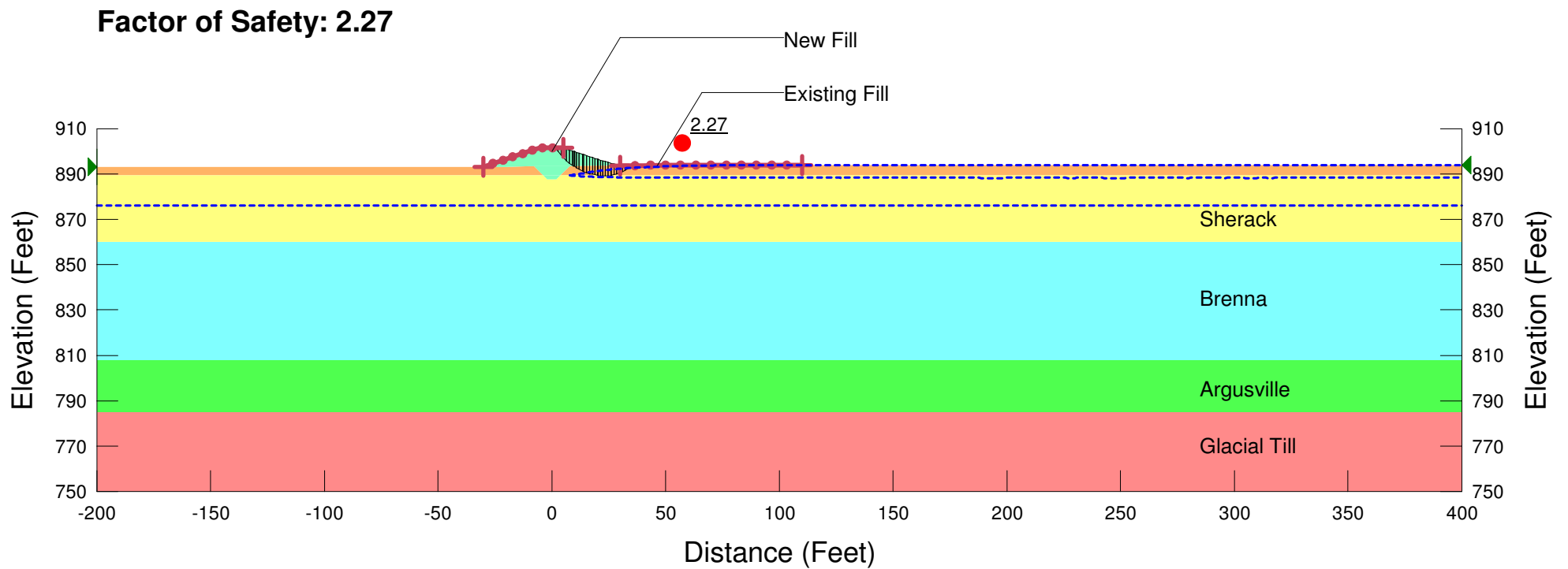
Flood Stage Stability, 100 Year Event
Drained Analysis, Optimized Failure

Factor of Safety: 1.57



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #1 (Sta. 1+21.49)

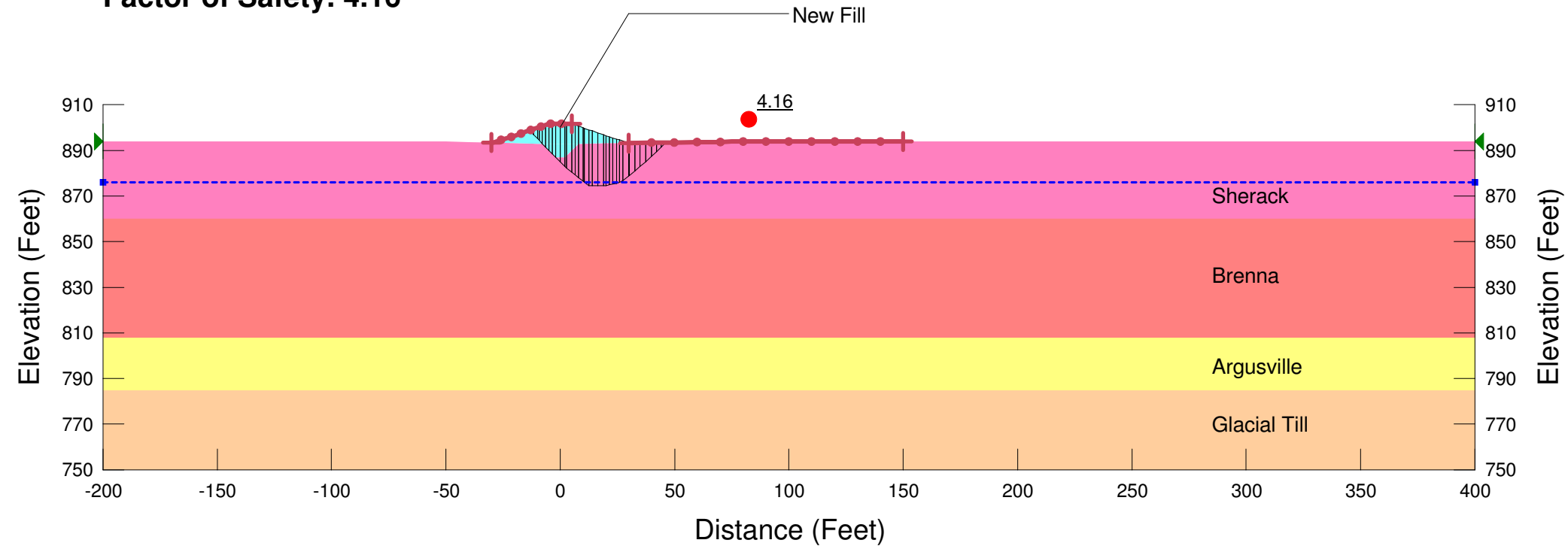
Post Flood Drawdown Stability, 100 Year Event
Drained Analysis, Optimized Failure



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #2 (Sta. 12+00)

End of Construction Stability
Undrained Analysis, Optimized Failure

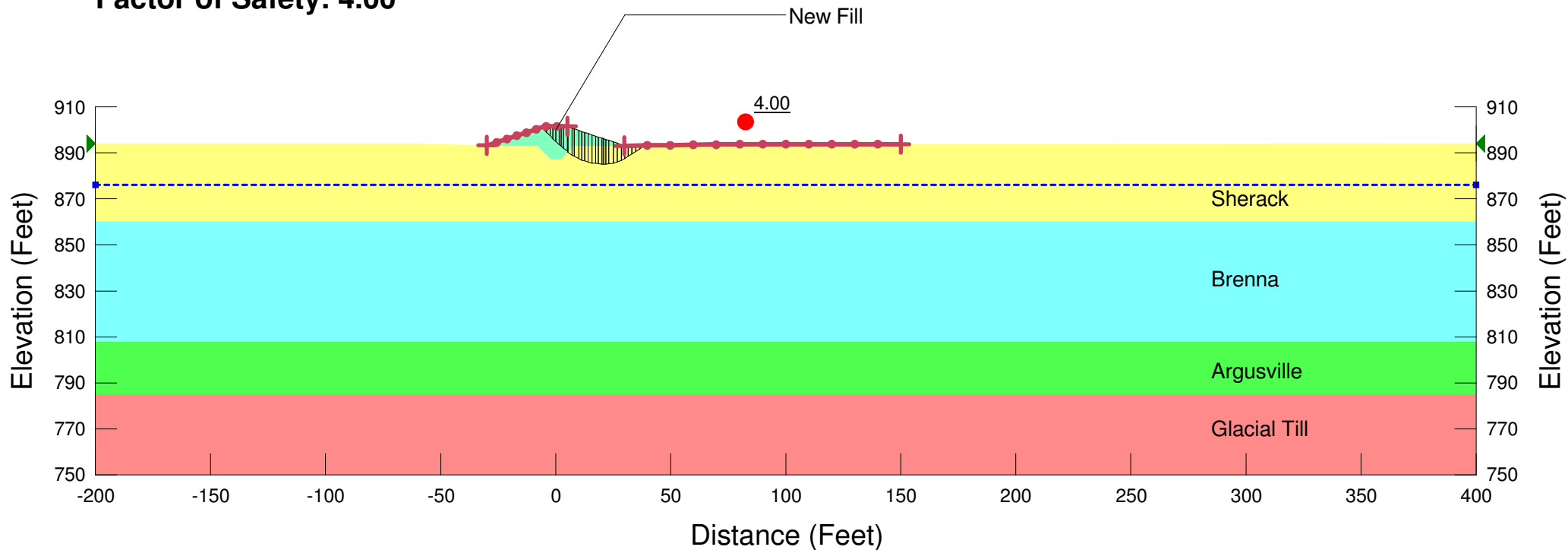
Factor of Safety: 4.16



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #2 (Sta. 12+00)

Long Term Steady State Stability
Drained Analysis, Optimized Failure

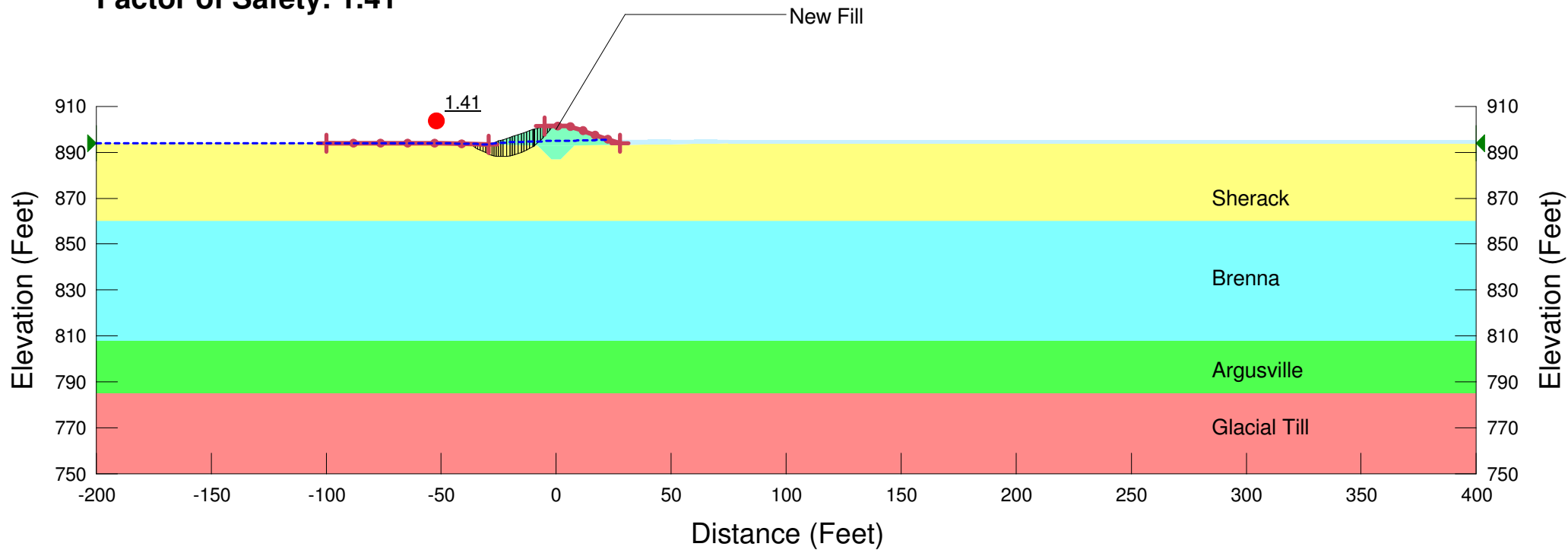
Factor of Safety: 4.00



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #2 (Sta. 12+00)

Flood Stage Stability, 100 Year Event
Drained Analysis, Optimized Failure

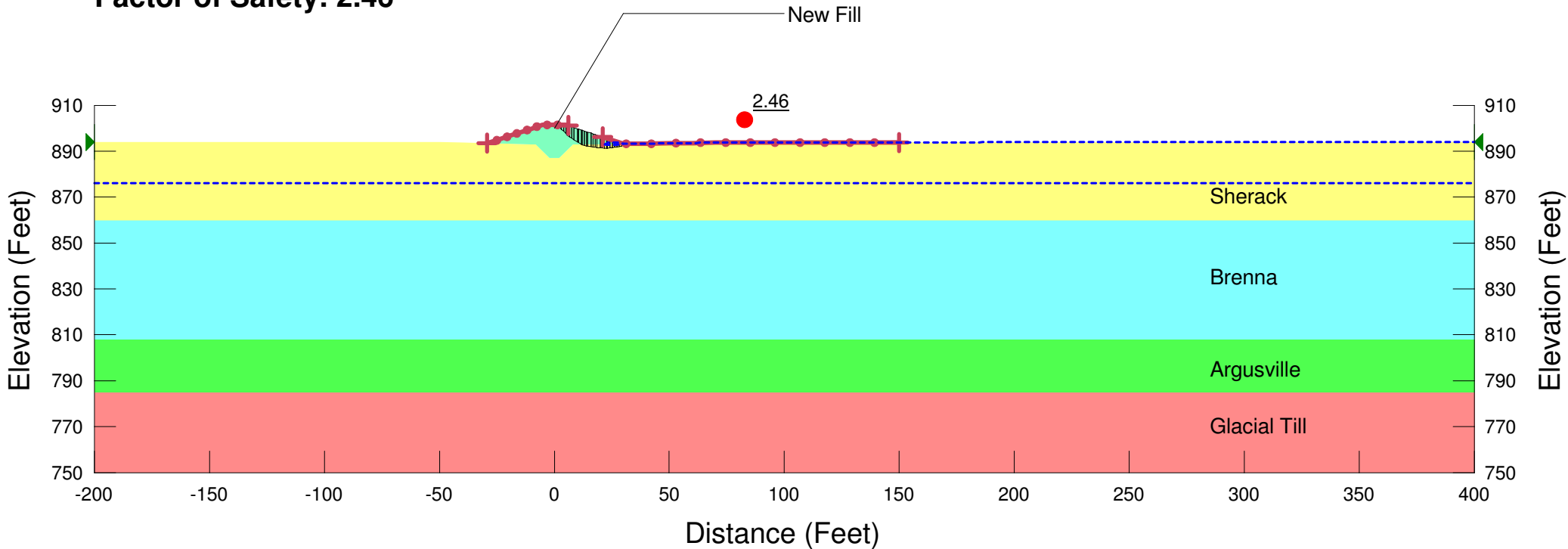
Factor of Safety: 1.41



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #2 (Sta. 12+00)

Post Flood Drawdown Stability, 100 Year Event
Drained Analysis, Optimized Failure

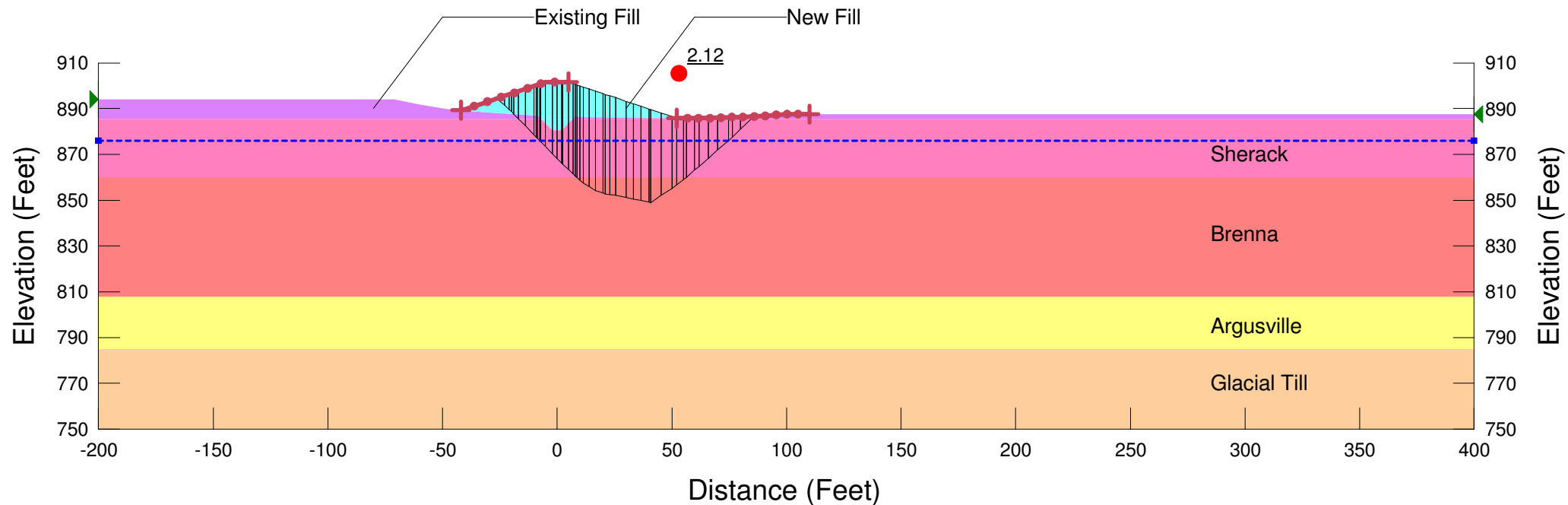
Factor of Safety: 2.46



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #3 (Sta. 19+00)

End of Construction Stability
Undrained Analysis, Optimized Failure

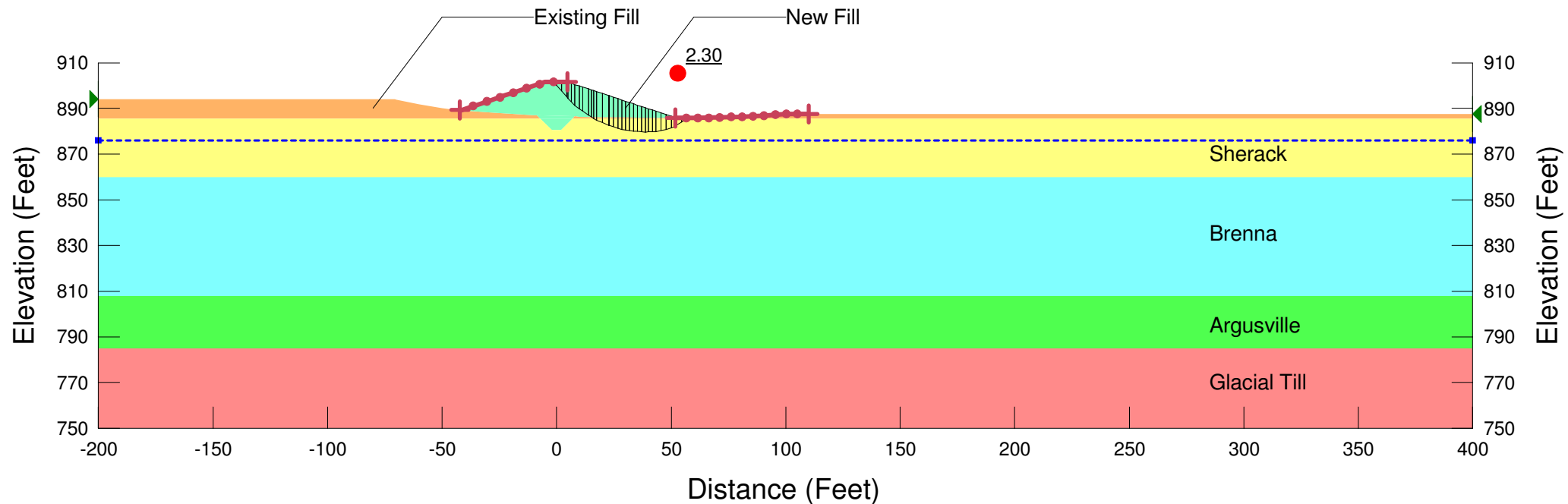
Factor of Safety: 2.12



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #3 (Sta. 19+00)

Long Term Steady State Stability
Drained Analysis, Optimized Failure

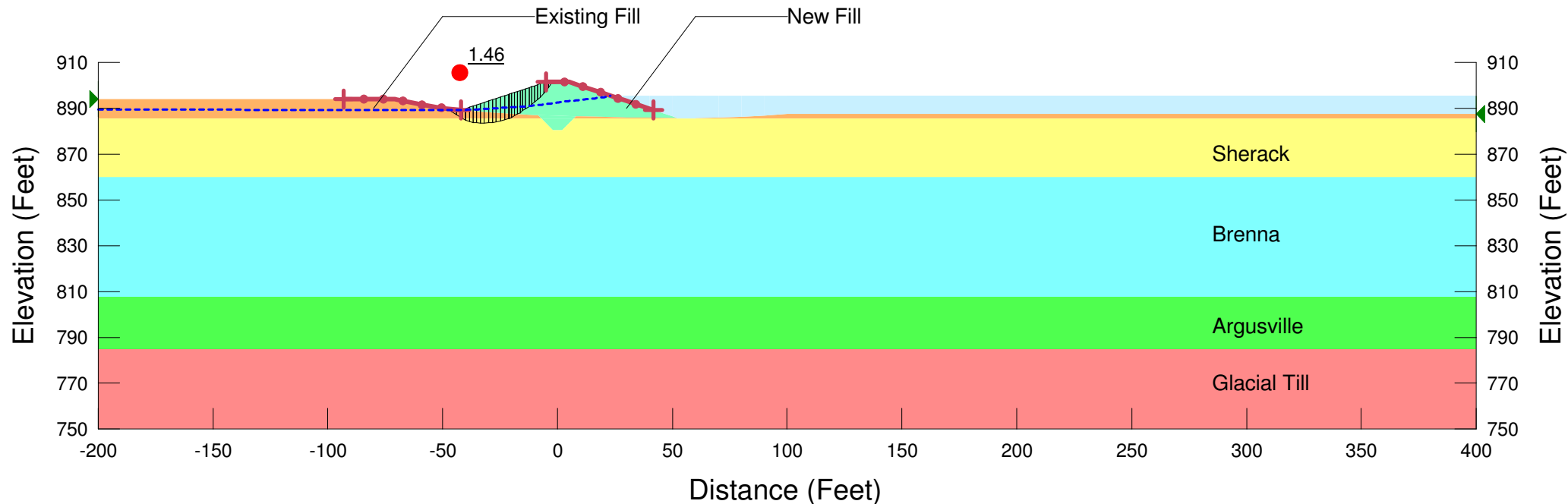
Factor of Safety: 2.30



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #3 (Sta. 19+00)

Flood Stage Stability, 100 Year Event
Drained Analysis, Optimized Failure

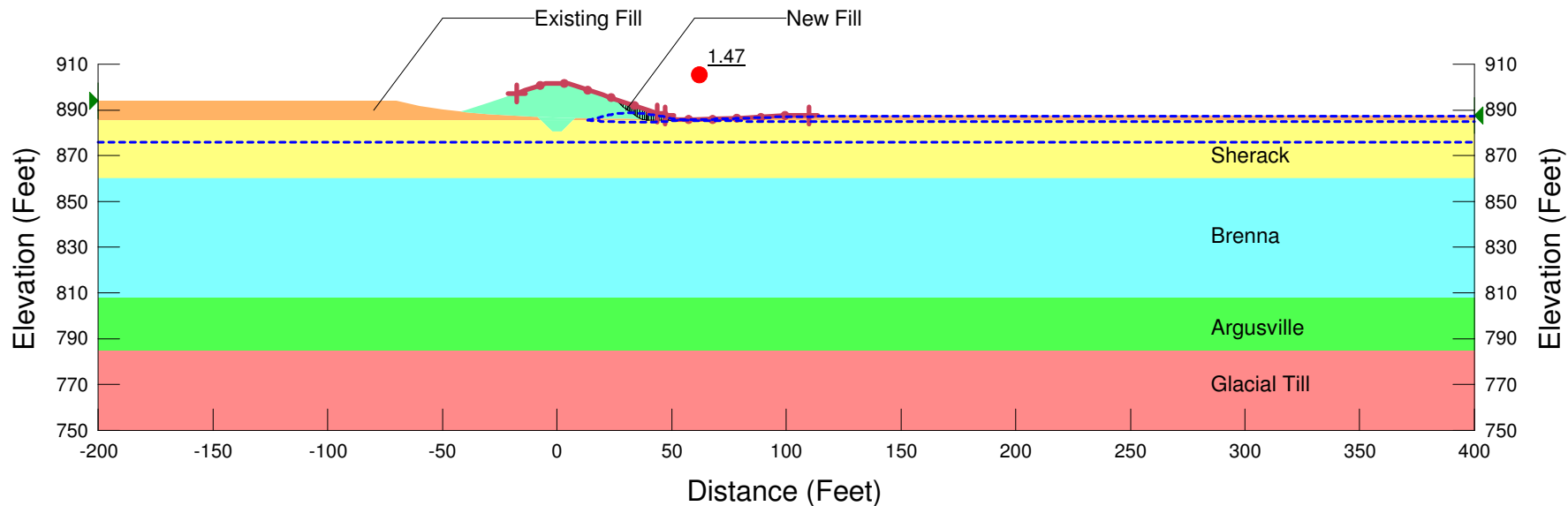
Factor of Safety: 1.46



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #3 (Sta. 19+00)

Post Flood Drawdown Stability, 100 Year Event
Drained Analysis, Optimized Failure

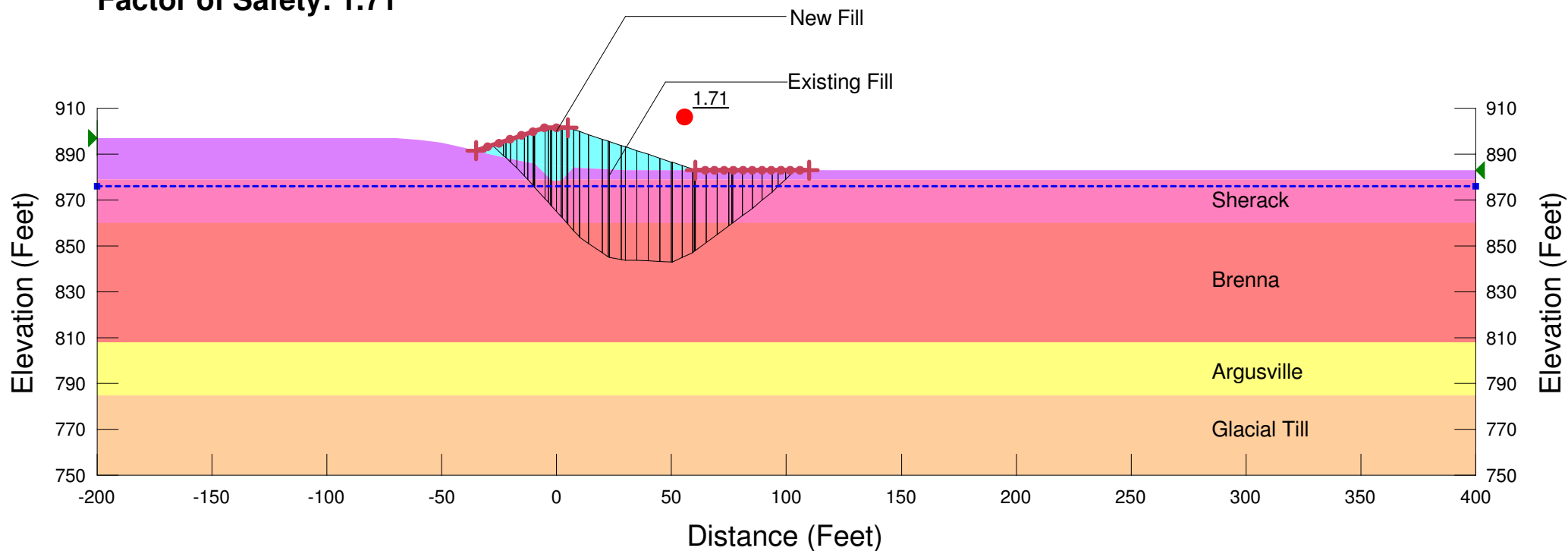
Factor of Safety: 1.47



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #4 (Sta. 21+25.55)

End of Construction Stability
Undrained Analysis, Optimized Failure

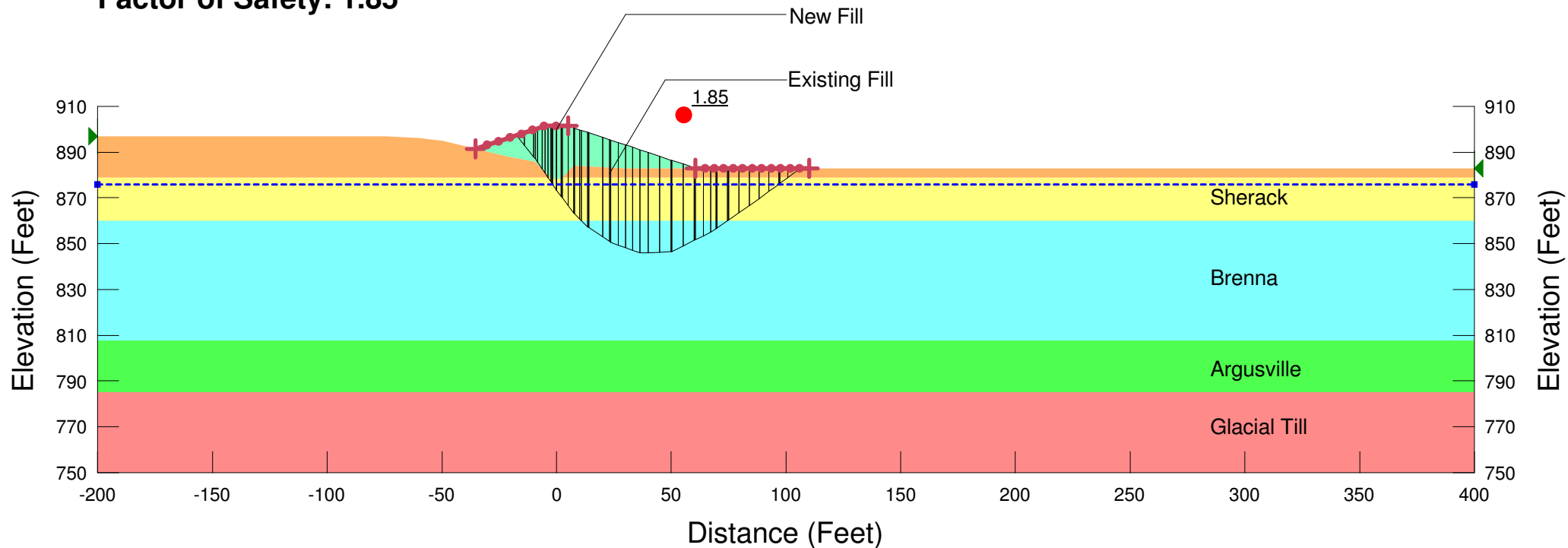
Factor of Safety: 1.71



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #4 (Sta. 21+25.55)

Long Term Steady State Stability
Drained Analysis, Optimized Failure

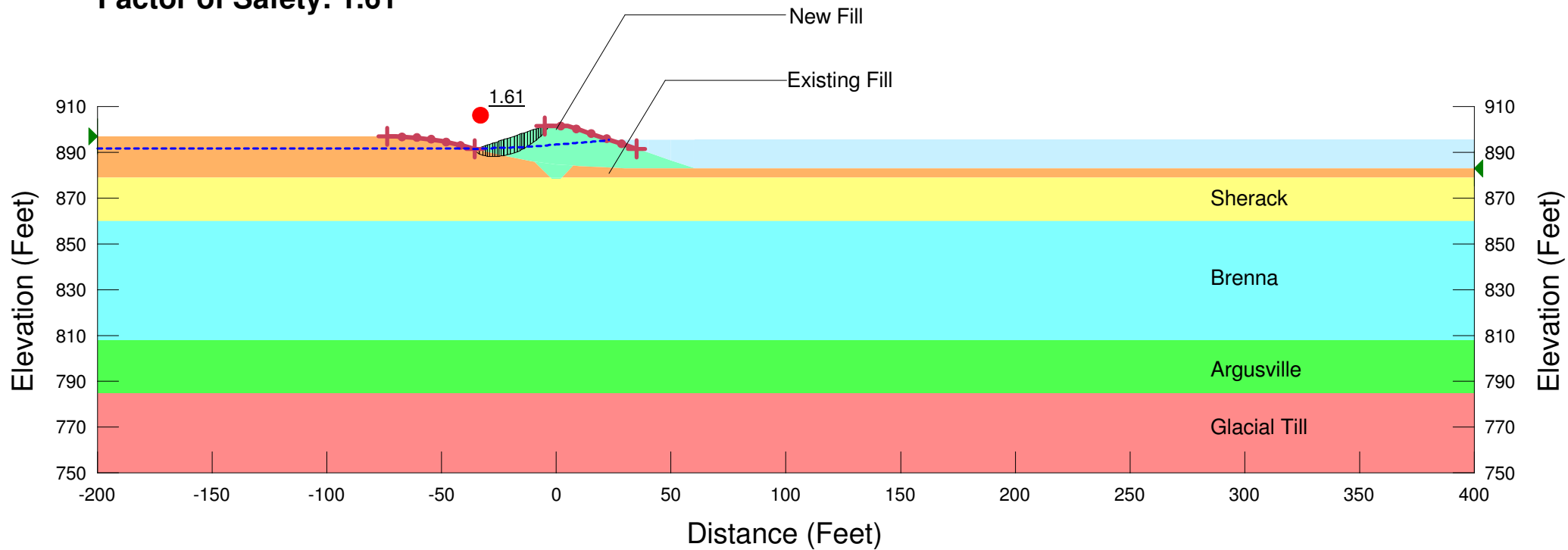
Factor of Safety: 1.85



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #4 (Sta. 21+25.55)

Flood Stage Stability, 100 Year Event
Drained Analysis, Optimized Failure

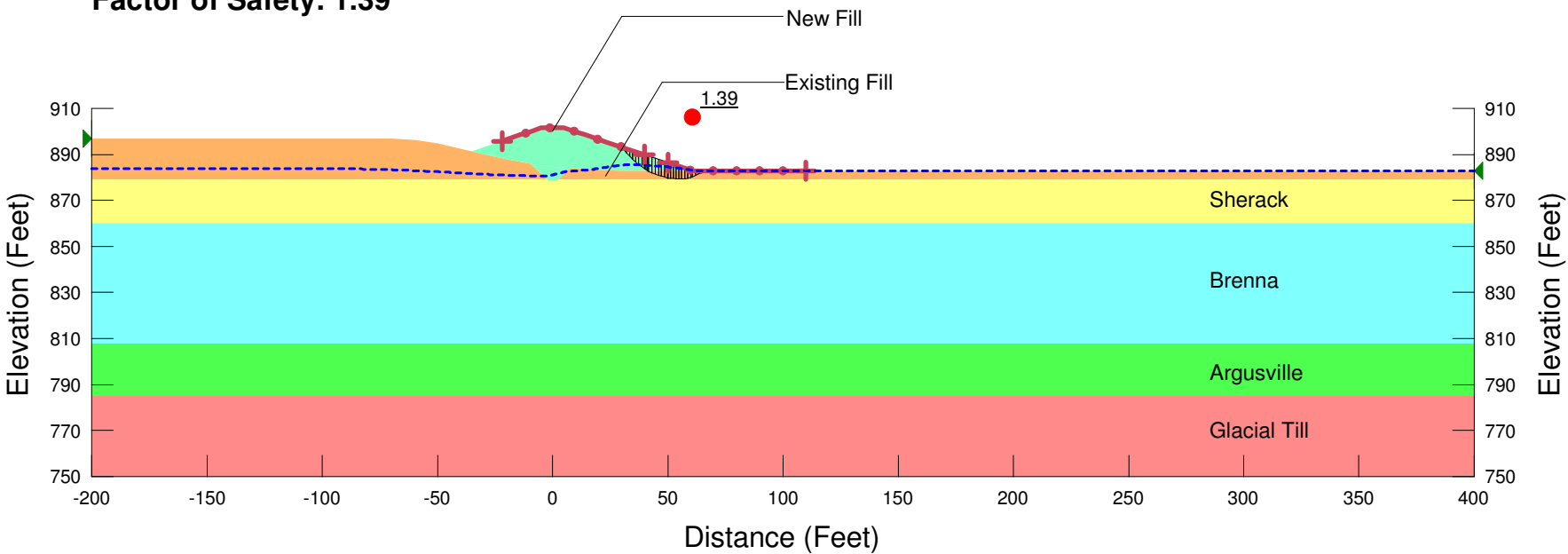
Factor of Safety: 1.61



B14-02674: WWTP Levee
North Broadway
Fargo, North Dakota
Section #4 (Sta. 21+25.55)

Post Flood Drawdown Stability, 100 Year Event
Drained Analysis, Optimized Failure

Factor of Safety: 1.39



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Technical Memorandum

To: Justin Klabo, PE; AE2S
From: Cody Wardien, PE and Nathan McKinney, PE
Subject: Fargo WWTP Flood Protection, 30% Design Review
Date: October 16, 2017
Project: B1707437

Introduction

The City of Fargo is considering constructing a flood protection structure around the existing wastewater treatment plant (WWTP) that could protect the facility up to a flood elevation of 899.5 feet. The WWTP is located at 3400 North Broadway in Fargo, North Dakota. AE2S is providing design of the flood protection structure and we have been retained to review the geotechnical aspects of the 30% design. At this stage of design we understand the proposed structure will consist primarily of earthen levee with 4H:1V (horizontal: vertical) side slopes. The exception to this is along the south entrance drive where about 300 feet of sheetpile wall will be used, and also at the northeast clarifier where sheetpile will be installed to provide the flood protection. The structures will tie into high ground along the south and east sides of the plant.

To support our design review we reviewed the following documents.

- Site plan including existing and proposed grades, provided by AE2S, labeled “WWTF Levee Project”, dated May 2016.
- Aerial image of the site including existing and propose grades, provided by AE2S, labeled “Fargo WWTP Levee”, dated October 2016.
- 100-year design flood elevation provided by AE2S.
- Preliminary Geotechnical Engineering Report, prepared by Terracon Consultants, Inc. (Terracon Project No. M1165052), labeled “Fargo Wastewater Treatment Facility Improvements”, dated October 5, 2016.
- Geotechnical Evaluation Report, prepared by Braun Intertec Corporation (Braun project number B14-02674), labeled “Fargo WWTP Flood Protection Levee”, dated April 14, 2015.
- Geotechnical Evaluation Report, prepared by Braun Intertec Corporation (Braun project number B14-06400), labeled “Broadway Interceptor SSO Reduction Project”, dated January 8, 2015.

We compared the work we completed for evaluation of a proposed levee at the plant in 2014/2015 to the current design and concluded that soil borings would be needed at the northeast clarifier and in the low spot in the southwest corner of the site.

We understand that consideration is being given to utilizing cast-in-place concrete floodwall instead of earthen levee along portions of the site, but as of the date of this memo design details have not been formalized. We understand the concept of the floodwall design would be to retain up to 6 feet of water

utilizing a footing with a burial depth of 7 1/2 feet, a top of wall height of 902 feet, and a net allowable bearing pressure of 1,200 psf.

Analytical Method

Although we understand that certification of the flood protection structure may not be applied for, our flood analyses are generally performed in accordance with Federal Emergency Management Agency (FEMA) provisions for Riverine Structures and with analytical procedures developed by the US Army Corps of Engineers (USACE) specifically for flood control structures in the Red River Valley. FEMA, which governs the National Flood Insurance Protection program, requires an evaluation of structure stability under end-of-construction, steady-state, flood stage, post-flood drawdown, and earthquake conditions, as applicable, along with an evaluation of flood-related seepage, piping and uplift potential, and foundation bearing capacity. FEMA minimum factors of safety for structure stability are 1.3 for end-of-construction conditions, 1.4 for steady-state and flood stage conditions, 1.0 for post-flood drawdown conditions and 1.0 for earthquake conditions.

For structures on or near slopes known or suspected to have failed, the USACE also recommends that shear strength parameters for the failed portion of an analytical section be back-calculated to a factor of safety of approximately 1.0 before the entire design section is then analyzed. When a failed section is considered, a minimum steady-state factor of safety is generally allowed to be 1.2.

To facilitate our evaluation, computer analyses were performed on selected levee cross sections using GeoStudio 2012 by Geo-Slope International. Steady state stability was analyzed using limit equilibrium methods available in the GeoStudio program Slope/W. Stability was determined based on both force and moment equilibrium, and incorporated effective stress soil parameters and an estimated hydrostatic groundwater surface. Levee stability during the flood stage and post-flood drawdown was determined with Slope/W. We used the GeoStudio program Seep/W to model the advance and withdrawal of seepage "fronts" during the flood stage and under post-flood rapid drawdown conditions.

During the flood stage, a steady state seepage model was used that included a boundary condition for the design flood elevation on the river side of the levee, and potential seepage review points on the landward levee slope and landward ground surface. Drawdown was controlled with regression functions based on the 100-year flood hydrograph illustrated in the Appendix. Profiles of the seepage "fronts," whose advance and withdrawal were governed by hydraulic conductivity and volumetric water content functions assigned to the levee and foundation materials, were obtained for several time steps over the course of the post-flood drawdown.

We did not perform analyses to determine factors of safety under earthquake conditions. FEMA's National Earthquake Hazards Reduction Program (NEHRP) maps indicate that the project is located in an area of limited seismicity, and not likely to experience unfavorable ground accelerations. Furthermore, according to Corps of Engineers Regulation ER 1110-2-1806, *Earthquake Design Analysis for Corps of Engineers Projects*, the region near Fargo, North Dakota is located within earthquake Seismic Risk Zone 0 which does not require evaluations of embankment, slope, and/or foundation susceptibility to liquefaction or excessive deformation when subjected to ground motions.

Sigma/W was used to estimate structure settlement. The structure loads were applied to the in-situ stress/strain conditions, and mesh deformation determined using elastic plastic (Young's Modulus and

Poisson's Ratio) stiffness parameters that incorporated pore water pressure changes. In this manner, settlement was estimated based on the contribution of both vertical and horizontal load-induced compression.

To supplement work previously performed at the plant, AE2S provided us with two cross sections at locations we selected along the proposed levee. One cross section was provided for the southwest corner of the site where the deepest fills are proposed. The other cross section was through the northeast corner of the site where indications of past slope movement has occurred. The boring location sketch in the Appendix shows the locations of the two cross sections.

The analytical graphics attached in the Appendix illustrate the geometry and subsurface geologic profile assumed for the two cross sections evaluated.

Results

Soil Borings

We performed two borings in the southwest corner of the site and one in the northeast corner of the site near the existing clarifier. The table below provides a summary of the soil boring results, in the general order we encountered the strata. Please refer to the Log of Boring sheets in the Appendix for additional details. The Descriptive Terminology sheets in the Appendix include definitions of abbreviations used in the table below.

Table 1. Subsurface Profile Summary*

Strata	Soil Type - ASTM Classification	Range of Penetration Resistances	Commentary and Details
Fill	CH	3 to 12 blows per foot (BPF)	<ul style="list-style-type: none"> Soils were predominately fat clay (CH). Moisture condition generally damp to moist. Thicknesses at boring locations varied from 4 to 25 feet. Boring ST-03 was performed near the existing below grade clarifier and the fill observed in this boring was likely foundation wall backfill. A majority of the soils contained trace roots.
Alluvial	ML	5 to 10 BPF	<ul style="list-style-type: none"> Soils were predominately silt (ML). Moisture condition generally waterbearing. Only encountered in one of the borings (ST-03). Extended to a depth of 39 feet.
Glacial lake deposits	CH, ML	1 to 12 BPF	<ul style="list-style-type: none"> Generally consisted of fat clay deposits with silt lenses and laminations. A silt layer was encountered in Boring ST-01 starting at a depth 20 1/2 feet. Penetration resistance values generally decrease with depth. Moisture condition generally moist to wet and increasing with depth.

*Abbreviations defined in the attached Descriptive Terminology sheets.

Laboratory Testing

The boring logs show the results of laboratory testing we performed, next to the tested sample depth.

The moisture content of the soil tested varied from approximately 15 to 69 percent, indicating that the materials were below to well above their probable optimum moisture contents.

The results of the unit weights performed on the soils tested indicate the materials' have wet densities (WD) ranging from 108 to 121 pounds per cubic foot (pcf), and dry densities (DD) ranging from 75 to 94 pcf.

Our mechanical analyses indicated that the sample tested from Boring ST-03 contained 97 percent silt and clay by weight.

Analytical Models

The results of our analyses are tabulated on the Analytical Summary page and shown graphically on the final pages of this letter. The results of our previous and current analyses indicate the proposed levee is favorably designed and will meet or exceed FEMA minimums, except in the area of the northeast clarifier. Factors of safety at the clarifier do not meet FEMA minimums, but the installation of a sheetpile wall will have negligible impact on the current factor of safety. To the north and to the south of the clarifier an earthen embankment should not be constructed as end of construction conditions are not favorable. It is our opinion that a sheet pile wall could be used to the north and to the south of the clarifier as stress changes in the soil would be negligible in consideration of the end of construction condition. The sheet pile wall should continue north from the clarifier to a distance of 60 feet along the flood protection centerline northwest of the north edge of the plant entrance drive. The sheet pile wall should continue south to a distance of 10 feet north of the next entrance drive. We note that the area of the clarifier and the adjacent sheet pile wall do not meet FEMA minimum requirements for slope stability, but they have negligible impact on the current factor of safety. Factor of safety during drawdown falls to less than 1.0, but this occurs during low pool conditions and not during flood conditions so there would be time to react and maintain the slope should movement occur.

Our deformation analyses suggest that settlement for the proposed levee in the low area of the southwest corner of the plant will be approximately 1 1/2 feet. Our original analysis indicated that the remaining portions of the levee away from the southwest corner of the site will have settlements of less than 1/2 foot.

Our seepage analyses indicate that the factor of safety for the seepage gradient under steady state flood is greater than 3 and flood water is not likely to impact the land side of the new levee. For the floodwall option, the bottom of the concrete flood wall will experience an estimated pore pressure of 700 to 850 psf across the bottom of the foundation.

Conclusions

For the levee option, the current design incorporates a levee that is favorably designed from a geotechnical perspective, except for the area of the northeast clarifier. In the area of the clarifier described above, a levee embankment should not be constructed. In this area, a sheet pile floodwall could be used. If used, the factor of safety for slope stability would be similar to current conditions, which currently do not meet the minimum requirements of FEMA. Our analysis showed that the

installation of a shallow sheet pile floodwall would not increase or decrease the factor of safety for the existing slope. In order to meet FEMA minimum requirements, a structural element would need to be installed, such as deeper sheet pile to resist the forces of slope movement.

For the levee option, the design should consider overbuild based on the estimated settlement amounts in order to maintain freeboard.

For the concrete floodwall option, the current design incorporates a wall that is favorably designed and would meet FEMA minimum criteria. A net allowable soil bearing pressure of 1,200 pounds per square foot (psf) is adequate and could be increased to 1,500 psf and still maintain a factor of safety of at least 3. We anticipate total settlement of the wall will not exceed 1 inch; however, we recommend additional settlement analysis be performed as part of final wall design.

Remarks


In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.

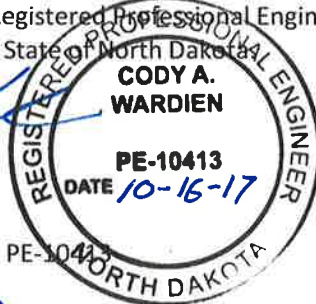
Sincerely,

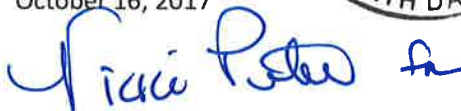
BRAUN INTERTEC CORPORATION

Professional Certification:

I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of North Dakota as


Cody A. Wardien, PE
Project Engineer
Registration Number: PE-10413
October 16, 2017



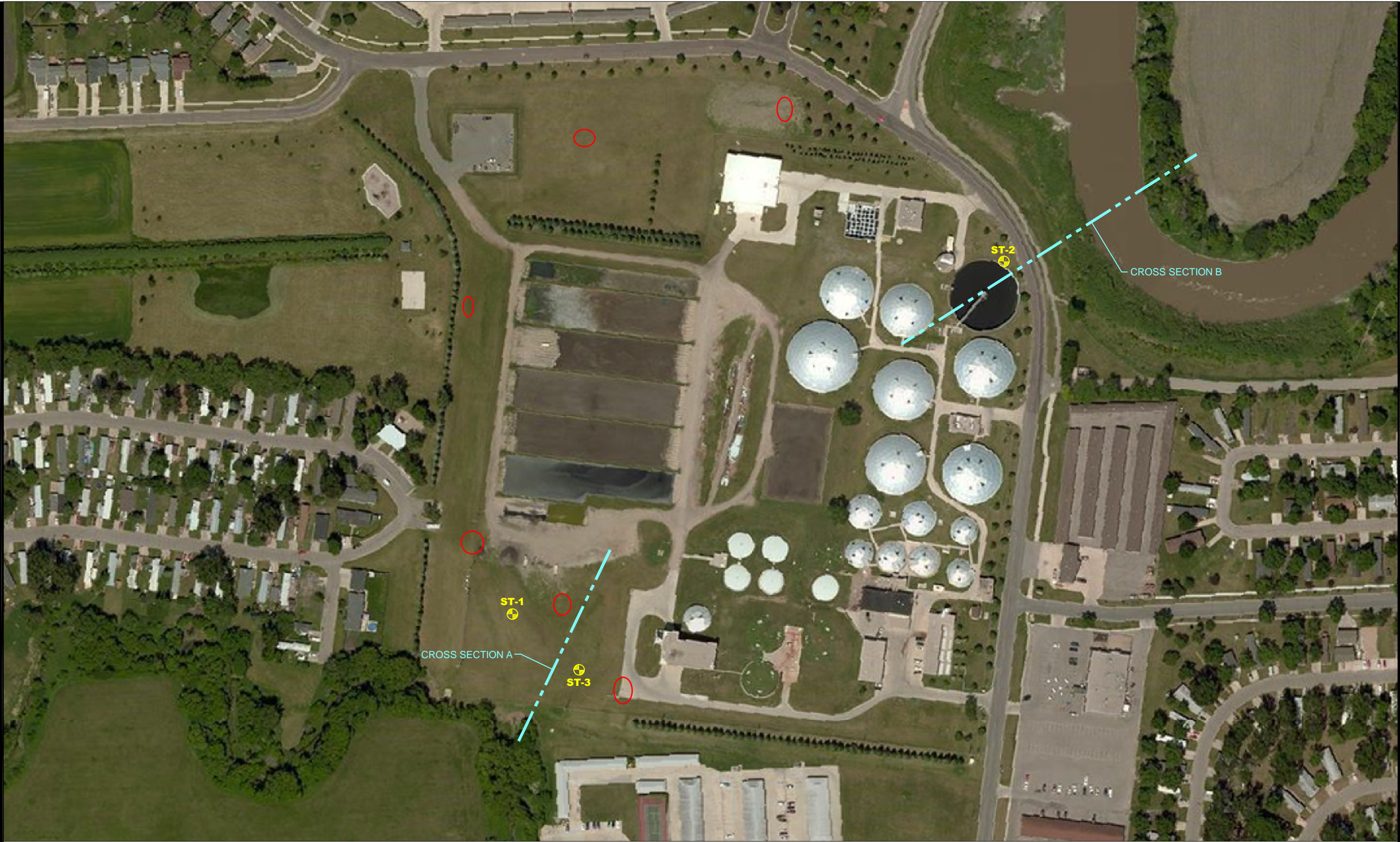


Nathan L. McKinney, PE
Principal/Senior Engineer

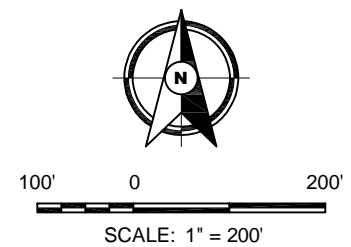
Attachments:

Boring Location Sketch
Log of Boring Sheets
Descriptive Terminology
Analytical Summary
Stability Analyses

F:\2017\B1707437.dwg, Geotech, 9/21/2017 12:53:20 PM



 **DENOTES APPROXIMATE LOCATION OF STANDARD PENETRATION TEST BORING**



SCALE: 1" = 200'

**BRAUN
INTERTEC**
The Science You Build On.
11001 Hampshire Avenue S
Minneapolis, MN 55438
PH. (952) 995-2000
FAX (952) 995-2020

Base Dwg Provided By:

SOIL BORING LOCATION SKETCH
GEOTECHNICAL EVALUATION
FARGO WWTP FLOOD PROTECTION LEVEE
3400 NORTH BROADWAY
FARGO, NORTH DAKOTA

Project No:
B1707437
Drawing No:
B1707437
Scale: 1" = 200'
Drawn By: LAO
Date Drawn: 9/5/17
Checked By: CW
Last Modified: 9/21/17

Sheet: of Fig:

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(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\07437.GPJ BRAUN_V8_CURRENT.GDT 8/17/17 08:54

Braun Project B1707437 Geotechnical Memorandum Fargo WWTP Flood Protection Levee 3400 North Broadway Fargo, North Dakota				BORING: ST-01 LOCATION: N 479906.0; E 2894986.1 See sketch.				
DRILLER:		METHOD:		DATE:		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes
893.3	0.0	FILL	FILL: Fat Clay, trace roots, dark brown and brown, damp.	12				
				9		15		
889.3	4.0	CH	FAT CLAY, with Silt lenses and laminations, brown with iron-staining, moist, rather soft to rather stiff. (Glacial Lake Deposit)	12		30	2 1/2	
				6		37	1 1/2	WD=108 pcf, DD=79 pcf
				6		41	1 1/2	
				5		40		WD=110 pcf, DD=78 pcf
			-brown and gray at 15 feet.	5		39		
872.8	20.5	ML	SILT, gray, moist, loose. (Glacial Lake Deposit)	8				
870.3	23.0	CH	FAT CLAY, gray, moist, very soft. (Glacial Lake Deposit)					
867.3	26.0			3		37	1/2	
			END OF BORING.					
			Water observed at a depth of 24 feet with a cave-in depth of 24 1/2 feet immediately after withdrawal of auger.					
			Boring then backfilled with bentonite grout.					

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\07437.GPJ BRAUN_V8_CURRENT.GDT 8/17/17 08:54

Braun Project B1707437 Geotechnical Memorandum Fargo WWTP Flood Protection Levee 3400 North Broadway Fargo, North Dakota						BORING: ST-02 LOCATION: N 479788.8; E 2895126.8 See sketch.				
DRILLER:			METHOD:			DATE:		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes		
883.0	0.0	FILL	FILL: Fat Clay, trace roots, dark brown and brown, damp to moist.	9						
			-dark brown, brown and gray below 4 feet.	8		32				
				5						
				3		31				
872.5	10.5	CH	FAT CLAY, with Silt lenses, brown, wet, very soft to medium. (Glacial Lake Deposit)	4			3/4			
			-gray below 14 feet.	5		38	3/4			
				6		45	1 1/2	WD=108 pcf, DD=75 pcf		
862.0	21.0		END OF BORING.	1		69	<1/4			
			Water observed at a depth of 6 1/2 feet while drilling.							
			Water observed at a depth of 5 1/2 feet with a cave-in depth of 19 feet immediately after withdrawal of auger.							
			Boring then backfilled with bentonite grout.							

(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\07437.GPJ BRAUN_V8_CURRENT.GDT 8/17/17 08:54

Braun Project B1707437 Geotechnical Memorandum Fargo WWTP Flood Protection Levee 3400 North Broadway Fargo, North Dakota					BORING: ST-03 LOCATION: N 480657.6; E 2896024.7 See sketch.				
DRILLER:		METHOD:			DATE:		SCALE: 1" = 4'		
Elev. feet	Depth feet	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes	
896.7	0.0								
895.7	1.0	FILL	FILL: Fat Clay, trace roots, dark brown, damp.	8				WD=121 pcf, DD=94 pcf	
		FILL	FILL: Fat Clay with Silt inclusions, dark brown and brown, moist.	7					
				5		27			
			-brown and gray at 7 1/2 feet.	5		28			
			-dark brown and brown, trace roots at 10 feet.	6					
				7		24			
				5		30			
				7		28			
871.7	25.0	ML	SILT, gray, waterbearing, loose. (Alluvium) -wood fragments at 25 feet.	10		34		P200=97%	
			-trace organic and wood fragments from 29 to 30 1/2 feet.	5					

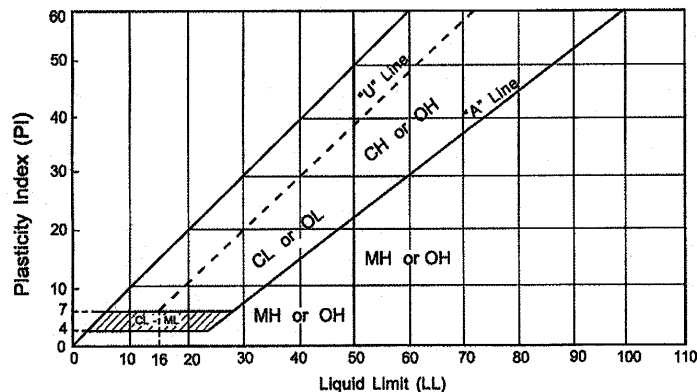
(See Descriptive Terminology sheet for explanation of abbreviations)

LOG OF BORING N:\GINT\PROJECTS\AX PROJECTS\2017\07437.GPJ BRAUN_V8_CURRENT.GDT 8/17/17 08:54

Braun Project B1707437 Geotechnical Memorandum Fargo WWTP Flood Protection Levee 3400 North Broadway Fargo, North Dakota						BORING: ST-03 (cont.) LOCATION: N 480657.6; E 2896024.7 See sketch.				
DRILLER:			METHOD:			DATE:		SCALE: 1" = 4'		
Elev. feet 864.7	Depth feet 32.0	Symbol	Description of Materials (Soil-ASTM D2488 or D2487, Rock-USACE EM1110-1-2908)	BPF	WL	MC %	qp tsf	Tests or Notes		
			SILT, gray, waterbearing, loose. (Alluvium) <i>(continued)</i>							
			-wood fragments at 35 feet. -6 inch SILTY SAND layer at 35 feet.	6						
857.7	39.0	CH	FAT CLAY, gray, wet, medium. (Glacial Lake Deposit)							
855.7	41.0		END OF BORING.	6		33	1/2			
			Water observed at a depth of 36 1/2 feet with 39 1/2 feet of hollow-stem auger in the ground.							
			Boring then backfilled with bentonite grout.							

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests ^a					Soils Classification	
					Group Symbol	Group Name ^b
Coarse-grained Soils more than 50% retained on No. 200 sieve	Gravels More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines ^a	$C_u \geq 4$ and $1 \leq C_u \leq 3^c$	GW	Well-graded gravel ^g	
			$C_u < 4$ and/or $1 > C_u > 3^c$	GP	Poorly graded gravel ^g	
		Gravels with Fines More than 12% fines ^a	Fines classify as ML or MH	GM	Silty gravel ^{g f s}	
			Fines classify as CL or CH	GC	Clayey gravel ^{g f c}	
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines ^a	$C_u \geq 6$ and $1 \leq C_u \leq 3^c$	SW	Well-graded sand ^h	
			$C_u < 6$ and/or $1 > C_u > 3^c$	SP	Poorly graded sand ^h	
		Sands with Fines More than 12% ^a	Fines classify as ML or MH	SM	Silty sand ^{g f s}	
			Fines classify as CL or CH	SC	Clayey sand ^{g f c}	
Fine-grained Soils 50% or more passed the No. 200 sieve	Silt and Clays Liquid limit less than 50	Inorganic	PI > 7 and plots on or above "A" line ^f	CL	Lean clay ^{s i m}	
			PI < 4 or plots below "A" line ^f	ML	Silt ^{s i m}	
		Organic	Liquid limit - oven dried < 0.75	OL	Organic clay ^{s i m c}	
			Liquid limit - not dried	OL	Organic silt ^{s i m o}	
	Silt and clays Liquid limit 50 or more	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{s i m}	
			PI plots below "A" line	MH	Elastic silt ^{s i m}	
		Organic	Liquid limit - oven dried < 0.75	OH	Organic clay ^{s i m c}	
			Liquid limit - not dried	OH	Organic silt ^{s i m o}	
Highly Organic Soils		Primarily organic matter, dark in color and organic odor		PT	Peat	

- Based on the material passing the 3-inch (75mm) sieve.
- If field sample contained cobbles or boulders, or both, add "with cobbles or boulders or both" to group name.
- $C_u = D_{60}/D_{10}$, $C_c = (D_{30})^2 / (D_{10} \times D_{60})$
- If soil contains $\geq 15\%$ sand, add "with sand" to group name.
- Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
- If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.
- If fines are organic, add "with organic fines" to group name.
- If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.
- Sand with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay
- If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.
- If soil contains 10 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
- If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
- If soil contains $\geq 30\%$ plus No. 200 predominantly gravel, add "gravelly" to group name.
- PI ≥ 4 and plots on or above "A" line.
- PI < 4 or plots below "A" line.
- PI plots on or above "A" lines.
- PI plots below "A" line.



Laboratory Tests

DD	Dry density, pcf	OC	Organic content, %
WD	Wet density, pcg	S	Percent of saturation, %
MC	Natural moisture content, %	SG	Specific gravity
LL	Liquid limit, %	C	Cohesion, psf
PL	Plastic limits, %	ϕ	Angle of internal friction
PI	Plasticity index, %	qu	Unconfined compressive strength, psf
P200	% passing 200 sieve	qp	Pocket penetrometer strength, tsf

Particle Size Identification

Boulders.....	over 12"
Cobbles	3" to 12"
Gravel	
Coarse	3/4" to 3"
Fine.....	No. 4 to 3/4"
Sand	
Coarse	No. 4 to No. 10
Medium	No. 10 to No. 40
Fine.....	No. 40 to No. 200
Silt	<No. 200, PI < 4 or below "A" line
Clay	<No. 200, PI ≥ 4 and on or about "A" line

Relative Density of Cohesionless Soils

Very Loose.....	0 to 4 BPF
Loose.....	5 to 10 BPF
Medium dense	11 to 30 BPF
Dense	31 to 50 BPF
Very dense.....	over 50 BPF

Consistency of Cohesive Soils

Very soft.....	0 to 1 BPF
Soft.....	2 to 3 BPF
Rather soft	4 to 5 BPF
Medium	6 to 8 BPF
Rather stiff	9 to 12 BPF
Stiff	13 to 16 BPF
Very stiff.....	17 to 30 BPF
Hard.....	over 30 BPF

Drilling Notes

Standard penetration test borings were advanced by 3 1/4" or 6 1/4" ID hollow-stem augers, unless noted otherwise. Jetting water was used to clean out auger prior to sampling only where indicated on logs. All samples were taken with the standard 2" OD split-tube samples, except where noted.

Power auger borings were advanced by 4" or 6" diameter continuous flight, solid-stem augers. Soil classifications and strata depths were inferred from disturbed samples augered to the surface, and are therefore, somewhat approximate.

Hand auger borings were advanced manually with a 1 1/2" or 3 1/4" diameter auger and were limited to the depth from which the auger could be manually withdrawn.

BPF: Numbers indicate blows per foot recorded in standard penetration test, also known as "N" value. The sampler was set 6" into undisturbed soil below the hollow-stem auger. Driving resistances were then counted for second and third 6" increments, and added to get BPF. Where they differed significantly, they are reported in the following form: 2/12 for the second and third 6" increments, respectively.

WH: WH indicates the sampler penetrated soil under weight of hammer and rods alone; driving not required.

WR: WR indicates the sampler penetrated soil under weight of rods alone; hammer weight, and driving not required.

TW: TW indicates thin-walled (undisturbed) tube sample.

Note: All tests were run in general accordance with applicable ASTM standards.

B1707437: Fargo WWTP Flood Protection, 30% Design Review

Shear Strength Parameters

Formation	Unit Weight	Effective Stress Analyses ^A		Total Stress Analyses ^B	
		Ø, Post-Peak	C	Ø	C
Existing Fill	118 pcf	24 deg	0 psf	0 deg	650 psf
New Fill	120 pcf	22 deg	0 psf	0 deg	650 psf
Sherack	118 pcf	28 deg	0 psf	0 deg	750 psf
Silt	112 pcf	28 deg	0 psf	0 deg	0 psf
Brenna	99 pcf	18 deg	0 psf	0 deg	600 psf
Argusville	106 pcf	20 deg	0 psf	0 deg	700 psf
Glacial Till	130 pcf	30 deg	0 psf	0 deg	2000 psf

Hydraulic Parameters

Formation	k _v	k _h	k _v /k _h
Existing Fill	.01 ft/day	.01 ft/day	1.0
New Fill	.01 ft/day	.01 ft/day	1.0
Sherack	.0001 ft/day	.001 ft/day	0.1
Silt	.25 ft/day	.5 ft/day	0.5
Brenna	.0001 ft/day	.001 ft/day	0.1
Argusville	.0001 ft/day	.001 ft/day	0.1
Glacial Till	.0001 ft/day	.001 ft/day	0.1

Deformation Parameters

Formation	E	Poisson's Ratio
Existing Fill	100,000 psf	0.33
New Fill	100,000 psf	0.33
Sherack	120,000 psf	0.37
Brenna	80,000 psf	0.43
Argusville	80,000 psf	0.43
Glacial Till	200,000 psf	0.33

Structure Stability and Performance

Location	Factor of Safety ^C				Settlement ^D
	End of Construction	Long-Term Steady State, No Flood	Steady State Seepage, FEMA 100-Year Flood Level	FEMA 100-Year Rapid Drawdown	
Sec. A (Southwest Corner)	1.65	1.69	1.41	1.54	1 1/2 feet
Sec. B (Northeast Corner)	Not Evaluated	1.21	10.43	0.93	Not Evaluated

^A Used in Long-Term Steady-State, Flood Stage and Drawdown Analyses

^B Used in End-of-Construction Analysis

^C DHS-FEMA Minimums per Riverine Structures Form and/or Provisions of USACE Engineer Manual EM 1110-2-1913:

End-of-Construction = 1.3

Long-Term Steady-State = 1.4 (1.2 when considering back analysis based on historic slope movement)

Flood Stage = 1.4

Drawdown = 1.0-1.2

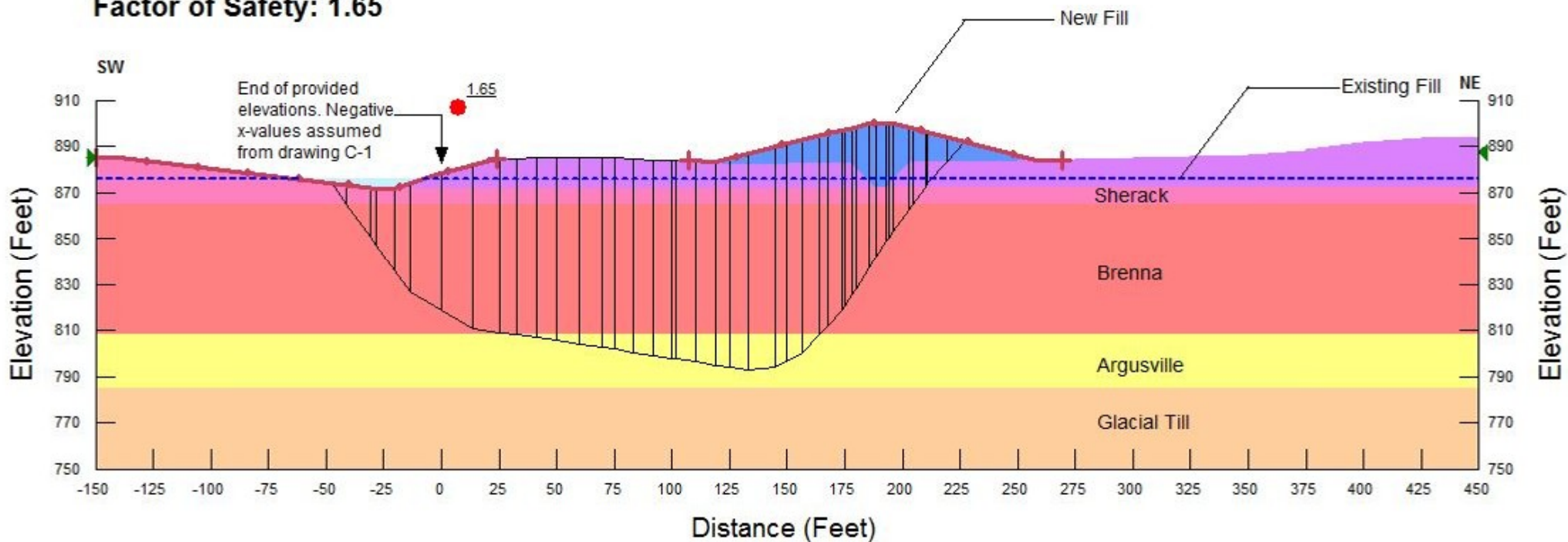
^D Estimated future total settlement

Background colors assigned to the geologic materials above match the colors/materials on the analytical cross sections.

B1707437: Fargo WWTP Flood Protection
North Broadway & 35th Avenue North
Fargo, North Dakota
Section A (SW Slope)

End of Construction Stability
Undrained Analysis, Optimized Failure

Factor of Safety: 1.65

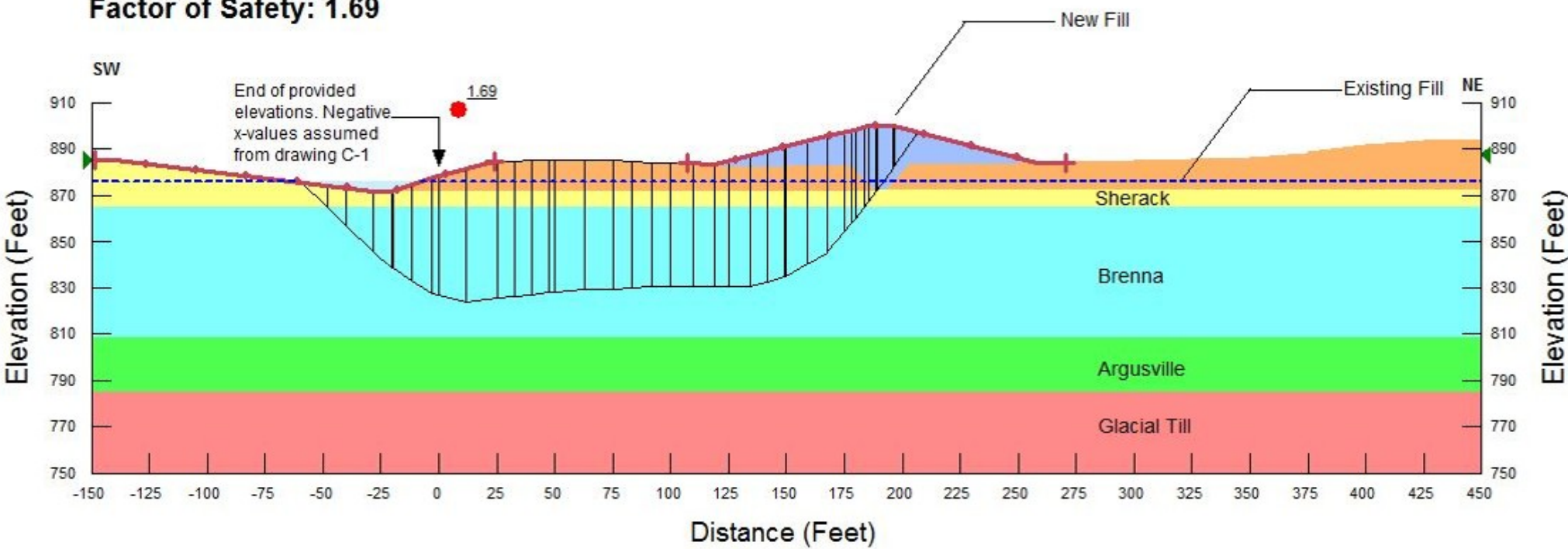


-211.00000, 1,116.0000

7437: Fargo WWTP Flood Protection North Broadway & 35th Avenue North Fargo, North Dakota Section A (SW Slope)

Long Term Steady State Stability
Drained Analysis, Optimized Failure

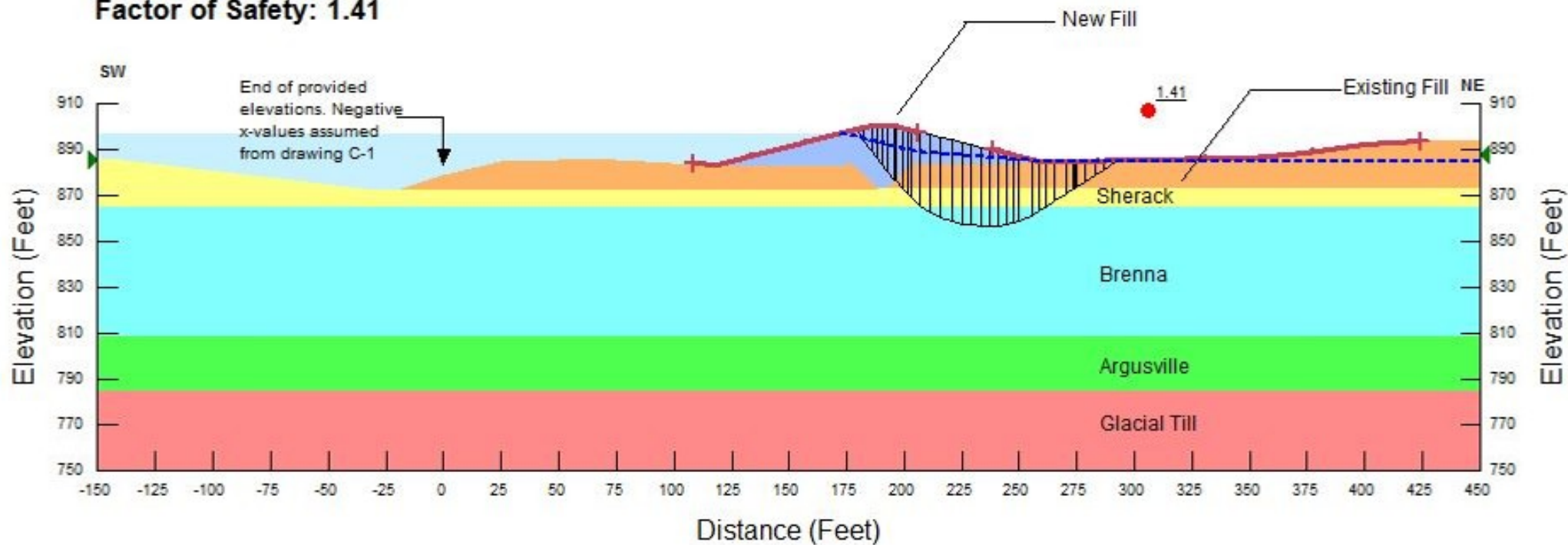
Factor of Safety: 1.69



B1707437: Fargo WWTP Flood Protection
North Broadway & 35th Avenue North
Fargo, North Dakota
Section A (SW Slope)

Flood Stage Stability - 100 Year Event
Effective Stress Analysis, Optimized Failure

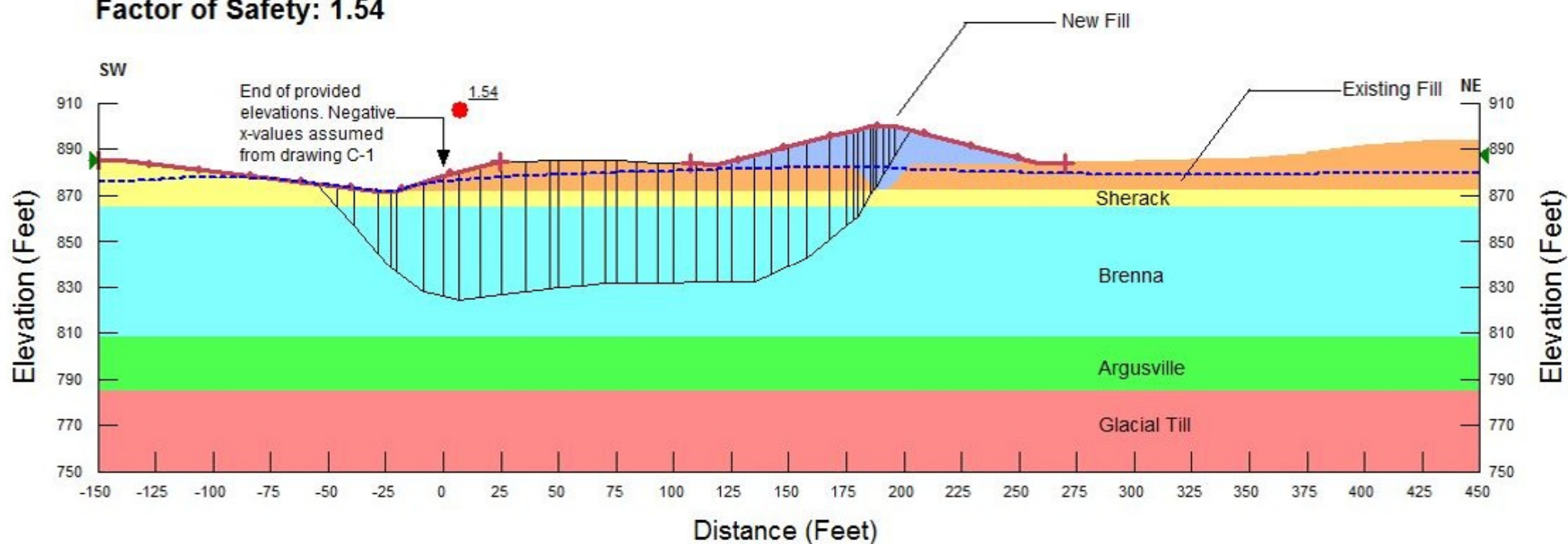
Factor of Safety: 1.41



B1707437: Fargo WWTP Flood Protection
North Broadway & 35th Avenue North
Fargo, North Dakota
Section A (SW Slope)

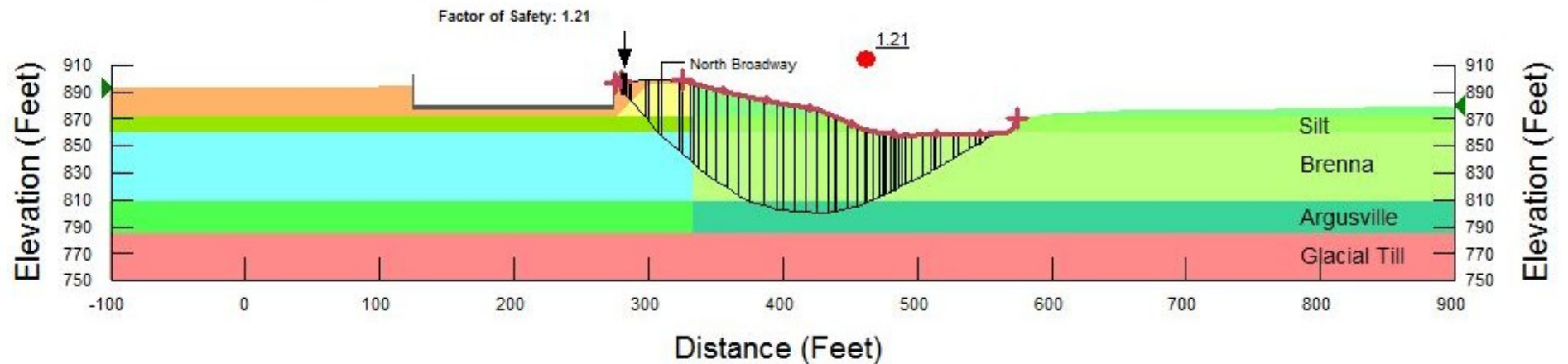
Post Flood Drawdown Stability, 100 Year Event
Drained Analysis, Optimized Failure

Factor of Safety: 1.54



B1707437: Fargo WWTP Flood Protection
Broadway North & 35th Ave North
Fargo, North Dakota
Section B (NE Slope)

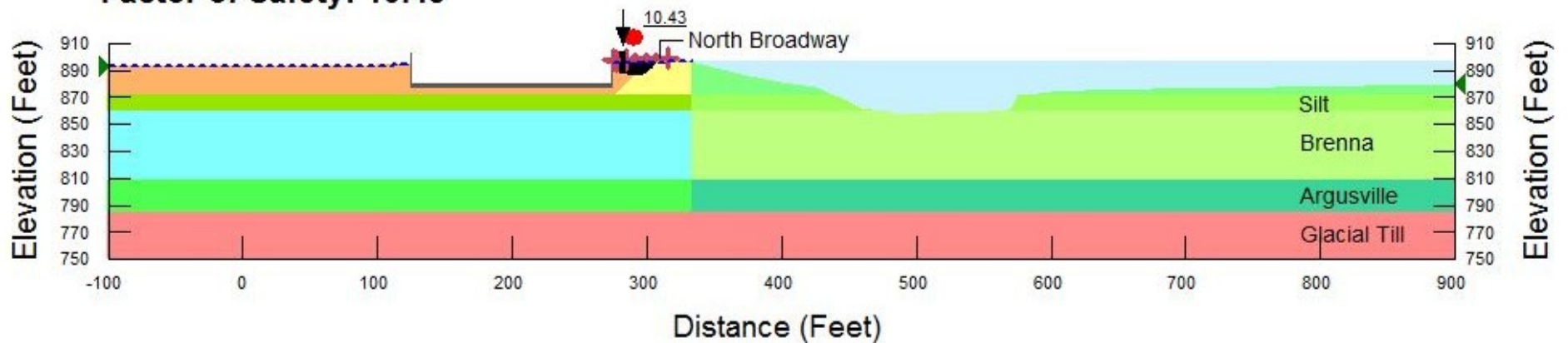
Long Term Steady State Stability-Slope
Drained Analysis, Optimized Failure



B1707437: Fargo WWTP Flood Protection
Broadway North & 35th Ave North
Fargo, North Dakota
Section B (NE Slope)

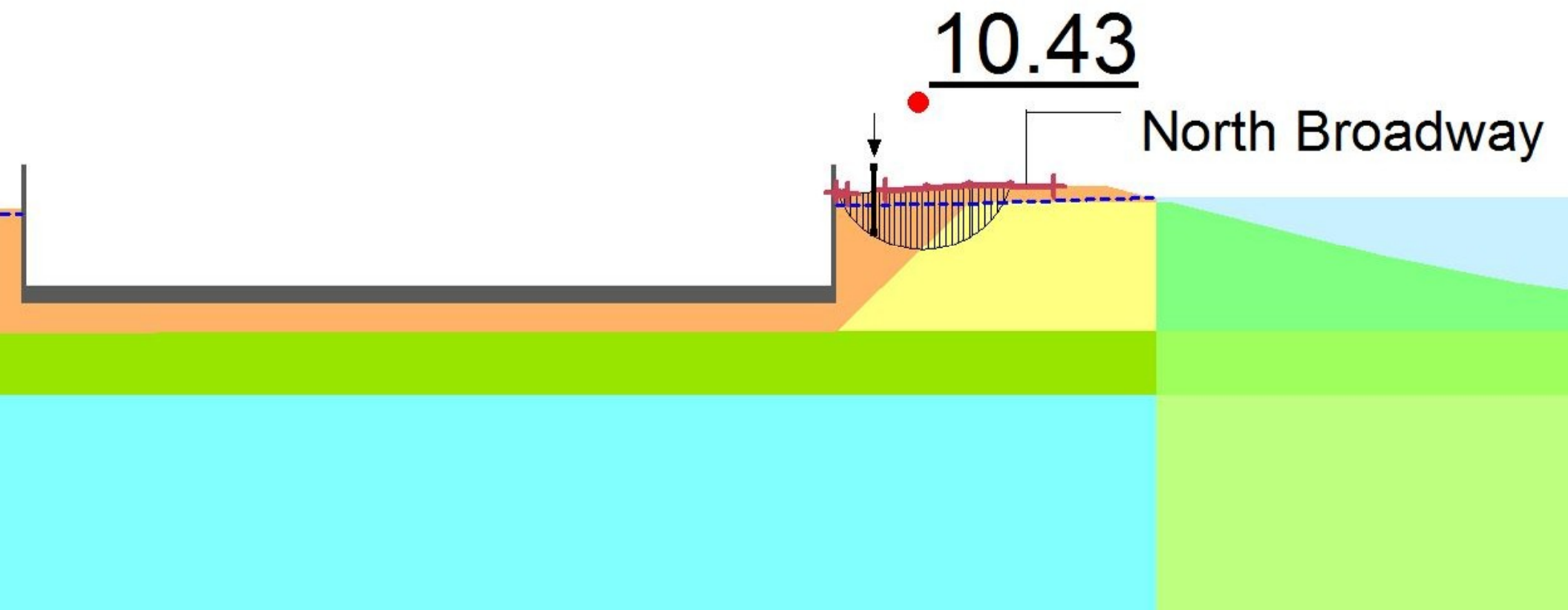
Flood Stage Stability
Drained Analysis, Optimized Failure

Factor of Safety: 10.43



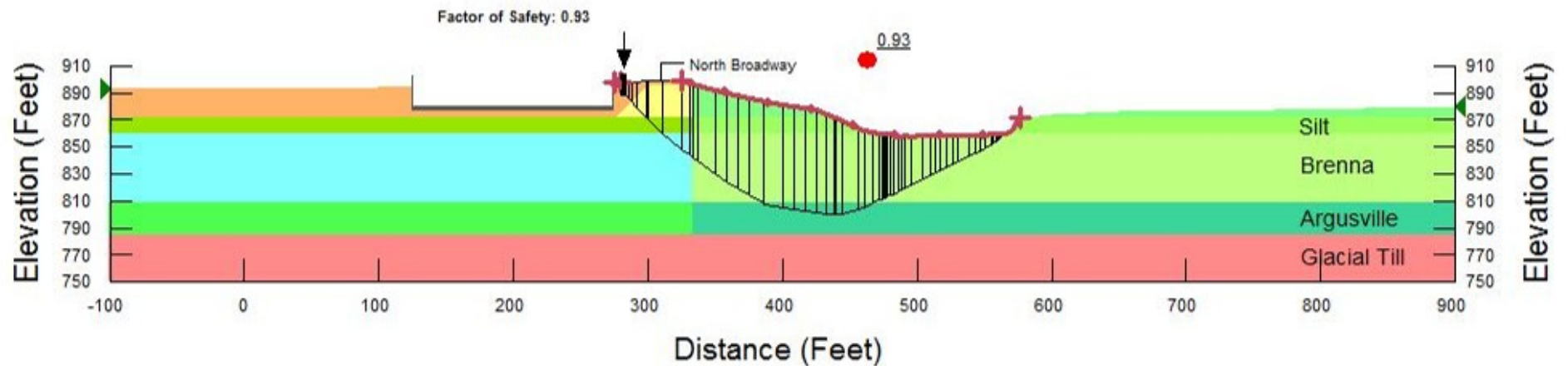
Flood Stage Stability Drained Analysis, Optimized Failure

Factor of Safety: 10.43



B1707437: Fargo WWTP Flood Protection
Broadway North & 35th Ave North
Fargo, North Dakota
Section B (NE Slope)

Post Flood Drawdown Stability
Drained Analysis, Optimized Failure



December 13, 2023

Project B2310819

Brian Gaddie, PE
Advanced Engineering and Environmental Services, LLC (AE2S)
9635 Maroon Circle, Suite 210
Englewood, CO 80112

Re: Stockpile Suitability Letter
Fargo RWRF Flood Protection, Stockpile Suitability
3600 Broadway North
Fargo, ND 58102

Dear Mr. Gaddie:

Braun Intertec Corporation is pleased to provide this letter describing the test results of on-site stockpile samples and recommendations regarding the use of sampled stockpile materials for flood protection levees.

Background

Based on the information provided by Advanced Engineering and Environmental Services, LLC (AE2S), we understand there are two main stockpiles of material that are being considered for use in building a future flood protection project located on the grounds of the Fargo Regional Water Reclamation Facility (RWRF) at 3600 Broadway North in Fargo, North Dakota. The stockpiles were part of excavations of other projects on the grounds of the facility.

Results

A sketch attached to this letter shows the approximate locations the samples were taken from. An excavator dug into the piles in 4 separate locations, and we collected material from each excavation. We brought the materials to our laboratory and conducted various index tests to evaluate compliance with levee material requirements.

Table 1: Classification Test Results

Location and Proctor Number	Sample Depth (ft)	Classification	Color	Organic Content (%)	Percent Passing #200 Sieve (P200)	Liquid Limit	Plastic Index
Pile 1, Location #1, P-01	7	Fat Clay with Sand (CH)	Brown/Dark Brown Mix	2.0	83	76	52
Pile 1, Location #2, P-02	6	Fat Clay (CH)	Light Brown / Dark Brown Mix	3.2	90	58	40

Location and Proctor Number	Sample Depth (ft)	Classification	Color	Organic Content (%)	Percent Passing #200 Sieve (P200)	Liquid Limit	Plastic Index
Pile 2, Location #3, P-03	6	Fat Clay with Sand (CH)	Brown/Gray Mix	2.9	80	77	51
Pile 2, Location #4, P-04	4	Fat Clay with Sand (CH)	Dark Brown	4.3	73	79	53

Table 2. Laboratory Standard Proctor Test Results

Location and Proctor Number	Classification	As Received Moisture Content (%)	Optimum Moisture Content (%)	Maximum Dry Density (pcf)
Pile 1, Location #1, P-01	Fat Clay with Sand (CH)	39	26.2	94.1
Pile 1, Location #2, P-02	Fat Clay (CH)	31	23.0	97.5
Pile 2, Location #3, P-03	Fat Clay with Sand (CH)	32	25.3	92.4
Pile 2, Location #4, P-04	Fat Clay with Sand (CH)	31	27.0	91.6

Discussion and Recommendations

Current material recommendations for backfill of inspection trenches and placement of new levee fill for this project can be found in Section C.2.b of Braun Intertec's Geotechnical Evaluation Report numbered B14-02674 and dated April 14, 2015. An excerpt from this report section is provided here.

We recommend inspection trench backfill and levee fill consist of material meeting the requirements of the City of Fargo Specification 2000, Part 2.2 for Impervious Fill with the modification that the gradation shall not have less than 55% material by weight passing the No. 200 sieve. We recommend placing the material within 1 percent below to 3 percent above the optimum moisture content.

The City of Fargo's Standard Specification for Construction, Section 2000, Part 2.2 currently reads as follows.

Clay for levees shall be cohesive and consist of material classified by ASTM D-2487 as CL or CH. Gradation shall not have less than 40% by weight passing the No. 200 sieve. The liquid limit (L.L.) shall be greater than 25% and plasticity index (P.I.) greater than 10 percent. The material shall be free of ice, snow, frozen earth, trash, debris, sod, roots, organic matter including silts

which are unstable, inorganic materials too wet to be stable or stones larger than 3-inches in any dimension.

Based on our visual observations of the stockpiles, the east side of Stockpile 2 appears to be a topsoil stockpile and test results (Location #4, P-04) showed that it contains 4.3 percent organic material. While the definition of organic material can vary, commonly a material is considered too organic for levee fill in this region when it is above about 3 to 4 percent. This material on the east side of Stockpile 2 should not be used as levee fill but could be considered for topsoil respread. Alternatively, additional analyses could be conducted on the planned levees to evaluate if the organic material could be used outside of a “levee core.” For instance, a levee core could be considered to consist of material from the top edges of the levee and extending down and away at a 2H:1V slope. If desired, we could conduct additional analyses to evaluate if placing organic material outside the 2H:1V core would still meet seepage and stability requirements for the levee.

Materials found in sample locations #1, #2, and #3 (P-01 through P-03) meet the requirements noted above and are suitable for reuse as inspection trench backfill and levee fill but will require additional processing prior to compaction. When this material was sampled, it was about 7 to 13 percent above optimum moisture so it will require additional processing through drying on the order of 4 to 10 percent in order to meet compaction requirements. Furthermore, organic contents were slightly elevated, indicating variability within the piles that should be monitored. If pockets of organic materials are encountered, they should be sorted out so that they are not reused as levee fill.

General

In performing its services, Braun Intertec used that degree of care and skill ordinarily exercised under similar circumstances by reputable members of its profession currently practicing in the same locality. No warranty, express or implied, is made.


If you have any questions on the services provided to date or require additional information, please contact Matt Haugstad at 701.492.5880, or Nate McKinney at 952.995.2228.

Sincerely,

BRAUN INTERTEC CORPORATION

Professional Certification:

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


Nathan L. McKinney, PE
Vice President, Principal Engineer
License Number: PE-6735
December 13, 2023




Matthew Haugstad, PE
Project Engineer

Attachments:

Sketch of Sample Locations
Lab Test Results



Standard Proctor M-D Relationship

ASTM D698

Report Date: 11/28/2023

526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:

Advanced Engineering and Environmental, LLC
4050 Garden View Dr, Ste 200
4050 Garden View Drive Suite 200
Grand Forks, ND 58201

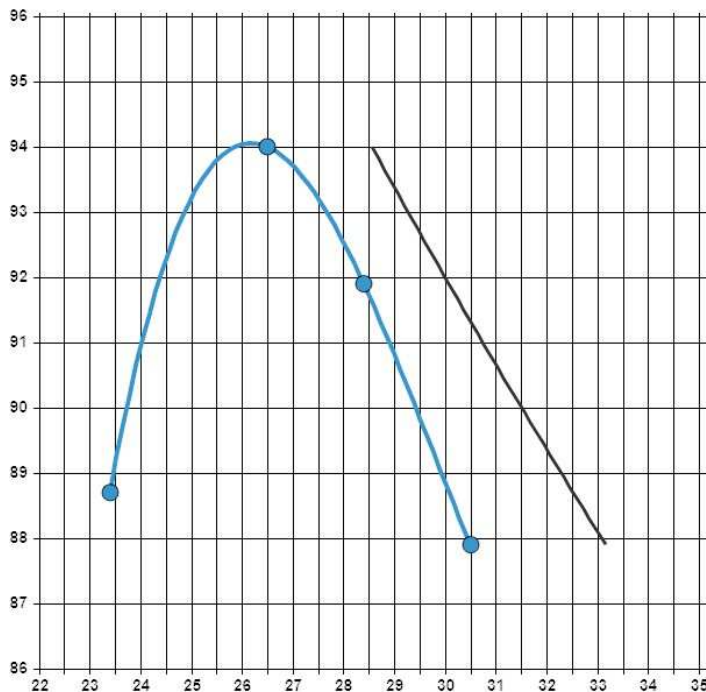
Project:

B2310819
Fargo WRRF Flood Protection, Stockpile Suitability
3600 Broadway N
Fargo, ND 58102

Sample Information

Sample Number:	568227	Alternate ID:	P-01
Sample From:	Stockpile	Source:	Existing Material
		Sampled By:	McClay, Wyatt
Location Details:	Stockpile #1, Location 1, 7 feet into pile		
Sample Date:	11/17/2023		
Received Date:	11/17/2023	Lab:	526 10th Street NE, Suite 300, West Fargo, ND
Tested Date:	11/24/2023	Tested By:	Lage, Andrew

Laboratory Data



Proctor ID:	P-01	
Maximum Dry Density (pcf):	94.1	
Optimum Moisture (%):	26.2	
Method:	Method A	
Preparation Method:	Moist	
Rammer Type:	Manual Round	
Specific Gravity:	2.65	
Specific Gravity Source:	Assumed	
Liquid Limit:	76	Plastic Limit: 24
Plastic Index:	52	
Passes #200 (%):	83.2	Retained #200 (%): 16.8
Retained On 3/4 (%):	0	Retained On 3/8 (%): 1
Retained On #4 (%):	3	Passing #4 (%): 97

Classification: Fat Clay with Sand and trace Gravel (CH), Brown/Dark Brown Mix

General

As received moisture content = 39.0%
Organic content = 2.0%

Matthew Haugstad

Uncertainty was not taken into account in determining whether the test results meet the requirements. The results included in this report relate only to the items inspected or tested. Sampled per project specifications or industry standards. Also, this report is for the exclusive use of the addressed parties. We assume no responsibility to other parties regarding this report. The information indicated in this report shall not be reproduced, except in full, without prior written approval.

Standard Proctor M-D Relationship

ASTM D698

Report Date: 11/28/2023

526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:

Advanced Engineering and Environmental, LLC
4050 Garden View Dr, Ste 200
4050 Garden View Drive Suite 200
Grand Forks, ND 58201

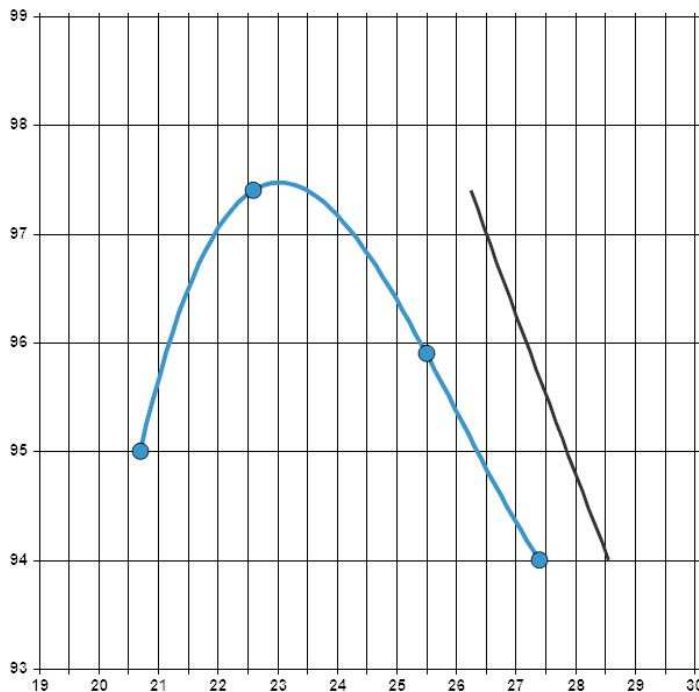
Project:

B2310819
Fargo WRRF Flood Protection, Stockpile Suitability
3600 Broadway N
Fargo, ND 58102

Sample Information

Sample Number:	568229	Alternate ID:	P-02
Sample From:	Stockpile	Source:	Existing Material
		Sampled By:	McClay, Wyatt
Location Details:	Stockpile #1, Location 2, 6 feet into pile		
Sample Date:	11/17/2023		
Received Date:	11/17/2023	Lab:	526 10th Street NE, Suite 300, West Fargo, ND
Tested Date:	11/24/2023	Tested By:	Lage, Andrew

Laboratory Data



Proctor ID:	P-02		
Maximum Dry Density (pcf):	97.5		
Optimum Moisture (%):	23.0		
Method:	Method A		
Preparation Method:	Moist		
Rammer Type:	Manual Round		
Specific Gravity:	2.65		
Specific Gravity Source:	Assumed		
Liquid Limit:	58	Plastic Limit:	18
Plastic Index:	40		
Passes #200 (%):	89.5	Retained #200 (%):	10.5
Retained On 3/4 (%):	0	Retained On 3/8 (%):	1
Retained On #4 (%):	1	Passing #4 (%):	99

Classification: Fat Clay with trace Sand and Gravel (CH), Light Brown/Dark Brown Mix

General

As received moisture content = 31.1%
Organic content = 3.2%

Matthew Haugstad

Standard Proctor M-D Relationship

ASTM D698

Report Date: 11/28/2023

526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:

Advanced Engineering and Environmental, LLC
4050 Garden View Dr, Ste 200
4050 Garden View Drive Suite 200
Grand Forks, ND 58201

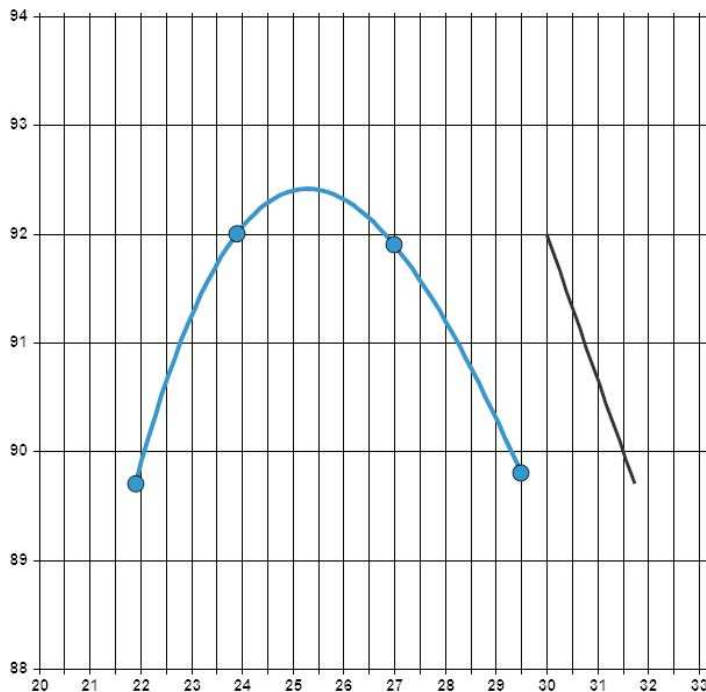
Project:

B2310819
Fargo WRRF Flood Protection, Stockpile Suitability
3600 Broadway N
Fargo, ND 58102

Sample Information

Sample Number:	568230	Alternate ID:	P-03
Sample From:	Stockpile	Source:	Existing Material
		Sampled By:	McClay, Wyatt
Location Details:	Stockpile #2, Location 3, 6 feet into pile		
Sample Date:	11/17/2023		
Received Date:	11/17/2023	Lab:	526 10th Street NE, Suite 300, West Fargo, ND
Tested Date:	11/24/2023	Tested By:	Lage, Andrew

Laboratory Data



Proctor ID:	P-03		
Maximum Dry Density (pcf):	92.4		
Optimum Moisture (%):	25.3		
Method:	Method A		
Preparation Method:	Moist		
Rammer Type:	Manual Round		
Specific Gravity:	2.65		
Specific Gravity Source:	Assumed		
Liquid Limit:	77	Plastic Limit:	26
Plastic Index:	51		
Passes #200 (%):	80.3	Retained #200 (%):	19.7
Retained On 3/4 (%):	0	Retained On 3/8 (%):	0
Retained On #4 (%):	2	Passing #4 (%):	98

Classification: Fat Clay with Sand and trace Gravel (CH), Brown/Gray Mix

General

As received moisture content = 31.5%
Organic content = 2.9%

Matthew Haugstad

Standard Proctor M-D Relationship

ASTM D698

Report Date: 11/28/2023

526 10th St NE, Suite 300
PO Box 485
West Fargo, ND 58078
Phone: 701-232-8701

Client:

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4050 Garden View Dr, Ste 200
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Grand Forks, ND 58201

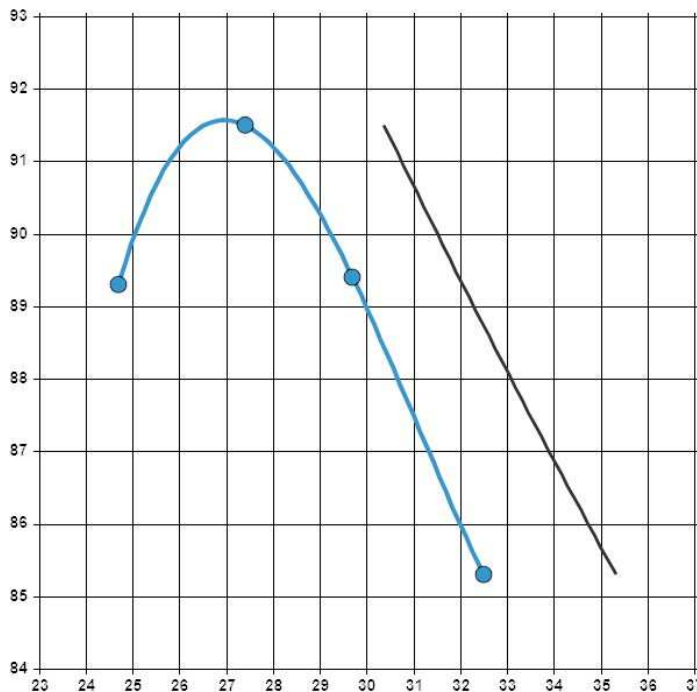
Project:

B2310819
Fargo WRRF Flood Protection, Stockpile Suitability
3600 Broadway N
Fargo, ND 58102

Sample Information

Sample Number:	568231	Alternate ID:	P-04
Sample From:	Stockpile	Source:	Existing Material
		Sampled By:	McClay, Wyatt
Location Details:	Stockpile #2, Location 4, 4 feet into pile		
Sample Date:	11/17/2023		
Received Date:	11/17/2023	Lab:	526 10th Street NE, Suite 300, West Fargo, ND
Tested Date:	11/24/2023	Tested By:	Lage, Andrew

Laboratory Data



Proctor ID:	P-04		
Maximum Dry Density (pcf):	91.6		
Optimum Moisture (%):	27.0		
Method:	Method A		
Preparation Method:	Moist		
Rammer Type:	Manual Round		
Specific Gravity:	2.65		
Specific Gravity Source:	Assumed		
Liquid Limit:	79	Plastic Limit:	26
Plastic Index:	53		
Passes #200 (%):	73.0	Retained #200 (%):	27.0
Retained On 3/4 (%):	0	Retained On 3/8 (%):	1
Retained On #4 (%):	2	Passing #4 (%):	98

Classification: Fat Clay with Sand and trace Gravel (CH), Dark Brown

General

As received moisture content = 31.0%
Organic content = 4.3%

Matthew Haugstad

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SECTION 02 32 00
GEOTECHNICAL INVESTIGATIONS

PART 1 - GENERAL

1.01 SUMMARY

A. This Section includes:

1. Soils Investigation Data: Soil and subsurface investigations conducted at site by an independent testing laboratory and report with log of borings prepared.
2. Report obtained for Engineers' design use only.
3. Copy of report follows this Section.

1.02 SOILS INVESTIGATION DATA

A. Soil and Subsurface investigations were conducted at the site of the wastewater treatment facility for this project. Investigation results are documented in the following:

1. Geotechnical Evaluation Report - Fargo WWTP Flood Protection Levee prepared by Braun Intertec Corporation Dated April 14, 2015
2. Geotechnical Technical Memorandum - Fargo WWTP Flood Protection 30% Design Review, prepared by Braun Intertec Corporation Dated October 16, 2017.
3. Stockpile Suitability Letter – Fargo RWRF Flood Protection prepared by Braun Intertec Corporation Dated December 13, 2023

B. Soil and Subsurface investigations conducted at the site of the wastewater treatment facility for other projects. Investigation results are documented in the following:

1. Geotechnical Exploration and Engineering Review – Fargo Wastewater Treatment Facility Phase II-B Improvements prepared by Northern Technologies, LLC Dated September 26, 2019
2. Geotechnical Exploration and Engineering Review – Stormwater Lift Station # 24 Fargo WWTF Phase II-B Expansion prepared by Northern Technologies, LLC Dated October 3, 2019

C. Copies of the reports and drawings itemized in Article 1.02.A and B that are not included with the Bidding Documents may be examined by request to the OWNER.

1.03 BIDDER INVESTIGATION

A. Bidders are responsible for reviewing the report(s), visiting the site, and becoming familiar with site conditions.

B. Bidder may, at Bidder's own expense and prior to bidding, make soil surveys, and investigations Bidder considers necessary to bid and perform the work.

C. Bidder assumes risk that the soil and underground conditions may be other than that indicated in soil investigation data.

- D. Bidder shall obtain authorization from Owner prior to start of borings or subsurface investigations. Immediately upon completion of Bidder subsurface investigation, return site areas affected by investigations to condition existing prior to start of Bidder subsurface investigations as directed by Owner.

1.04 INTERPRETATION

- A. Soil investigation data and reports are provided only for information and the convenience of bidders, and is not warranted to indicate actual conditions.
- B. Bidders and contractor may rely upon the boring logs and test results indicated in the investigations performed which shall be limited to the soils and subsurface conditions directly encountered when performing the investigations and the test results of only those specific materials that were tested.
- C. Owner and Engineer disclaim all responsibility for the accuracy, true location, and extent of the soils investigation that has been prepared by others. They further disclaim responsibility for interpretations of that data by bidders, including but not limited to projecting soil-bearing values, interpreting soil types, rock profiles, soil stability, material properties and the presence, level, and extent of underground water as well as changes in conditions that may have occurred since the soil investigations were performed.
- D. Owner and Engineer disclaim all responsibility for the existence of other soil, the presence, level and extent of underground water at the site that was not discovered as a part of the soil investigation data and reports performed and subsurface investigations that may have been previously prepared for Owner, Engineer, or others. It is the sole responsibility of the Bidder to obtain other soil and subsurface investigations that may be available for interpretation, at no additional cost to the Owner.
- E. Soil investigation data and reports are not part of the contract documents, but the "technical data" contained therein upon which the Contractor may rely as identified and established in this Specification Section are incorporated therein by reference. Contractor is not entitled to rely upon other information and data utilized by Engineer and Engineer's Consultants in preparation of Drawings and Specifications.

END OF SECTION

SECTION 02 41 13
SELECTIVE SITE DEMOLITION

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. The removal and satisfactory disposal of pavement materials including concrete pavement, asphalt pavement, concrete driveways, sidewalks, curb and gutter, aggregate base, and geotextile fabric.
2. The removal and disposal of designated utility structures, pipes, and related appurtenances.
3. The removal and disposal of existing chain link fence.

B. Related Sections include, but are not limited to:

1. Section 01 10 00 – Summary.
2. Section 01 30 00 – Administrative Requirements.
3. Section 01 45 00 – Quality Requirements.
4. Section 31 10 00 – Site Clearing.
5. Section 32 97 00 – Restoration of Disturbed Areas.

1.02 PROTECTION

- A. Confine Work to within all designated areas and stockpiling to within designated areas as coordinated with the OWNER.
- B. Leave undisturbed all pavement and utility appurtenances not indicated for removal or renovation.
- C. Maintain proper positive drainage during construction operations and through completion.

PART 2 PRODUCTS

2.01 NOT USED.

PART 3 EXECUTION

3.01 PREPARATION

- A. Inspect and record existing conditions on site and at adjacent areas prior to starting construction.
- B. Become familiar with required lines of removal and saw cutting.
- C. Identify underground utilities.
- D. Provide, erect, and maintain adequate barriers and warning lights.

3.02 SITEWORK DEMOLITION AND REMOVAL

- A. Protect and maintain survey monuments or any construction staking from disturbance during pavement removal.

- B. Keep streets, sidewalks, alleys, and driveways in usable condition; avoid property owner inconvenience insofar as practicable; do not trespass on private property.
- C. Verify traffic control in place prior to commencement of pavement removal.
- D. Commencement of this Section's Work means acceptance of existing conditions.

3.03 REMOVAL

- A. Saw cutting is required on all concrete and asphalt pavements. Pavement removal beyond the limits established in the notes on the Drawings shall be replaced at the Contractor's expense.
- B. Saw cut vertically full depth to obtain a clean break. Remove on straight lines approximately parallel or perpendicular to centerline or pavement.
- C. Remove curb and gutter where indicated on Drawings, or as necessary to accomplish Contractor's work. All additional curb and gutter removal must be approved by Engineer and Owner. Curb and gutter removal not specified and without proper approval shall be replaced at the Contractor's expense.
- D. Disturbances, breakage, or damage to areas not designated for removal shall be restored at Contractor's expense prior to final payment.
- E. Pavement removed beyond the limits established shall be replaced to the same specifications as the adjacent removal at Contractor's expense.
- F. Remove entire width of sidewalk if replacement width is less than sidewalk width.
- G. Remove abandoned utility structures, pipes, and related appurtenances where indicated on the drawings or encountered by new construction. Fill trenches with appropriate backfill material, and compact to required density as indicated in section 01 45 00.
- H. Where abandoned pipes are to remain in place, plug all exposed ends with concrete.
- I. Where abandoned structures are to remain in place, plug all pipe penetrations with concrete and fill structure with Class 3 material, as specified in Section 31 05 16.

3.04 TOLERANCES

- A. Saw cut full depth of pavement to achieve a clean break. If required line of removal falls within 2 feet of an existing joint, adjust line of removal to be the existing joint.

3.05 DISPOSAL

- A. Remove broken pavement, pipes, utility structures, and appurtenances, and dispose of materials off site in Contractor furnished disposal area in a manner that is acceptable to local authorities and regulatory agencies.

END OF SECTION

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DIVISION 03 CONCRETE

SECTION 03 10 00
CONCRETE FORMING AND ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Formwork for cast-in place concrete, with shoring, bracing and anchorage.
- B. Waterstops.
- C. Form accessories.
- D. Form stripping.

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements and product substitution requirements.
- B. Section 03 20 00 - Concrete Reinforcing.
- C. Section 03 30 00 - Cast-in-Place Concrete.
- D. Section 04 20 01 - Masonry Veneer: Spacing for veneer anchor reglets recessed in concrete.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures (1999).
- D. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- E. ACI 347R - Guide to Formwork for Concrete; 2014, with Errata (2017).
- F. ASTM C156 - Standard Test Method for Water Loss Through Liquid Membrane Forming Curing Compounds for Concrete"
- G. ASTM C171 - Sheet Materials for Curing Concrete
- H. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete
- I. ASTM D395 - Test Methods for Rubber Property-Compression Set
- J. ASTM D412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
- K. ASTM D994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type)
- L. ASTM D1190 - Concrete Joint Sealer, Hot-Poured Elastic Type
- M. ASTM D1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

- N. ASTM D1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- O. ASTM D2103 - Polyethylene Film and Sheeting
- P. ASTM D2240 - Test Method for Rubber Property-Durometer Hardness
- Q. PS 1 - Structural Plywood; 2009.

1.04 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Rubber waterstop minimum performance requirements of:

Property	ASTM	Standard Results
Tensile Strength (psi)	D412	100
Elongation (percent)	D412	500
Hardness (Hs)	D2240	20 Shore A
The time period to maximum volume expansion is 35 days.		

- B. Wood Forms for Sidewalks and Driveways:

1. Minimum of 1-1/2 inch thick except for sharply curved sections where a flexible material shall be use width the Engineer's approval.

1.05 SUBMITTALS

- A. See section 01 33 00 - SUBMITTAL PROCEDURES , for general requirements of submittals.

1. Shop Drawings: Submit complete fabrication, assembly and installation drawing for all products and accessories to illustrate construction and assembly of components and their connection to the work General Arrangement Drawings
 - a. Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties
 - b. Include plans, elevations, sections, details of installation, and attachments to other Work
2. Fabrication Drawings
 - a. System fabrication, dimensions, locations of connections, connection details, quantities of waterstop, and material procurement and cutting schedules
 - b. Fabricator's detailed requirements for system foundations and connections to existing work
3. Furnish setting Drawings, templates, and directions for installation

- B. Product Data: Submit sufficient data to verify compliance with specifications to include materials, parts, and accessories:

1. Provide data on void form materials and installation requirements, joint devices, and attachment accessories
2. Forms
3. Chamfer Strips
4. Form Coating
5. Form Ties
6. Reinforcing Steel Bar Supports

7. Reinforcing Steel Tie Wire
 8. Waterstop
 - a. Adhesive
 - b. Type 1 and Type 2
 - c. Sealant for pipe penetrations, base joints, irregular surfaces
 9. Accessories
 - a. Expansion Joint Filler
 - b. Expansion and Contraction Joint Shear Bar Grease
 - c. Membrane Curing Compound
 - d. Bonding Admixture and Bonding Agent
 10. Manufacturer's Installation Instructions: Provide connection requirements and installation procedures
- C. Samples: Submit two, 12 inch long samples of each type of waterstops.
- D. Installation Plans:
1. Curing
 - a. Name of installing contractor.
 - b. Name of curing compound manufacturer.
 - c. Type and trade name of curing compound.
 - d. Statement that curing compound meets all requirements of the Specifications.
 - e. Indicate Equipment and methods used for applying curing compound.
- E. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.

1.06 QUALITY ASSURANCE

- A. Installer: Installation performed by skilled workers trained in procedures and methods required for proper performance of the product. Components and installation procedures in accordance with the manufacturer's instructions.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate shipping, handling, storage, and protection with manufacturer.
- B. Accept products and components on site in factory packing.
- C. Protect products and accessories from physical damage including effects of weather, water, and construction debris.
- D. Maintain the waterstops in a dry condition during delivery, storage, handling, installation and concealment.

1.08 WARRANTY

- A. Provide both a one (1) year Materials and Defect's Warranty and Contractor's Warranty, both commencing with Substantial Completion or written owner acceptance and utilization.
- B. If Manufacturer's Standard Warranty is for a term greater than specified herein, Manufacturer's Warranty shall continue to remain in force and effect and

available to Owner beyond the end of warranty obligations required in Article 1.08 A.

- C. The Warranty provisions for the specified products and systems included herein supersede conflicting provisions in other Sections of the Contract Documents

PART 2 PRODUCTS

2.01 FORMWORK - GENERAL

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct to produce hardened concrete that complies with design with respect to shape, lines, and dimensions indicated in the contract documents.
- C. Size and space wailers, studs, internal ties and other form supports so proper working stresses are not exceeded.
- D. Install form ties on exposed surfaces in uniformly spaced vertical and horizontal rows.
- E. Provide chamfer strips to bevel salient edges and corners. Do not provide for top edges of walls and slabs to be tooled or for edges to be buried.
- F. Chamfer outside corners of beams, joists, columns, and walls.
 - 1. 1" chamfer unless noted otherwise.
- G. Comply with ACI 117 and ACI 347R with respect to design, fabrication, erection, and removal of formwork.
- H. Comply with relevant portions of ACI 347R, ACI 301, and ACI 318.
- I. Circular walls shall be formed with radiused form work. 2 foot maximum width, may be used for curved surfaces 25 feet minimum diameter. Larger panel widths may be considered on a case by case basis for larger diameters.

2.02 REMOVABLE PREFABRICATED FORMS

- A. Preformed Steel Forms: Minimum 16 gauge, 0.0598 inch thick, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.

2.03 FORMWORK ACCESSORIES

- A. Form Ties:
 - 1. Manufacturer
 - a. The Burke Company - Burke Penta-Tie System
 - b. Or equal
 - 2. Removable end, galvanized metal, permanently embedded body, adjustable length, cone on both ends type, 1 inch minimum back break dimension, free of defects that could leave holes larger than 1 inch in concrete surface.
- B. Form Release Agent:

1. Manufacturer
 - a. The Burke Company - Burke Release #1
 - b. Industrial lubricants – Nox Crete Form Coating
 - c. L & M - Debond
 - d. Protex – Pro Cote
 - e. Richmond - Rich Cote
 - f. Or equal
 2. Capable of releasing forms from hardened concrete without staining or discoloring concrete or forming bugholes and other surface defects, compatible with concrete and form materials, and not requiring removal for satisfactory bonding of coatings to be applied.
 - a. Composition: Colorless, reactive, water-based compound.
 - b. Do not use materials containing diesel oil or petroleum-based compounds.
- C. Filler Strips for Chamfered Corners:
1. Wood or Rigid plastic type; 1 by 1 inch size; maximum possible lengths.
- D. Dovetail Anchor Slot:
1. Galvanized steel, at least 22 gauge, 0.0299 inch thick, foam filled, release tape sealed slots, anchors for securing to concrete formwork.
- E. Embedded Anchor Shapes, Plates, and Bars:
1. As specified in Section 05 50 00.
- 2.04 WATERSTOPS
- A. Manufacturer
1. Type I waterstop
 - a. Grace "Durajoint Type 7"
 - b. W.R. Meadows "Sealtight Type 6380"
 - c. Vinylex "RB6-38"
 - d. Or equal
 2. General concrete work (type II waterstop):
 - a. Adeka Ultra Seal MC-201OM
 - b. Greenstreak Hydrotite CJ
 - c. Sika "Swellstop"
 3. Sealant, pipe penetrations, base joints, irregular joint surfaces:
 - a. Adeka Ultra Seal P201
 - b. Greenstreak Leakmaster
 4. Adhesive:
 - a. 3M Company 3M-2141
 - b. Adeka Ultra Bond
 - c. Greenstreak Rubber Adhesive
 - d. Greenstreak Leakmaster
- B. Waterstops Type 1: Polyvinyl chloride, minimum 1,750 psi tensile strength, minimum minus 50 degrees F to plus 175 degrees F working temperature range, 6 inch wide by 3/8 inch thick, "U" or "O" bulb closed center section, maximum possible lengths, ribbed or serrated profile, preformed corner sections, heat welded jointing.

1. Waterstops at new-to-existing concrete joints shall be renovation style with a split leg that can be fastened to the existing concrete substrate.
- C. Waterstops Type 2: butyl rubber, expanding and swelling type prismatic shape.
 1. Size: 3/4" wide, minimum.

2.05 ACCESSORIES

- A. Backer Rod:
 1. ASTM D5249, Backer Rod Material for use with Cold and Hot Applied Joint Sealant in Portland Cement and Asphalt Joints, Type 1 or Type 3
- B. Bonding Admixture and Bonding Agent:
 1. Manufacturer
 - a. Sika "Sikalatex" bonding admixture and agent
 - b. Tamms "Akkro-7T" bonding admixture and Tamms "Tamms Bond" bonding agent
 - c. Or equal
- C. Pavement Dowel Bar, Expansion and contraction joint shear bar grease:
 1. Provide uniform coat on entirety of bar.
 2. Manufacturer
 - a. Tectyl 506
 - b. NLGI Grade #2 multipurpose lithium grease
 - c. No-Ox-Id "A Special" grease
 - d. Or equal
- D. Expansion / Isolation joint filler:
 1. ASTM D1751, asphalt impregnated fiber board, 1/2 inch thickness unless indicated otherwise.
 2. ASTM D 1752, preformed sponge rubber, cork, and PVC, 1/2 inch thickness unless indicated otherwise.
 - a. Manufacturer
 - 1) Refelex Rubber Expansion Joint
 - 2) Or equal
- E. Expansion / Isolation joint sealant:
 1. ASTM D6690, Hot Applied for Concrete and Asphalt Pavements, Type 1
 - a. Asphalt cement shall meet AASHTO M226
 - b. Manufacturer:
 - 1) Meadows Safe-Seal 3405
 - 2) Or equal
 2. ASTM D5893, Low Modulus, Cold applied, Single Component, Chemically Curing Silicon for Portland Cement Concrete Pavements
- F. Membrane curing compound:
 1. General Use: ASTM C309, White pigment, Liquid Membrane Forming Compound for Curing Concrete Type 2, Class B with 100 percent poly-alpha-methylstyrene resin.
 2. Colored Concrete Pavement: ASTM C309, Transparent, non-yellowing, Liquid Membrane Forming Compound for Curing Concrete Type 1, Class

- A and B, acrylic based.
- 3. In potable water chambers: Sodium silicate, certified by the manufacturer as suitable for potable water use.
- G. Sheet and Burlap curing:
 - 1. Polyethylene film, white opaque, minimum nominal thickness of 4 mil, 0.004 inch.
 - 2. White-burlap-polyethylene sheet, weighing not less than 3.8 ounces per square yard.

PART 3 EXECUTION

3.01 GENERAL

- A. Coordinate as required with other trades to assure proper execution and installation of product. Examine surfaces and correct any surface imperfections which will prevent proper installation and performance of the products.

3.02 EXAMINATION

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.
- B. Verify existing radii where new walls conform and match to existing radii. Confirmed field dimensions must be indicated on form work submittals.

3.03 EARTH FORMS

- A. Earth forms are not permitted.

3.04 ERECTION - FORMWORK

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.
- B. Provide bracing to ensure stability of formwork and maintaining of desired position, shape, and alignment during and after concrete placement. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Provide substantial forms sufficiently tight to prevent leakage of mortar.
- E. Keep form joints to a minimum.
- F. Obtain approval before framing openings in structural members that are not indicated on drawings.
- G. Surfaces exposed to view:
 - 1. Laid out in a regular and uniform pattern with long dimensions vertical and joints aligned.
 - 2. Produce finished surfaces free from offsets, ridges, waves, and concave or convex areas.

- H. Coordinate this section with other sections of work that require attachment of components to formwork.
- I. If formwork is placed after reinforcement, resulting in insufficient concrete cover over reinforcement, request instructions from Engineer before proceeding.

3.05 APPLICATION - FORM RELEASE AGENT

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings that are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

3.06 INSERTS, EMBEDDED PARTS, AND OPENINGS

- A. Locate and set in place items that will be cast directly into concrete.
- B. Accurately position and securely anchor in forms, anchor bolts, steel shapes, conduit, sleeves, masonry anchorages, and other materials to be embedded in concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other work.
- D. Position recessed anchor slots for brick veneer masonry anchors to spacing and intervals specified in Section 04 20 01.
- E. Install accessories in accordance with manufacturer's instructions, so they are straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- F. Install waterstops in accordance with manufacturer's instructions, so they are continuous without displacing reinforcement.
- G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.

3.07 WATERSTOPS

- A. Install waterstops and provide required concrete cover in accordance with manufacturers written instructions.
- B. Measure and cut an exact length of waterstop to minimize the number of splices required for the installation to the maximum practical extent.
- C. Excessive splices in the waterstop are not permitted.

- D. Unless required by the installation, splices in waterstop shall not be closer than 10 feet on center.
- E. Type I waterstop:
 - 1. Shall be fusion welded.
 - 2. New-to-existing concrete cold joints shall be fastened to existing concrete substrates.
- F. Type II waterstop:
 - 1. Brush apply uniform coat of adhesive to the concrete surface along the line of placement.
 - 2. Apply a uniform coat of adhesive to the waterstop.
 - 3. Gaps in the glue application will not be permitted.
 - 4. Firmly press waterstop to concrete surface after adhesive has dried to tacky condition.
- G. Seal ends of waterstop where required by manufacturer's instructions.
- H. Place concrete within 12 hours. Protect waterstop from water and from displacement prior to concrete placement.
- I. Visually observe waterstop during concrete placement to assure proper placement and alignment.

3.08 FORM CLEANING

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
 - 1. Flush with compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.
 - 2. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.09 FORMWORK TOLERANCES

- A. Construct formwork to maintain tolerances required by ACI 117, unless otherwise indicated.
- B. All concrete formwork shall provide a maximum surface defect of no greater than 1/8". Defects larger than 1/8" shall be removed.
- C. Surfaces exposed to view:
 - 1. Maximum deviation from a true plane: 1/8 inch within 6 feet.

3.10 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00 - Quality Requirements.
- B. Contractor and engineer's on-site project representative shall inspect erected formwork, shoring, and bracing prior to placement of concrete to ensure that

work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

3.11 FORM REMOVAL

- A. Maintain forms in place for a minimum of 72 hours of curing time in accordance with ACI 306/306R when temperature is 45 degrees F and below.
- B. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed live, dead and impact loads.
- C. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.
- C. Epoxy adhesive to anchor steel dowels to concrete substrates.

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements and substitution requirements.
- B. Section 03 10 00 - Concrete Forming and Accessories.
- C. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. ACI 301 - Specifications for Structural Concrete; 2016.
- B. ACI 315 - Manual of Standard Practice for Detailing Reinforced Concrete Structures; 1999.
- C. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- D. ACI SP-66 - ACI Detailing Manual; 2004.
- E. ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement; 2002
- F. ASTM A185 – Welded Steel Wire Fabric for Concrete Reinforcement; 2002
- G. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement; 2001
- H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.
- I. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2016.
- J. ASTM A775 - Epoxy Coated Steel Reinforcing Bars; 2022
- K. ASTM A1078 - Epoxy Coated Steel Dowels for Concrete Pavement; 2019
- L. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel; 2018.
- M. CRSI (DA4) - Manual of Standard Practice; 2009.
- N. CRSI (P1) - Placing Reinforcing Bars; 2011.
- O. CRSI (RB4.1) – Supports for Reinforcement; 2022.

1.04 SUBMITTALS

- A. See Section 01 33 00 - SUBMITTAL PROCEDURES for general requirements of submittals.
- B. Shop Drawings:
 - 1. Comply with requirements of ACI SP-66.
 - 2. All curved walls shall have curved horizontal bars conforming to the radii of the walls. Contractor shall field verify all existing radii prior to rebar approval submittals.
 - 3. General Arrangement Drawings
 - a. Include plans, elevations, sections, details of installation, and attachments to other Work.
 - b. Indicated bar sizes, spacings, locations, and quantities of reinforcing steel.
 - c. Indicate size and location of pipe penetrations, wall sleeves and embedments.
 - 4. Fabrication Drawings
 - a. Reinforcing bar schedule.
 - b. Reinforcing dimensions, bar sizes, shapes of bent bars, spacing of bars, location of splices, length of splice overlap, locations of connections, connection details, quantities of reinforcing steel and wire fabric bending and cutting schedules.
 - c. Location and extent where each bar support will be used.
- C. Product Data: Submit sufficient data to verify compliance with specifications to include materials, parts, and accessories:
 - 1. Certified Mill Analysis for each product, grade and producer including the following:
 - a. Producer name and address
 - b. Type and grade of reinforcement or dowl bar
 - c. Heat number
 - d. Authorized signature of person responsible for quality control
 - e. List all chemical and physical test results.
 - f. Date and location where steel was melted.
 - g. Date reinforcement of dowel bards were rolled.
 - h. Date document printed.
 - 2. Reinforcing Steel
 - 3. Welded Wire Fabric
 - 4. Reinforcing Steel Bar Supports
 - 5. Reinforcing Steel Tie Wire
- D. Samples: All bar supports proposed for use.
- E. Manufacturer's Installation Instructions: Provide connection requirements and installation procedures.
- F. Manufacturer's Test Reports: Certified Mill Test Reports
- G. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- H. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative

with a copy of each bill of lading.

1.05 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301.
- B. The ENGINEER may require that test samples be taken, and test certificates be furnished by a reputable material testing laboratory at the OWNER's expense.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel:
 - 1. Unless specifically indicated otherwise, ASTM A615/A615M, Grade 60 (60,000 psi).
 - 2. Deformed billet-steel bars.
 - 3. Unfinished.
 - 4. Varying grades shall not be used interchangeably in structures.
 - 5. All deformed bars shall be provided with epoxy coating, ASTM A775
- B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
- C. Spiral Reinforcement: ASTM A82.
- D. Dowel Bars for Concrete Pavement:
 - 1. ASTM A1078.
 - 2. Deviation from true shape shall not exceed 0.04 inch in diameter.
 - 3. Coating Thickness: 8 mils minimum.
- E. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch.
- F. Chairs, Bolsters, Bar Supports, Spacers:
 - 1. Sized and shaped for adequate support of reinforcement during concrete placement.
 - 2. Conform to ACI 315.
 - 3. CRSI PS 7; Class B or E, fabricated from galvanized wire having PVC coated legs.
 - 4. Provide galvanized, plastic coated steel, or other non-corrosive materials components for placement within 1-1/2 inches of weathering surfaces, surfaces exposed or potentially exposed to moisture, and tank interior surfaces.
 - 5. Bar supports shall consist of approved high density "adobes", stainless steel chairs, plastic spacers or plastic shim plates.
 - a. Brick, broken concrete masonry units, spalls, rocks or similar materials shall not be used for support of reinforcing steel.
 - b. Steel chairs shall be furnished with plastic tips when incorporated into concrete exposed to view, such as in the roof slab.
 - c. Plastic spacers shall be PRECO BARSPAN WHEELS, as manufactured by the PRECO CORPORATION or equal.
 - d. Plastic shim plates may be used to support the plastic spacers unless shown otherwise on the Drawings.
 - 6. Welded Wire Fabric Reinforcement:

- a. If specified on the Drawings, welded wire fabric shall be manufactured in accordance with ASTM A185.
- b. It shall be of new stock and maintained free from rust.

2.02 EPOXY ADHESIVE ANCHORAGE

- A. All reinforcing steel anchored to or attached to existing concrete substrates shall be anchored with epoxy adhesive specifically formulated to anchor rebar to solid concrete.
- B. Acceptable products are listed on the General Structural Notes.

2.03 FABRICATION

- A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
- B. Field Welding of reinforcement is not permitted without submittal of welders certificates.
- C. Locate splices at indicated locations. If locations are not indicated, a splice is not acceptable.
- D. Where 135 degree seismic hooks are indicated but not specifically called out, a standard 90 degree hook is acceptable.
- E. All curved walls shall have curved horizontal bars conforming to the radii of the walls. Contractor shall field verify all existing radii prior to rebar approval submittals.

PART 3 EXECUTION

3.01 GENERAL

- A. Steel reinforcing bars shall be furnished and placed as indicated on the Drawings.
- B. At the time of placing concrete, all reinforcement shall be free from loose mill scale, rust, grease unless required by the contract documents for concrete joints, or other coating which might destroy or reduce its bond with concrete.
- C. Steel reinforcement which is to be placed in the work shall be stored under cover to prevent rusting, and shall be placed on blocking such that no steel touches any ground surface.
- D. All reinforcing steel placed in the work shall be tied together and supported in such a manner that displacement during placing of concrete and shotcrete will not occur.
- E. When there is a delay in depositing concrete, reinforcement shall be re-inspected and cleaned when necessary.

3.02 CUTTING AND BENDING

- A. When allowed mild steel reinforcement shall be cut and bent in accordance with ACI 318 and with approved practices and machine methods, either at the shop or

in the field.

- B. Reinforcement shall be accurately formed to the dimensions indicated on the Drawings and on the bending schedule.
- C. Bends for hooks on bars shall be made around a pin having a diameter not less than six times the minimum thickness of the bar.
- D. All bars shall be bent cold.

3.03 MINIMUM BAR SPACING

- A. The clear distance between parallel bars shall not be less than one and one half times the diameter of the bars and, unless specifically authorized, shall in no case be less than 1-inch, nor less than the maximum size of coarse aggregate specified.

3.04 CONCRETE COVER (MINIMUM)

- A. On all formed surfaces which will be exposed to water, ground, or the elements, there shall be a nominal cover over the steel of 2 inches for bars number 6 through number 18 and 1-1/2 inches for bars number 5 and smaller, with an installation tolerance of + 1/4-inch. When crossing bars of different diameter are encountered in one face, one shall consider the bar size and location that will provide the largest cover over the nearest steel to the outside surface.
- B. Unless otherwise specified in these specifications or shown on the Drawings, all reinforcing steel facing subgrades in footing and floors for concrete construction shall be given a nominal protective cover of 3.0-inch minimum. The largest cover shall be used when different size bars are encountered in one face.
- C. The minimum cover over reinforcing steel for concrete construction of other facilities shall be as shown on the Drawings.
- D. No "bury" or "carrier" bars will be allowed unless specifically approved by the ENGINEER.

3.05 SPLICING

- A. Except as shown or specified on the Drawings, reinforcing steel shall not be spliced at any location without specific approval by the ENGINEER. Splices in adjacent bars shall be staggered.
- B. Where permitted or required, splices in reinforcing steel shall have sufficient lap to transfer full strength of the bar by bond and shear. In no event shall the lap be less than 40 diameters of the spliced bars.
- C. Unless specified or shown otherwise on the Drawings, bars shall be lap spliced in accordance with ACI 318 in full contact with one another for the required lap length and shall be fastened together with steel tie wire.
- D. Unless shown otherwise on the Drawings, where bars are to be lapped spliced at joints in the concrete, all bars shall project from the concrete first placed, a minimum length equal to the lap splice length indicated on the Drawings. All

concrete or other deleterious coating shall be removed from dowels and other projecting bars by wire brushing or sandblasting before the bars are embedded in a subsequent concrete placement.

3.06 SUPPORTS

- A. All reinforcement shall be retained in place, true to indicated lines and grades, by the use of approved bar supports.
- B. The supports shall be of sufficient quantity, strength and stability to maintain the reinforcement in place throughout the concreting operations. Bar supports shall be placed no further than 4 feet apart in each direction. Supports must be completely concealed in the concrete and shall not discolor or otherwise mar the surface of the concrete. The CONTRACTOR shall be held responsible for providing the appropriate quantity and type of bar supports.
- C. Do not place reinforcing bars more than 2 inches beyond the last leg on continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads.

3.07 BAR TYING

- A. Bars shall be tied sufficiently often to prevent shifting. There shall be at least three ties in each bar length (this shall not apply to dowel laps or to bars shorter than 4 feet, unless necessary for rigidity).
- B. Slab bars shall be tied at every intersection around the periphery of the slab. Wall bars and slab bar intersections shall be tied at not less than every fourth intersection, but at not greater than the following maximum spacings:

	Slab Bars (inches)	Wall Bars (inches)
Bars No. 5 and smaller	60	48
Bars No. 6 through No. 9	96	60
Bars No. 10 through No.11	120	96

- C. Reinforcement Around Openings:
 - 1. Where reinforcing steel has to be cut to permit passage of pipe or to create openings, and should no detail be shown for extra reinforcing in such areas, the area of steel removed by the creation of the opening must be replaced by placing at least double the area of steel removed by the opening equally around the openings. The steel shall be placed such that it extends 5 feet beyond the opening on each side to provide for sufficient bond.

3.08 WELDED WIRE FABRIC REINFORCEMENT

- A. General
 - 1. All necessary tie wiring, spacing chairs, or supports shall be installed to keep the welded wire fabric in place while concrete is being placed.
 - 2. The welded wire fabric shall be bent as shown or required on the Drawings to fit the work. Welded wire fabric shall be rolled or otherwise straightened to make a perfectly flat sheet before placing in the Work.

- B. Splicing
 - 1. Welded wire fabric shall be lap spliced as indicated on the Drawings. If the lap splice length is not indicated on the Drawings, the welded wire fabric shall be spliced in accordance with ACI 318 and no less than a minimum of 40 wire diameters of the lapped wire, or 12 inches, whichever is greater.
 - 2. Offset end laps in adjacent widths to prevent continuous laps in either direction.

3.09 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Maintain minimum concrete cover as indicated on General Structural Note sheets and as required in this Specification Section, in the case of a discrepancy the greater amount of cover shall be required
- C. Anchor all rebar dowels to existing concrete substrate with drilled adhesive anchorage depths indicated. If a depth is not indicated, drill and epoxy to a depth that develops 75% of the tension strength of the indicated rebar size, using data provided by the epoxy adhesive manufacturers technical literature.

3.10 FIELD QUALITY CONTROL

- A. All rebar shall be inspected by an independent testing agency special inspector and the Engineers resident project representative prior to placing any concrete.
- B. Independent testing agency requirements specified in Section 01 45 00.
- C. Contractor shall adjust placement of reinforcing steel as directed by the independent testing agency special inspector and the Engineers resident project representative prior to placing any concrete.

END OF SECTION

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SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. All structural cast-in-place concrete materials and placement, including vaults, walls, piers, pilasters.
- B. Special deleterious limits for concrete aggregates and mixing water.
- C. Joint devices associated with concrete work.
- D. Placement of embedded items.
- E. Concrete curing, finishing, and protection.
- F. Leak-testing of water storage tanks.

1.02 RELATED REQUIREMENTS

- A. Division 01 for submittal requirements and product substitution requirements.
- B. Section 03 10 00 - Concrete Forming and Accessories: Forms and accessories for formwork.
- C. Section 03 20 00 - Concrete Reinforcing.
- D. Section 07 92 00 - Joint Sealants: Products and installation for sealants and joint fillers for saw cut joints and isolation joints in slabs.

1.03 REFERENCE STANDARDS

- A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- C. ACI 214R - Recommended Practice for Evaluating Compression Test Results of Field Concrete; 2011
- D. ACI 301 - Specifications for Structural Concrete; 2016.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- F. ACI 305R - Guide to Hot Weather Concreting; 2010.
- G. ACI 306R - Guide to Cold Weather Concreting; 2016.
- H. ACI 308R - Guide to External Curing of Concrete; 2016.
- I. ACI 309R – Standard Practice for Consolidation of Concrete; 2015.
- J. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).

- K. ASTM C31/C31M – Making and Curing Concrete Test Specimens in the Field; 2022.
- L. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- M. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2020.
- N. ASTM C40 - Standard Test Method for Organic Impurities in Fine Aggregate for Concrete; 2004.
- O. ASTM C88 - Standard Test Method for Soundness of Aggregates by use of Sodium Sulfate or Magnesium Sulfate; 2013.
- P. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2020.
- Q. ASTM C131/C131M - Standard Test Method for Resistance to Degradation of Small Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine; 2020.
- R. ASTM C136 - Standard Test Method for Sieve Analysis to Fine and Coarse Aggregate; 2006.
- S. ASTM C143/C143M - Standard Test Method for Slump of Hydraulic-Cement Concrete; 2015a.
- T. ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete; 2016.
- U. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- V. ASTM C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method; 2009a.
- W. ASTM C233 - Standard Test Method for Air-Entraining Admixtures for Concrete; 2010.
- X. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- Y. ASTM C457/C457M - Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete; 2016.
- Z. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.
- AA. ASTM C595/C595M - Standard Specification for Blended Hydraulic Cements, 2021.
- BB. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2019.
- CC. ASTM C670 - Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials; 2015.

- DD. ASTM C685/C685M - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 2017.
- EE. ASTM C803/C803M - Standard Test Method for Penetration Resistance of Hardened Concrete; 2018.
- FF. ASTM C881/C881M - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 2015.
- GG. ASTM C1084 - Standard Test Method for Portland-Cement Content of Hardened Hydraulic-Cement Concrete; 2019.
- HH. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2012.
- II. ICRI 310.2R - Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair; 2013.
- JJ. NSF 61 - Drinking Water System Components - Health Effects; 2019.

1.04 SUBMITTALS

- A. See Section 01 33 00 - SUBMITTAL PROCEDURES, for general requirements for submittals.
- B. Shop Drawings: Submit complete fabrication, assembly and installation drawing for all products and accessories to illustrate construction and assembly of components and their connection to the work:
 - 1. General Arrangement Drawings
 - a. Include plans, elevations, sections, details of installation, and attachments to other Work
 - b. Indicate size and location of pipe penetrations, wall sleeves and embedded conduit
 - c. Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties
 - 2. Fabrication Drawings
 - a. Fabricator's detailed requirements for system foundations
 - 3. Furnish setting Drawings, templates, and directions for installation
 - a. Indicate extent and sequence of concrete placement
 - 4. Construction joints: The contractor shall submit a drawing indicating the location of all construction joints to the engineer for approval prior to concrete placement.
- C. Product Data: Submit manufacturers' data on manufactured products showing compliance with specified requirements and installation instructions.
 - 1. Cement
 - 2. Fly Ash
 - 3. Admixtures
 - a. Retarder
 - b. Plasticizer
 - c. Air Entrainment
- D. Mix Design: Submit proposed concrete mix design.

1. Indicate proposed mix design complies with requirements of ACI 301, Section 4 - Concrete Mixtures.
2. Indicate proposed mix design complies with requirements of ACI 318, Chapter 5 - Concrete Quality, Mixing and Placing.
3. Proposed concrete mix design for structural concrete, concrete topping and concrete fill as well as testing for each mix design including:
 - a. Concrete Mill Certificate
 - b. Fly Ash Mill Certificate
 - c. Slump range on which the design is based
 - d. Total gal of water per cu yd
 - e. Brand, type, composition, and quantity of cement with manufacturer and plant location identified
 - f. Brand, type, composition and quantity of fly ash
 - g. Location, source, specific gravity, adsorption, deleterious reaction results and gradation of each aggregate
 - h. Blended aggregate proportions including a 0.45 power chart
 - i. Ratio of fine to total aggregates
 - j. Surface-dry weight of each aggregate per cu yd
 - k. Brand, type ASTM designation, active chemical ingredients and quantity of each admixture
 - l. Air content and tolerance
 - m. Water/cementitious material ratio and tolerance
 - n. Compressive strength based at 7- and 28-day compression tests
 - o. Time of initial set
 - p. Amount of field water or other field-mixed admixture that may be added
 - q. All other typical data that may affect performance of the proposed mix design
4. Existing data on proposed design mixes may be acceptable if complete and certified within the last 5 years and meet the requirements of these contract documents.

E. Installation Plans:

1. Hot Weather
2. Cold Weather

F. Manufacturer's Laboratory Test Reports:

1. Submit suppliers certified fly ash test reports for each shipment delivered to concrete supplier:
 - a. Physical and chemical characteristics
 - b. Certification of compliance with the specifications
 - c. Signed by Contractor and concrete supplier
2. Submit reports for each proposed concrete mix design and testing including information required in Article 1.04 D.
3. Submit report for each test or series of tests specified.

G. Sustainable Design Submittal: If any fly ash, silica fume, rice hull ash, or other waste material is used in mix designs to replace Portland cement, submit the total volume of concrete cast in place, mix design(s) used showing the quantity of portland cement replaced, reports showing successful cylinder testing, and temperature on day of pour if cold weather mix is used.

- H. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- I. Field Test Reports:
 - 1. Provide field quality control testing reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.
 - 2. Submit concrete delivery tickets.
- J. Project Record Documents: Accurately record actual locations of embedded utilities and components that will be concealed from view upon completion of concrete work.
- K. Warranty: Submit manufacturer warranty and ensure forms have been completed in City of Fargo's name and registered with manufacturer.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting:
 - 1. Schedule and attend a Concrete Placement meeting at least one (1) week prior to placing concrete.
 - 2. The meeting shall be attended by the OWNER, ENGINEER, CONTRACTOR, Testing Laboratory Representative, and the Concrete Supplier.
 - 3. The following shall be discussed at the meeting: Safety, Batching and Delivery, Adjustments to Mix; Site Dosing, Placement Rates and Anticipated Schedule of Placing and Finishing, Site Layout –Holding Area; Pump Truck Location; Truck Wash-out Area; Parking area, Equipment – Pumps and Appurtenances; Vibrators; Spare Equipment, Concrete Testing Procedures, and Curing.

1.06 QUALITY ASSURANCE

- A. Perform work of this section in accordance with ACI 301 and ACI 318.
- B. Follow recommendations of ACI 305R when concreting during hot weather.
- C. Follow recommendations of ACI 306R when concreting during cold weather.
- D. Laboratory and field testing agency and procedures shall comply with Section 01 45 00 - QUALITY CONTROL.
- E. Acquire cement and aggregate and all concrete mix design components from their same source for all work.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Cement and fly ash: Store in moisture proof enclosures, do not use if caked or lumpy
- B. Aggregate: Store to prevent segregation and inclusion of foreign materials, do not use the bottom 6 inch of piles in contact with the ground

- C. Rubber and plastic materials: Store in a cool place, do not expose to direct sunlight
- D. Prepare a delivery ticket for each load of ready-mixed concrete
- E. Truck operator shall hand ticket to Engineer at the time of delivery with ticket to show:
 - 1. Quantity delivered
 - 2. Actual quantity of each material in batch
 - 3. Outdoor temp in the shade
 - 4. Time at which cement was added and batched
 - 5. Numerical sequence of the delivery
 - 6. Quantity of water and admixtures that can be added in the field based on mix design
 - 7. Free moisture in fine and coarse aggregate in percent by weight
 - 8. Temperature of batch

PART 2 PRODUCTS

2.01 FORMWORK

- A. Comply with requirements of Section 03 10 00.

2.02 REINFORCEMENT MATERIALS

- A. Comply with requirements of Section 03 20 00.

2.03 CONCRETE MATERIALS

- A. Cement: ASTM C595/C595M, Type 1L.
 - 1. Acquire cement for entire project from same source.
- B. Fly Ash: ASTM C618, Class C or F, except loss on ignition not more than 5 percent.
 - 1. 25% replacement.
- C. Fine Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Clean, natural sand, ASTM C33; no manufactured or artificial sand.
 - 3. Maximum expansion:
 - a. ASTM C1260 and ASTM C1567, 0.01 percent.
 - b. ASTM C1293, 0.04 percent.
- D. Coarse Aggregates: ASTM C33/C33M.
 - 1. Acquire aggregates for entire project from same source.
 - 2. Crushed rock, natural gravel, or other inert granular material, ASTM C33 **except clay and shale particles no more than 0.5 percent**. Free of all materials deleteriously reactive with alkalis in the cement in an amount to cause excessive expansion of concrete.
 - 3. Maximum expansion:
 - a. ASTM C1260 and ASTM C1567, 0.01 percent.

- b. ASTM C1293, 0.04 percent.
- E. Water: ASTM C1602/C1602M; clean, potable, and free from injurious amounts of oils, acids, alkalis, salts, organic materials, or other substances that may be deleterious to concrete or steel. Provide mixing water free from deleterious amounts of chloride ion for prestressed concrete or for concrete which will contain aluminum embedments including that portion of the mixing water contributed in the form of free moisture on the aggregates..

2.04 ADMIXTURES

- A. Chemical Admixture: Contractor and concrete supplier may use any combination of specified admixtures to suit their work processes.
- B. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
- C. Air Entrainment Admixture: ASTM C260/C260M.
 - 1. All concrete shall be air entrained.
 - 2. Manufacturer
 - a. Grace - Darex AEA
 - b. Master Builders - MB VR
 - c. Protex – AES
 - d. Sika Chemical – AEK
 - e. Or equal
- D. High Range Water Reducing and Retarding Admixture: ASTM C494/C494M Type G.
- E. High Range Water Reducing Admixture: ASTM C494/C494M Type F.
- F. Water Reducing and Retarding Admixture: ASTM C494/C494M Type D.
- G. Retarding Admixture: ASTM C494/C494M Type B.
 - 1. Manufacturer
 - a. Grace - Duratard-HC
 - b. Master Builders - MC HC
 - c. Protex - Protard
 - d. Sika Chemical - Plastiment
 - e. Or equal
- H. Plasticizer: ASTM C494, Type A.
 - 1. Manufacturer
 - a. Grace - WRD A-HC
 - b. Sika Chemical – Plastocrete
 - c. Or equal
- I. Water Reducing Admixture: ASTM C494/C494M Type A.
- J. Waterproofing Admixture: Admixture formulated to reduce permeability to liquid water, with no adverse effect on concrete properties.
 - 1. Admixture Composition: Crystalline, functioning by growth of crystals in capillary pores.

2. Manufacturers:
 - a. Xypex Chemical Corporation; XYPEX Admix C-500:
www.xypex.com/#sle.

2.05 BONDING AND JOINTING PRODUCTS

- A. Epoxy Bonding System:
 1. Complying with ASTM C881/C881M and of Type required for specific application.
- B. Bonding Admixture and Bonding Agent: Comply with requirements of Section 03 10 00.
- C. Waterproofing Admixture Slurry: Slurry coat of Portland cement, sand, and crystalline waterproofing additive, mixed with water in proportions recommended by manufacturer to achieve waterproofing at cold joints in concrete.
- D. Waterstops: Comply with requirements of Section 03 10 00.
- E. Slab Isolation Joint Filler:
 1. Comply with requirements of Section 03 10 00.
 2. 1/2 inch thick, height equal to slab thickness, with removable top section that will form 1/2 inch deep sealant pocket after removal.

2.06 CURING MATERIALS

- A. As required in Specification 03 10 00.

2.07 CONCRETE MIX DESIGN

- A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
- B. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience or trial mixtures, as specified in ACI 301.
 1. For trial mixtures method, employ independent testing agency acceptable to Engineer for preparing and reporting proposed mix designs.
- C. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended or required by manufacturer.
- D. Contractor may substitute fly ash for 20 percent of cement at a ratio of the specific gravity of cement divided by specific gravity of fly ash. When approved by Engineer, the fly ash cement content may be reduced to 15 percent at a ratio of the specific gravity of cement divided by specific gravity of fly ash between October 15 and April 15.
- E. Alkali content 3 lbs per cubic yard of concrete sodium oxide (Na₂O) equivalent, maximum.
- F. Calcium chloride content shall not exceed 0.05 percent of the cement content by weight.
- G. Cementitious content for all mixes, portland cement plus fly ash:

1. Minimum 560 lbs.
2. Maximum 620 lbs.

H. Normal Weight Concrete:

1. Coarse Aggregate Size: 3/4" nominal or 1" nominal aggregate size. Smaller coarse aggregates are not allowed. Larger aggregates may be acceptable as approved by the Engineer.
2. Water/Cementitious Material Ratio (Cement and Fly Ash): 0.42 Maximum.
3. Air Content: 5.0% - 7.0% total air content after placement.
 - a. Vary air content with maximum aggregate, ASTM C94, Table 3.
 - b. Air may be omitted from interior slabs to be trowel finished.
4. Coarse Aggregate Size: 3/4" nominal or 1" nominal aggregate size. Smaller coarse aggregates are not allowed. Larger aggregates may be acceptable as approved by the Engineer.
5. Aggregate blends shall be uniformly graded, and the aggregate blend must be included with the mix design submittals.
6. Slump: Within 4 inch maximum and as low as possible consistent with proper handling and thorough compaction.
7. Initial Set: 5-1/2 hrs \pm 1 hr after water and cement are added to the aggregates as determined by ASTM C403:
 - a. Adjust retarder or accelerator quantities to compensate for temp and job condition variations
8. Strength: Compressive strength as determined by ASTM C39:

AGE	STRENGTH
7 Days	3,000 psi
28 Days	4,500 psi

I. CONCRETE TOPPING AND FILL

1. Proportions: 100 lbs cement, 300-400 lb sand and pea gravel mix, less than 5 gal per sack of cement
2. Water cement ratio less than or equal to 0.45
3. Maximum slump: 2 inches
4. 28 day strength = 3,000 psi
5. Admixtures:
 - a. Air entraining agent
 - b. Water reducer

2.08 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.
- B. Adding Water: If concrete arrives on-site with slump less than suitable for placement, do not add water that exceeds the maximum water-cement ratio or exceeds the maximum permissible slump. Water may only be added if field water amounts are indicated in the accepted mix designs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify lines, levels, and dimensions before proceeding with work of this section. Commencement of concrete placement indicates acceptance of all conditions affecting the placement, alignment, and quality of the installed concrete materials and elements.
- B. Verify requirements for concrete cover over reinforcement.
- C. Verify that anchors, seats, plates, reinforcement and other items to be case into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

- A. Verify that forms are clean and free of rust before applying release agent.
- B. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
- C. Prepare existing concrete surfaces to be repaired according to ICRI 310.2R, methods as appropriate for the correction.
- D. Where new concrete is to be bonded to previously placed concrete, prepare existing surface by cleaning with steel brush or sandblasting and applying bonding agent in according to bonding agent manufacturer's instructions.
 - 1. Use epoxy bonding system for bonding to damp surfaces, for structural load-bearing applications, and where curing under humid conditions is required.
 - 2. Coat all exposed rebar with corrosion-inhibiting bonding agents.
- E. Where new concrete with integral waterproofing is to be bonded to previously placed concrete, prepare surfaces to be treated with waterproofing slurry in accordance with waterproofing manufacturer's instructions. Saturate cold joint surface with clean water, and remove excess water before application of coat of waterproofing admixture slurry. Apply slurry coat uniformly with semi-stiff bristle brush at rate recommended by waterproofing manufacturer.
- F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and anchor with epoxy adhesive specified in 03 20 00.

3.03 TRANSPORTING MIXED CONCRETE

- A. Transporting of mixed concrete shall conform to ACI 305R.
- B. Do not exceed manufacturer's guaranteed capacity of truck agitators. Maintain the mixed concrete in a thoroughly mixed and uniform mass during hauling.
- C. Do not incorporate additional mixing water into the concrete during hauling or after arrival at the delivery point, unless ordered by the Engineer. If additional water is to be incorporated into the concrete, revolve the drum not less than 70 to 100 revolutions at mixing speed after the water is added and before placing concrete.

- D. Furnish a water measuring device in good working condition, mounted on each transit mix truck, for measuring the water added to the mix on the site by the Engineer.
- E. Provide delivery ticket and comply with delivery requirements of this section.

3.04 PLACING CONCRETE

- A. Place concrete in accordance with ACI 304R.
- B. Notify Engineer not less than 24 hours prior to commencement of placement operations.
- C. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
- D. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
- E. Predetermine limits at each pour and place all concrete within limits of pour in one continuous operation.
- F. Remove all mud, water, ice, snow, frozen material, and debris from space to be occupied by concrete.
- G. Clean surfaces encrusted with dried concrete from previous concrete operations.
- H. Convey to the point of final deposit by methods which will prevent separation or loss of ingredients.
- I. Place concrete in final position without being moved laterally more than 5 feet.
- J. Place concrete in approximately horizontal layers of proper depth for proper compaction, not more than 2 feet.
- K. Place subsequent layer while the preceding layer is still plastic.
- L. Top finish concrete when thoroughly settled.
- M. Remove all laitance, debris, and surplus water from the tops of the forms by screeding, scraping or other effective means.
- N. Overfill the forms for walls whose tops will be exposed to the weather and screed off the excess after the concrete has settled.
- O. Allow concrete in walls and columns to settle at least 2 hours before concrete is placed in structural systems to be supported by the walls and columns.
- P. Where construction joints are necessary, before next placement prepare joint surface by removing laitance and exposing the sand and sound surface mortar, by sandblasting or high-pressure water jetting.

3.05 BONDING TO HARDENED CONCRETE

- A. Place new concrete on rough, clean, damp faces of existing concrete.
- B. Remove surface mortar to expose aggregate.

- C. Clean hardened concrete of all foreign substances, including curing compound, washed with clean water, and keep saturated for 24 hrs preceding placement of fresh concrete.
- D. Apply bonding agent for bonding to hardened concrete.

3.06 COMPACTION

- A. Thoroughly compact concrete during and immediately after placement.
- B. Work concrete around all reinforcements and embedments and into the corners of the forms.
- C. Use mechanical vibrators which will maintain 9,000 cycles per minutes when immersed in the concrete, 1-1/2 hp motor minimum.

3.07 COLD WEATHER CONCRETING

- A. Conform to ACI 306/306R, except as modified herein.
- B. Minimum concrete temp at the time of mixing:

Outdoor Temp at Placment (inshade)	Concrete Temp at Mixing
Below 30 degrees F	70 degrees F
Between 30 degrees F and 45 degrees F	60 degrees F

- C. Do not place heated concrete which is warmer than 80 degrees F.
- D. If freezing temp are expected during curing, maintain the concrete temp at or above 50 degrees F for 5 days or 70 degrees F for 3 days with forms in place.
- E. Do not allow concrete to cool suddenly.
- F. Do not water cure during cold weather. Use membrane forming curing.

3.08 HOT WEATHER CONCRETING

- A. Conform to ACI 305/305R, except as modified herein.
- B. At air temp of 90 degrees F and above keep concrete as cool as possible during placement and curing.
- C. Do not allow concrete temperature to exceed 80 degrees F at placement.
- D. Prevent plastic shrinkage cracking due to rapid evaporation of moisture.
- E. Do not place concrete when the actual or anticipated evaporation rate equals or exceeds 0.2 lbs per sq ft per hr as determined from ACI 305, Fig 2.1.4.

3.09 CONSTRUCTION JOINTS

- A. As indicated on the drawings or designated by Engineer. The Contractor shall also submit plans showing location of all vertical construction joints in walls and the location of construction joints in suspended slabs and beams and foundation slabs for approval by the Engineer.
- B. In columns and walls:

1. At the underside of beams, girders, haunches, drop panels, column capitals, and at floor panels.
 2. Haunches, drop panels, and column capitals are considered of the supported floor or roof and shall be placed monolithically therewith.
 3. Column bases need not be placed monolithically with the floor below.
 4. Walls shall be divided into panels not greater than 30 feet in length. Place concrete in alternating panels unless more than 7 days have elapsed between concrete placements of adjoining panels.
 5. Horizontal construction joints shall not be allowed in walls.
- C. In beams:
1. At the middle of the span unless a beam intersects a girder at this point.
 2. If the middle of the span is at an intersection of a beam, offset the joint in the girder a distance equal to twice the beam width.
 3. Provide satisfactory means for transferring shear and other forces through the construction joint.
- D. In suspended slabs:
1. At or near the center of span in flat slab.
 2. Do not locate a joint between a slab and a concrete beam unless so indicated on the drawings.
 3. Install construction joints in beams and slabs perpendicular to the planes of their surfaces.
- E. Foundation slabs:
1. Foundation slabs shall be divided into approximate square sections not greater than 40 feet in their longest direction.

3.10 WATERTIGHT JOINTS

- A. Provide watertight joints with continuous waterstops at the following locations:
- B. Walls and bottom slabs of dry pits or rooms where below finished grade and in contact with backfill or subgrade material on the opposite side.
- C. Walls in contact with liquid where the opposite face is above finished grade or exposed in a dry pit or room.
- D. Slabs in contact with liquid where the opposite face is exposed in a dry pit or room.
- E. Filters and clear water reservoirs.
- F. Across construction joints in foundation slabs and walls of tanks and basins.
- G. Other locations indicated on the drawings.
- H. PVC waterstops—Type I:
 1. Size and thickness indicated on Drawings.
 2. Clean and free of coatings which would weaken the bond with concrete.
 3. Continuous through the length of the construction joint.
 4. Butt junctions between adjacent sections and securely heat weld together.

5. Maintain in proper position until surrounding concrete is deposited and compacted.
 - I. Hydrophilic waterstops—Type II:
 1. Refer to Section 03 20 00
- 3.11 EXPANSION AND CONTRACTION JOINTS
- A. Contraction joints:
 1. Provide as designated by Engineer.
 2. Seal accessible edges.
 - B. Expansion material:
 1. Provide as indicated on drawings.
 2. Firmly bond to previously poured joint. Face with a suitable adhesive.
 3. Pour new concrete directly against joint filler.
 4. Seal accessible edges.
- 3.12 FINISHING UNFORMED SURFACES
- A. Float finish buried or permanently submerged concrete not forming an integral of a structure except as required to attain surface elevations, contours and freedom from laitance
 - B. Screed and initial float finish followed by additional floating, and troweling as required, all other surfaces. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains as indicated on the drawings
 - C. Finish concrete floor surfaces in accordance with ACI 301
 - D. Screeding:
 1. Screed concrete surfaces to the proper elevation and contours with all aggregates completely embedded in mortar
 2. Surface free of irregularities of height or depth more than 1/4 inch measured from a 10 foot straightedge
 - E. Broom finish:
 1. Broom finish exterior slabs and exterior concrete stair treads for a non-slip surface
 2. Broom after second floating and at right angles to normal traffic
 - F. Troweling:
 1. Steel trowel finish interior floor surface which will be exposed at the completion of construction or surfaces designated by Engineer
 2. Trowel to produce a dense, smooth, uniform surface free from blemishes and trowel marks
 - G. Aggregate exposure:
 1. Remove surface mortar from surfaces to be covered later with concrete or mortar topping
 2. Expose coarse aggregates to improve bonding
- 3.13 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Engineer and Contractor within 24 hours of test.
- B. Non-Compliant Test Results: The testing agency shall immediately report tests results indicating non-complaint results to the Engineer, Contractor, and ready mix supplier.
- C. Defective Concrete: Concrete not complying with required lines, details, dimensions, tolerances or specified requirements.
- D. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- E. Repair defects in formed concrete surfaces within 24 hours of removing forms.
- F. Replace defective concrete within 48 hrs.
- G. Cut out and remove to sound concrete honeycombed or otherwise defective concrete.
- H. Cut edges square to avoid feathering.
- I. Comply with Chapter 9, ACI 301.
- J. Perform repair work so as not to interfere with thorough curing of adjacent concrete.
- K. Adequately cure repair work.

3.14 FINISHING FORMED SURFACES

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Remove fins and other surface projections from all formed surfaces except exterior surfaces that will be in contact with earth backfill and are not specified to be dampproofed.
 - 1. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/8 inch or more in height.
 - 2. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/8 inch or more in height.
- C. Use a power grinder, if necessary, to remove projections and provide a flush surface.
- D. Remove fins and fill tie holes on surfaces exposed to view:
 - 1. Clean, dry and fill tie holes with epoxy grout.
 - 2. Finish flush to match the texture of adjacent concrete.
- E. Grout cleaning under provisions of Chapter 10, ACI 301 (Grout Rub):
 - 1. Grout clean all exposed surfaces including but not limited to exterior and interior foundation walls exposed to view and interior of water retaining structures to produce a smooth uniform surface free of marks, voids, surface glaze and cement dust.

2. Use nonshrink grout mix with bonding agent. Dampen surface and apply with cork or rubber float.

3.15 CURING AND PROTECTION

- A. Protect concrete from moisture loss at relatively constant temperature for at least 7 days after placement except that the time period for curing by saturation for concrete being protected from low temp shall be 1 day less than the duration of low temp protection.
- B. Comply with requirements of ACI 308R. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
- C. Maintain rate of temperature change less than 5 degrees F in any one (1) hour period.
- D. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
 1. Normal concrete: Not less than seven days, or until 75% of the compressive strength of the approved mix design is obtained and verified by concrete compressive strength tests.
- E. Formed Surfaces: Cure by moist curing with forms in place for full curing period.
- F. Water curing:
 1. Begin water saturation as quickly as possible after initial set.
 2. Regulate water application to provide complete surface coverage with a minimum of runoff.
 3. Interrupt the application of water to walls for grout cleaning only over the area being cleaned at the time and do not permit the surface to become dry during such an interruption.
- G. Membrane curing:
 1. Membrane curing compound may be used in lieu of water curing on concrete which will not be covered later with mortar or concrete.
 2. Spray apply membrane curing compound at not more than:
 - a. General use: 300 sf per gal recommended.
 3. Cover unformed surfaces within 30 minutes of final finishing.
 4. If forms are removed before the end of the curing period, immediately apply curing compound to the formed surface before they dry out.
 5. Protect curing compound against abrasion during the curing period.
- H. Do not permit traffic over unprotected concrete floor surface until fully cured.
- I. Insulate concrete to prevent freezing and to maintain curing environments during cold water conditions.
- J. Shield or protect concrete from drying conditions during hot weather conditions.

3.16 FIELD QUALITY CONTROL

- A. An independent testing agency as specified in Section 01 45 00 - QUALITY CONTROL will perform field quality control tests,

- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure compliance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M, for each test, mold and cure four concrete test cylinders. Obtain test samples for every 50 cubic yards or less of each class of concrete placed.
- F. Take one additional test cylinder set during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform slump, air content, unit weight test at each set of test cylinders taken. Record ambient weather conditions, locations where test specimen was obtained and where concrete is being placed at the time the sample is taken, concrete temperature, and other typical field data that is needed to troubleshoot problems with concrete performance.
- H. Storage facilities for concrete test cylinders:
 - 1. Including water necessary, a specially prepared box with high-low thermometer and thermostatically controlled heating devices in accordance with ASTM C31.
- I. Failure of test cylinder results:
 - 1. Upon failure of 28-day test cylinder results, the Engineer may require the Contractor, at his expense, to obtain and test at least three 4-inch diameter cored samples from area in question.
 - 2. Concrete will be considered adequate if average of three core tests is at least 85 percent of, and if no single core is less than 75 percent of, the specified 28-day strength.
 - 3. In the event an area is found to be structurally unsound, the Engineer may order removal and replacement of concrete as required. The cost of the core tests and removal and replacement of defective concrete shall be borne by the Contractor.
 - 4. Fill all core holes as specified for repairing defective concrete.
- J. Concrete leak testing:
 - 1. Individually leak test each water holding structure.
 - 2. Prior to backfilling walls, fill each basin to maximum operating water level. Fill and test each basin separately to check for leaks. Allow 48 hours for initial concrete saturation.
 - 3. The water level elevation shall be determined by using a surveyor's level and level rod; after a lapse of an additional 48 hours, the water level shall be checked in same manner. If during the 48 hours the water level has dropped not more than 0.50 inches, the tank will be considered sufficiently watertight.

4. If test fails to meet above requirements, the tank shall be drained, repaired, and tested again for water tightness. The Contractor will pay all costs associated with testing including but not limited to testing water and retesting. Damp spots on the exterior wall faces or footings shall be qualified as leaks. All leaks shall be repaired on the tank interior by applying concrete water plug, Sikaset plug, or approved equal.

END OF SECTION

DIVISION 04 MASONRY

SECTION 04 20 01
MASONRY VENEER

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block at base of wall veneer.
- B. Facing brick.
- C. Mortar and grout.
- D. Anchorage.
- E. Flashings.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements and product substitution requirements.
- B. Section 03 30 00 - Cast in Place Concrete
- C. Section 03 10 00 - Concrete Forming and Accessories
- D. Section 05 50 00 - Metal Fabrications: Loose steel ledgers, fabrication and installation.
- E. Section 07 92 00 - Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2019.
- C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2020.
- D. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- E. ASTM C67/C67M - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2020.
- F. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2016a.
- G. ASTM C91/C91M - Standard Specification for Masonry Cement; 2018.
- H. ASTM C144 - Standard Specification for Aggregate for Masonry Mortar; 2018.

- I. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- J. ASTM C216 - Standard Specification for Facing Brick (Solid Masonry Units Made From Clay or Shale); 2019.
- K. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.
- L. ASTM C404 - Standard Specification for Aggregates for Masonry Grout; 2018.
- M. ASTM C476 - Standard Specification for Grout for Masonry; 2020.
- N. International Building Code—Chapter 17 Structural Tests and Inspections; 2021
- O. International Building Code—Chapter 21 Masonry; 2021
- P. BIA Technical Notes No. 7 - Water Penetration Resistance – Design and Detailing; 2017.
- Q. BIA Technical Notes No. 28B - Brick Veneer/Steel Stud Walls; 2005.
- R. BIA Technical Notes No. 46 - Maintenance of Brick Masonry; 2017.
- S. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting:
 - 1. Convene two weeks before starting work of this section.
 - 2. The meeting shall be attended by the OWNER, ENGINEER, CONTRACTOR, Masonry Subcontractor, and Testing Laboratory Representative.
 - 3. The following shall be discussed at the meeting: Safety, Batching Grout, Adjustments to Mix, Site Dosing, Placement Rates and Anticipated Schedule of Placing and Finishing, Site Layout – Material Storage Area, Scaffolding, Parking area, Equipment – Long Reach Lifts and Appurtenances, Grout Testing Procedures, and Curing.

1.05 SUBMITTALS

- A. See section 01 33 00 - SUBMITTAL PROCEDURES for general requirements for submittals.
- B. Shop Drawings:
 - 1. Reinforcing bar lists, fabrication and placement drawings:
 - a. Indicated bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric bending and cutting schedules
 - b. Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties
 - 2. Construction joints:
 - a. Submit a drawing indicating the location of all construction joints to the engineer for approval prior to delivery of masonry
- C. Product Data:

1. Provide data for masonry units, mortar, reinforcement, wall ties, anchors, grout, and all specified masonry products and accessories.
 2. Manufacturer's Installation Instructions: Provide connection requirements and installation procedures.
- D. Samples:
1. Coordinate and submit the color samples for products specified under this section with the submission of color samples for all other products specified in other Divisions of these Specifications.
 2. Color Samples:
 - a. Submit two samples of each type and color of masonry scheduled to have an exposed architectural finish, indicating each pattern and surface finish, minimum of 8 by 8 inch in size illustrating range.
 - b. Furnish two sets of a full pallet of available colors, patterns and surface finish of motor for selection by Engineer and Owner.
 - c. Color selections by Owner may exceed manufacturer's standard range of colors.
- E. Design Data
1. Submit mix designs for grout for masonry reinforcement. Provide test results from an independent testing laboratory certifying conformance to grout strength requirements and IBC Standard 21-18.
- F. Certificates
1. Submit qualifications of masonry subcontractor, independent special inspector and testing laboratory
 2. Manufacturer's Certificate:
 - a. Provide certificates stating compliance with specifications for masonry unit grades, types, and classes indicating that the products meet or exceed the specified requirements.
 3. Supplier's Certificate
 - a. At time of, or prior to delivery of materials to jobsite a certification letter from supplier of the materials shall be provided to assure materials used in construction are representative of materials used to develop prism test records in accordance with IBC Standard 21, Section 2105.3.3, Item 1
- G. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- H. Maintenance Materials: Furnish the following for City of Fargo's use in maintenance of project.
1. 100 SF of brick units and sufficient anchors to install

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.

- B. Comply with all requirements of local building codes and all supplements as adopted by governing agency in which jurisdiction the masonry Work is performed.
- C. Special inspections and testing will be performed in accordance with Chapters 17 and 21, International Building Code except as indicated otherwise herein.
- D. Masonry subcontractor: Company specializing in masonry Work with a minimum of 5 years of recent relevant experience.
- E. Independent special inspector:
 - 1. Person certified by International Conference of Board Officials (ICBO) as a qualified masonry inspector.
 - 2. Qualified person shall demonstrate competence, to the satisfaction of the building official, Engineer and Structural Engineer, for the inspection of masonry Work.
- F. Testing laboratory: Comply with requirements of Section 01 45 00.

1.07 SAMPLE PANEL

- A. Prior to constructing walls, construct a sample panel for approval by Engineer and Owner. Construct sample panel full height of exposed face of wall, and 4'-0" wide with one 90 degree corner to illustrate mortar color, extremes of masonry color and texture ranges, and mortar jointing work.
- B. Sample panel shall be constructed of full size components and include all accessories for flashing, veneer anchors, stone veneer, stone cap, stone trim, etc. to demonstrate the complete construction of the wall.
- C. Leave sample panel in place until masonry Work is completed and accepted by Engineer to insure minimum deviation from the sample panel. Construct with wall surfaces facing south and east.
- D. Approved sample panel will become standard for appearance and workmanship.
- E. Remove sample panel and dispose of debris after all masonry construction is completed and accepted by Owner.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Provide manufacturer's storage instructions along with shipped materials.

1.09 FIELD CONDITIONS

- A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 UNIT MASONRY - GENERAL

2.02 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Units conforming to ASTM C90 or ASTM C129 for hollow units as required, Type 1 (Moisture Controlled), compressive strength of masonry assemblage ($f'm$)=1,500 psi, normal weight.
 - 2. Size: Standard units with nominal face dimensions of 16 by 8 inches and nominal depths as indicated on drawings for specific locations.
 - 3. Load-Bearing Units: ASTM C90, normal weight.
 - a. Solid block.
 - 4. Provide from a single supplier.
- B. Incorporate water repellent admixture, Rheomix 235, BASF Rheopel Plus, or accepted, tested and approved substitution, into CMU mix at a rate of 6 fl oz per 100 lbs cement.

2.03 BRICK UNITS

- A. Facing Brick: ASTM C216, Type FBA, Grade SW.
 - 1. Nominal Size: standard modular, 3 courses for each 8" of height, 8" long units, standard 4" nominal thickness.
 - 2. Compressive Strength: 2500 psi individual and 3,000 psi average of 5 bricks, measured in accordance with ASTM C67/C67M.

2.04 MORTAR AND GROUT MATERIALS

- A. Portland cement:
 - 1. Type I, Type III used for cold weather construction.
 - 2. Provide low alkali, Portland cement conforming to ASTM C150.
 - 3. Masonry cements or plastic cements are not permitted.
 - 4. Do not use fly ash.
- B. Maximum percentage of alkali: As specified in Table 1A of ASTM C150 for low alkali cement. Hydrated Lime: ASTM C207, Type S.
- C. Sand: ASTM C 144
- D. Grout Aggregates:
 - 1. ASTM C404.
 - 2. Size No. 1 for fine aggregate.
 - 3. Size No. 8 or 89 for coarse aggregate.
- E. Water: Clean and potable.

2.05 MORTAR

- A. General: Provide packaged lime/cement mortar/sand.
 - 1. Dry Mix Manufacturer
 - a. Spec Mix from Quikrete Company.
 - b. Threewitt-Cooper Cement Company.
 - c. Or approved equal.
- B. Mortar color:

1. Selection by Engineer from manufacturer's full pallet of available colors
 2. Pure mineral oxide pigments pre-packaged to maintain consistent coloration of mortar
 3. Add to mortar mix at the rate not to exceed 10 percent of the weight of Portland Cement
 4. Manufacturer of pigment:
 - a. Solomon Chem/Grind Service A Series
- C. Design criteria: Type S, 1,800 min psi at 28 days per ASTM C270
- D. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity.
1. Incorporate water repellent admixture into mortar used in veneer block, mix at a rate of 6 fl oz per 100 lbs cement.
 2. Manufacturer
 - a. BASF Rheopel Plus.
 - b. Or tested and approved substitution.

2.06 GROUT

- A. Grout:
1. Conform to ASTM C476.
 2. Provide grout with a minimum 28-day compressive strength (f'g) of 2,000 psi.
 3. Fine grout proportions: One Portland cement; not more than 1/10 hydrated lime; 2-1/4 to 3 parts (by volume) damp loose sand.
 4. Coarse grout proportions: One Portland cement; not more than 1/10 hydrated lime; 2 to 3 parts (by volume) damp loose sand, and not more than 2 parts (by volume) pea gravel.
 5. Proportion water to produce a consistency which will allow pouring without segregation of components.
 6. Provide grout slump of 8 inch plus or minus one inch.
 7. Provide cohesive and homogeneous grout.
- B. Transit-mixed grout:
1. May be used.
 2. Continually rotate at idle speed from the time the water is added until the grout is discharged.

2.07 REINFORCEMENT AND ANCHORAGE

- A. Reinforcement bars:
1. Billet steel deformed bars, uncoated finish, ASTM A615, Grade 60, for #3 bar, ties and stirrups, Grade 60 for all other.
 2. Vertical bars: Continuous from top of foundation walls into bond beam at top of wall.
 3. Horizontal bars: Continuous throughout bond beam.
- B. Horizontal joint reinforcing:
1. Standard ladur type only, fabricated from 9 gage cold-drawn steel wire conforming to ASTM A82, with deformed side rods and longitudinal rods

- weld connected to perpendicular cross rods spaced 16 inches on center.
- 2. Hot-dipped galvanized after fabrication per ACI 530.1, coating requirements.
- 3. Use prefabricated corners and tee sections at all building corners and intersections.
- 4. Provide with one longitudinal side rod for each bed joint.
- 5. Provide overall width approximately 1.5 inches to 2 inches less than thickness of wall.
- 6. Manufacturer
 - a. Dur-O-Wal, Inc.
 - b. Or approved equal.
- C. Reinforcing bar positioners:
 - 1. D/A 811 for vertical reinforcing applications
 - 2. Positioners constructed of 9 gage wire with mill galvanized finish, sizes to fit masonry unit
 - 3. Manufacturer
 - a. Dur-O-Wal, Inc.
 - b. Or approved equal
- D. Ties and Anchors:
 - 1. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with subparagraphs below, unless otherwise indicated.
 - a. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153/A 153M, Class B-2 coating for exterior walls.
 - b. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel hot-dip galvanized after fabrication to comply with ASTM A 153/A 153M.
- E. Adjustable Masonry-Veneer Anchors for Connecting to Structure:
 - 1. Provide 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall, for attachment over sheathing to concrete, wood or metal studs.
 - 2. Structural Performance Characteristics: Capable of withstanding a 100-lbf (445-N) load in both tension and compression without deforming or developing play in excess of 0.05 inch (1.3 mm).
 - 3. Vertical adjustment: Not less than 3 inches.
 - 4. Screw-Attached, Masonry-Veneer Anchors: Units with triangular wire tie and rib-stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for connection of wire tie.
 - 5. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- (6.4-mm) diameter, hot-dip galvanized steel wire.
 - 6. Tie Section: Triangular-shaped wire tie, sized to extend within 2 inches (50 mm) of masonry face, made from 4.8-mm- 0.25-inch- (6.4-mm-) diameter, hot-dip galvanized steel wire.
 - 7. Tie Section for Concrete: Corrugated metal ties with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch (25 mm) of masonry face.

8. Manufacturer
 - a. Dur-O-Wall, Inc.; D/A 210 with D/A 700-708.
 - b. Heckman Building Products, Inc.; 315-D with 316.
 - c. Hohmann & Barnard, Inc.; DW-10.

2.08 FLASHINGS

A. Embedded Flashing Materials

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.0 mm).
2. Manufacturer:
 - a. Dur-O-Wal Division; Dur-O-Barrier-44.
 - b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - c. Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - d. Hohmann & Barnard, Inc.; Textroflash.
 - e. Polyguard Products, Inc.; Polyguard 300.
 - f. Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
 - g. Williams Products, Inc.; Everlastic MF-40.

B. Metal Flashing Materials:

1. Stainless Steel Flashing: ASTM A666, Type 304, soft temper; 26 gauge, 0.0187 inch thick; finish 2B to 2D.

C. Combination Non-Asphaltic Flashing Materials - Stainless Steel:

1. Stainless Steel/Polymer Fabric Flashing - Self-Adhering: ASTM A240/A240M; 2 mil type 304 stainless steel sheet bonded on inward facing side to a sheet of polymer fabric that has a clear adhesive with a removable release liner.

D. Flashing Sealant/Adhesives: Silicone, polyurethane, or silyl-terminated polyether/polyurethane, or other type required or recommended by flashing manufacturer; type capable of adhering to type of flashing used.

E. Termination Bars: Stainless steel; compatible with membrane and adhesives.

F. Drip Edge: Stainless steel; compatible with membrane and adhesives.

G. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.09 ACCESSORIES

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

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

configuration as indicated.

- C. Weeps:
 - 1. Type: Molded PVC grilles, insect resistant.
 - 2. Color(s): matched to mortar.
- D. Cavity Mortar Control: Semi-rigid polyethylene or polyester mesh panels, sized to thickness of wall cavity, and designed to prevent mortar droppings from clogging weeps and cavity vents and allow proper cavity drainage.
 - 1. Mortar Diverter: Panels installed at flashing locations.
 - a. Manufacturers:
 - 1) Mortar Net Solutions; MortarNet:
www.mortarnet.com/#sle.
- E. Air/Moisture Barrier
 - 1. Rubberized-Asphalt Flashing.
 - 2. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions including protection from exposure to UV light and harmful weather exposure as required by manufacturer.

2.10 CLEANING MATERIALS

- A. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.
- B. ProSoCo "Sure-Klean 600", "101", or "Vana Trol" as suited to surfaces and conditions and other types as recommended and necessary to clean particular stains or surfaces for natural colored CMU.
- C. Use "Heavy Duty Concrete Cleaner" for natural colored CMU.

PART 3 EXECUTION

3.01 GENERAL

- A. Hot and cold weather requirements: TMS MSJC specification.
- B. Cold weather preparation:
 - 1. Remove ice or snow formed on top of foundation wall or base construction where upon masonry will set before beginning work.
 - 2. Carefully apply heat until top of surface is dry to the touch.
- C. Cold weather construction requirements-Implement cold weather construction procedures when any of the following conditions exist:
 - 1. Ambient temperature falls below 40 degrees F.
 - 2. Temperature of masonry units is below 40 degrees F.
 - 3. Do not lay masonry units having a temperature below 20 degrees F. Remove visible ice on masonry units before unit is laid.
 - 4. Heat mortar sand or mixing water to produce mortar temperatures between 55 degrees F and 120 degrees F at the time of mixing. Maintain mortar above 40 degrees F until used in masonry.

5. When ambient temperature is between 25 degrees F and 20 degrees F, use heat sources on both sides of the masonry under construction and install wind breaks when wind velocity is in excess of 15 mph.
 6. When ambient temperature is below 20 degrees F, provide an enclosure for masonry under construction and use heat sources to maintain temperatures above 32 degrees F within enclosure.
 7. When mean daily temperature is between 40 degrees F and 25 degrees F, protect completed masonry from rain or snow by covering with weather resistive membrane for 24 hours after construction.
 8. When mean daily temperature is between 25 degrees F and 20 degrees F, completely cover completed masonry with insulating blankets or equal protection for 24 hours after construction.
 9. When mean daily temperature is below 20 degrees F, maintain masonry temperature above 32 degrees F for 24 hours after construction by enclosure with supplementary heat.
 10. Remove and replace masonry work which has been frozen or damaged by freezing conditions.
 11. Failure to follow cold weather procedures shall be prima facie evidence that masonry has frozen. Remove and replace such masonry.
- D. Cold weather grouting requirements:
1. Temperature of masonry to be grouted must be greater than 35 degrees F when grout is placed.
 2. Place grout in masonry at a minimum temperature of 70 degrees F and a maximum temperature of 120 degrees F.
 3. Maintain grouted masonry above 35 degrees F for 24 hours following placement of grout.
- E. Hot weather construction requirements:
1. Implement hot weather construction procedures when the ambient air temperature exceeds 100 degrees F, or 90 degrees F with a wind velocity greater than 8 mph.
 2. Do not spread mortar beds more than 4 feet ahead of masonry.
 3. Set masonry units within one minute of spreading mortar.
- F. Protect facing material and all adjoining work against staining:
1. Keep tops of walls covered with non-staining waterproof covering when work is not in progress.
 2. Extend cover 24 inches down face of wall, hold cover securely in place.
 3. Clean top surface of work of all loose mortar when work is resumed.
- G. Do not apply loads for at least three days after building masonry columns or walls.
- H. Prevent grout or mortar from staining face of exposed masonry: Protect all sills, ledges, projections and adjacent materials from damage.
- I. Protect and brace masonry walls during construction to prevent damage or loss due to wind.
- J. Yard age concrete masonry units a minimum of 30 days prior to delivery to jobsite.

3.02 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive masonry.
- B. Verify that related items provided under other sections are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.03 PREPARATION

- A. Direct and coordinate placement of metal anchors supplied to other sections.
- B. Furnish temporary bracing during installation of masonry work.
- C. Maintain in place until building structure provides permanent support.

3.04 INSTALLATION

- A. Establish lines, levels, and coursing indicated:
 - 1. Protect from displacement.
 - 2. Maintain masonry courses to uniform dimension.
 - 3. Form bed and head joints of uniform thickness.
- B. Built-in members:
 - 1. Ascertain from various trades and coordinate where all chases or opening for vents, pipes, wires, ducts, etc., are to go and construct all such chases as shown or required.
 - 2. Build in all anchors, bolts, flashing, wall plugs, nailing strips, beams, etc., as may be required.
 - 3. Place materials according to directions of those who furnish them.
 - 4. Coordinate with electrical trades so outlets are centered on or aligned with masonry joints in exposed work.
 - 5. Fully grout steel door frames set into masonry as wall is being built.
- C. Wetting masonry:
 - 1. Do not wet concrete masonry units.
- D. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Coursing: One unit and one mortar joint to equal 8 inches.
 - 3. Mortar Joints: Flush.
- E. Brick Units:
 - 1. Bond: Header Bond.
 - 2. Coursing: Three units and three mortar joints to equal 8 inches.
 - 3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

- A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.

- B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
- C. Remove excess mortar as work progresses.
- D. Interlock intersections and external corners.
- E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

3.06 JOINING OF WORK

- A. Where fresh masonry joins masonry that is partially set, clean and lightly wet the exposed surface of the set masonry so as to obtain the best possible bond with the new work.
- B. Remove all loose masonry and mortar as work progresses.
- C. When it becomes necessary to "stop off" a horizontal run of masonry, rake back in each course and, if grout is used, stop the grout 4 inch back of the rake.
- D. Toothing is not permitted for joining new work.
- E. Foundation surface which is to receive masonry: Clean and damp.
- F. Remove all laitance.
- G. In grouted construction when grouting is stopped for 1 hour or longer, stop the grout pour 1-1/2 inches below the top of the last course.
- H. Where joining new work to existing or repairing or finishing walls where selective demolition has exposed unfinished masonry or left a void in the masonry, remove existing surrounding masonry and tooth in new masonry to extent required so that all adjacent parallel and perpendicular masonry surfaces have continuous and unbroken, finished masonry appearance.

3.07 JOINTS:

- A. All joints in masonry: Unless noted otherwise, slightly concave, almost flush, tooled with an approved jointer.
- B. Steel jointers may be used except that stainless steel jointers must be used where white or a light colored mortar is used.
- C. Use minimum 16 inch long sled runner at horizontal joints.
- D. Fill joints in masonry Work and joints between masonry Work and other material required in connection therewith, with mortar as each course is laid.
- E. Solidly fill all bed joints and webs with mortar.
- F. Head joints laid with double heads of mortar.
- G. Thickness of mortar joints: Uniform and true to dimensions, consistent with masonry unit dimensional tolerances.

- H. Joints that will remain concealed may be struck flush.

3.08 LAYING:

- A. Lay all masonry units plumb and true to lines with completely filled webs, and head and bed joints.
- B. Furrowing of bed joints is not permitted.
- C. Rock closures into place with the head joint mortar thrown against two adjacent units in place.
- D. Shove all masonry at least 1/2 inch into place.
- E. Prevent grout or mortar from staining the face of masonry to be left exposed.
- F. If grout or mortar does contact the face of such masonry, remove immediately.
- G. Protect adjacent construction from damage during construction.
- H. Keep cavity or air space and face of masonry free of mortar droppings.

3.09 WEEPS/CAVITY VENTS

- A. Install weeps in veneer walls at 32 inches on center horizontally on top of through-wall flashing.

3.10 CAVITY MORTAR CONTROL

- A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.
- B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.
- C. Install cavity mortar control panels continuously throughout full height of exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions.
 - 1. Verify that airspace width is no more than 3/8 inch greater than panel thickness.
 - 2. Hold cavity mortar control panel tight to face wythe.
- D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.11 REINFORCEMENT AND ANCHORAGE

- A. Refer to Structural Drawings for principal horizontal and vertical reinforcing.
- B. All reinforcement continuous.
- C. Use continuous horizontal joint reinforcement in multi-wythe construction for bond tie between wythes unless noted otherwise on the Drawings.
- D. Vertical reinforcement bars:

1. Accurately position and secure against displacement from location shown on Drawings.
 2. In splicing vertical reinforcement to dowels, the bars shall be placed in contact and wired.
 3. Place horizontal reinforcement as Work progresses.
 4. Use bar positioners for vertical reinforcing bars.
 5. Locate vertical bar positioners at top of first masonry course, first course below top of wall with maximum of 4'-0" on center between positioners except where noted otherwise on the Drawings.
- E. Horizontal joint reinforcement:
1. Install in first, second and third bed joints immediately above lintels and below sills at openings.
 2. Install in bed joints at 8 inches vertically on center in parapet walls above the roof structure.
 3. Install in bed joints at 16 inches on center throughout vertical wall elsewhere.
 4. Extend joint reinforcement a minimum of 24 inches past edge of opening except where control joints occur adjacent to openings.
 5. All other reinforcement shall be continuous except that it shall not pass through vertical masonry expansion joints, except where so noted on Drawings.
 6. Lap side rods minimum 8 inches at splices.
 7. Place reinforcement to assure 5/8 inch mortar cover measured from outside face of mortar joint at faces exposed to exterior and not less than 1/2 inch elsewhere.
 8. Use prefabricated corners at wall intersections and pilasters.
- F. Install veneer anchors per manufacturer's instructions.

3.12 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
- B. Terminate flashing up 8 inches minimum on vertical surface of backing:
1. Apply cap bead of sealant on top edge of self-adhered flashing.
- C. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- D. Extend metal flashings through exterior face of masonry and terminate in an angled drip with hemmed edge. Install joint sealer below drip edge to prevent moisture migration under flashing.
- E. Lap end joints of flashings at least 6 inches, minimum, and seal watertight with flashing sealant/adhesive.

3.13 GROUTING:

- A. General:
1. Grout spaces less than 2 inches in width using fine grout.
 2. Grout spaces greater than inches in width using coarse grout.

3. Grout lifts not exceed 6 times width of grout space, with maximum height of 48 inches.
 4. Use low-lift grouting techniques.
 5. Provide cleanout holes at base of all grout lifts.
- B. Placement:
1. Place as indicated on Drawings.
 2. Where not otherwise indicated, provide 1-#5 vertical each side of each opening with a 2 foot minimum extension past sill and head, and 1-#5 vertical full height at all unsupported edges and each side of each control and/or expansion joint.
- C. Construct with vertical alignment of cells and other spaces to be grouted to provide continuous unobstructed openings.
- D. Solidly fill all bed joints and webs with mortar:
1. Struck flush to faces of masonry unit adjacent to grout spaces.
 2. Keep mortar droppings out of grout space.
- E. Use mechanical vibrator when grouting to insure proper consolidation of grout in cells:
1. Reconsolidate grout after water absorption into masonry units.
- F. When grouting is stopped for one hour or longer, stop pouring of grout 1 1/2 inches below top of uppermost unit.
- G. Use grout screen below all thru wall bond beams to control flow of grout into insulated cells below.

3.14 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Clean and seal joints
- D. Locate control joints as indicated on Drawings or as directed by Engineer
- E. Size control joints as indicated on drawings; if not indicated, 3/4 inch wide and deep.

3.15 MINIMUM CURING PERIOD

- A. 72 hours after building masonry columns or walls before uniform floor or roof loading is applied.
- B. 5 days before applying a concentrated loads, such as a truss or girder.

3.16 TOLERANCES

- A. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated

to be flush with units.

- B. Maximum variation from plumb in lines and surfaces of columns, walls, and arises: 1/8 inch in 10 ft and 1/4 inch in a story height of 20 feet maximum.
- C. Maximum variation from plumb for external corners, expansion joints and other conspicuous lines: Not more than 1/8 inch in 10 feet or 1/4 inch in any story or 20 feet maximum.
- D. Maximum variation from level of grades indicated on Drawings for exposed lintels, sills, parapets, leveling coursing, horizontal grooves, and other conspicuous lines: 1/8 inch in 10 ft and 1/4 inch in 20 ft; 3/8 inch maximum.
- E. Maximum variation in cross-sectional dimensions of columns and thickness of walls: Minus 1/4 inch, nor plus 1/2 inch from the dimensions indicated on Drawings
- F. Maximum variation for steel reinforcement:
 - 1. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
 - 2. Plus or minus 1 inch when distance is between 8 and 24 inches.
 - 3. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
 - 4. Plus or minus 2 inches from location along face of wall.
- G. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.

3.17 CUTTING AND FITTING

- A. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.18 MASONRY CLEANING

- A. Preparation: Point all holes in exposed masonry, cut out and repoint defective joints to match adjacent Work.
- B. Protection:
 - 1. Provide coverings and masking to protect plant materials and other non-masonry surfaces from damage due to cleaning operations.
 - 2. Remove excess mortar and mortar smears as Work progresses.
- C. Environmental conditions:
 - 1. Proceed with cleaning operations without special requirements when ambient and substrate temperatures are above 40 degrees F.
 - 2. If either the ambient or substrate temperatures are below 40 degrees F, water must be heated to a minimum of 120 degrees F and a maximum of 200 degrees F to achieve acceptable cleaning environmental conditions.
- D. Test:
 - 1. Test cleaning methods on sample wall panel; leave 1/2 panel uncleaned for comparison purposes.

2. Test separate samples of adjacent materials with full strength cleaning materials.
 3. Obtain Engineer's approval of sample cleaning before proceeding with cleaning of masonry.
- E. Clean all exposed unglazed masonry on which no green efflorescence appears.
- F. Clean exposed masonry surfaces after mortar and grout is fully cured and as recommended by BIA "Technical Notes 20 Revised". Use cleaning materials specified and in accordance with manufacturer's instructions.
- G. Cleaning procedures:
1. Thoroughly wet with clear water prior to application of cleaners.
 2. Apply cleaners immediately and scrub with fiber brushes to remove excess mortar and stains; remove cleaners promptly by rinsing thoroughly with clear water.
 3. Use bucket and brush hand cleaning method.
 4. Do not use muriatic acid.
 5. Pre-wetting and rinsing require application of not less than full available water pressure with pressure application at 400 psi preferred.
 6. Do not use high pressure spray for application of cleaning solutions. Apply with bucket and brush or spray at pressure less than 50 psi.
 7. Take special care to avoid discoloration of colored mortars.
- H. Clean and protect glazed surfaces per manufacturer instructions:
1. Marred or damaged glazed faces is cause for rejection.
- 3.19 FINAL CLEAN UP
- A. Remove all debris and excess material resulting from masonry Work and legally dispose of it.
- B. As masonry Work progresses, keep clean with burlap or brush and at completion thoroughly clean all masonry Work.
- C. Protect all adjacent surfaces susceptible to damage due to masonry installation:
1. Thoroughly clean these surfaces upon completion of masonry Work to render to new condition.
- 3.20 PROTECTION
- A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.
- 3.21 FIELD QUALITY CONTROL
- A. Special inspections and testing will be performed in accordance with Chapters 17 and 21, International Building Code except as indicated otherwise herein.
- B. Provide field testing under provisions of Section 01400, article 1.8.A:
1. Contractor shall coordinate and schedule all tests to determine compliance of masonry materials in accordance with the specifications.
- C. Provide prism tests in accordance with IBC Standard 21-17 for hollow masonry:

1. Provide set of 5 prisms made and tested prior to start of construction for each of the above mentioned materials.
 2. During construction provide one set of 3 prisms for each 5,000 square feet of hollow masonry.
 3. Tested strength of these prisms must equal or exceed 1.33 f'm.
- D. Independent special inspector:
1. Special inspector at the site shall be specially trained and certified by ICBO to perform special inspection and have at least 5 years continuous experience inspecting masonry.
 2. Inspect masonry Work during preparation of masonry wall prisms, sampling, and placing of all hollow masonry units, placement of reinforcement, and immediately prior to and during all grouting of all masonry on the project.
 3. Ascertain that all grout spaces are clear and ready to receive grout and that all reinforcing is properly placed and held against displacement during grouting operations.
 4. Observe that all grout is properly consolidated and then reconsolidated after 15 minutes using mechanical vibrators.
 5. Inspector and testing laboratory shall submit reports of their observations and test results to Engineer.
 6. Upon completion of the masonry Work, submit final signed report to Engineer, for distribution to Building Department and Structural Engineer, stating whether, to the best of his/her knowledge, the masonry Work was accomplished in conformance with the Contract Documents.
- E. Continuous special inspection shall be provided for the first 40 hours of masonry work and during any grouting operations:
1. Owner reserves the right to require continuous special inspection at any time during performance of masonry Work at no additional cost to Owner if, in the opinion of Engineer or Engineer's subconsultants, performance of masonry Work is not in conformance with Contract Documents.
- F. Periodic special inspection as approved by Engineer:
1. Inspections may be made on a periodic basis and satisfy requirements of continuous inspection, provided that an independent special inspector can submit final signed report as required above.
 2. Note that continuous inspection shall be required for all grouting operations and during the first 40 hours at the beginning of masonry Work.

END OF SECTION

SECTION 04 72 00
CAST STONE MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Architectural cast stone.
- B. Units required are indicated on drawings as "cast stone".
- C. Units required are:
 - 1. Exterior wall units, including wall caps and coping.

1.02 RELATED REQUIREMENTS

- A. Section 04 20 00 - Unit Masonry: Installation of cast stone in conjunction with masonry.
- B. Section 04 20 01 - MASONRY VENEER: Mortar, grout, and installation of cast stone in conjunction with masonry.
- C. Section 07 92 00 - Joint Sealants: Sealing joints indicated to be left open for sealant.

1.03 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary; 2014 (Errata 2018).
- B. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- C. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2016.
- D. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2018a.
- E. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2018.
- F. ASTM C150/C150M - Standard Specification for Portland Cement; 2020.
- G. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2019.
- H. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2019.
- I. ASTM C642 - Standard Test Method for Density, Absorption, and Voids in Hardened Concrete; 2013.
- J. ASTM C979/C979M - Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- K. ASTM C1364 - Standard Specification for Architectural Cast Stone; 2019.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting:

1. Meeting to concur with preinstallation meeting required under Specification 04 20 01.
2. Convene two weeks before starting work of this section.
3. The meeting shall be attended by the OWNER, ENGINEER, CONTRACTOR, Masonry Subcontractor, and Testing Laboratory Representative.
4. The following shall be discussed at the meeting: Safety, Batching Grout, Adjustments to Mix, Site Dosing, Placement Rates and Anticipated Schedule of Placing and Finishing, Site Layout – Material Storage Area, Scaffolding, Parking area, Equipment – Long Reach Lifts and Appurtenances, Grout Testing Procedures, and Curing.

1.05 SUBMITTALS

A. Div 01 sections for submittal requirements and product substitution requirements.

B. Shop Drawings:

1. General arrangement:
 - a. Include elevations, dimensions, layouts, profiles, cross sections, reinforcement, exposed faces, anchoring methods, anchors, and piece numbers.
2. Construction joints:
 - a. Submit a drawing indicating the location of all construction joints to the engineer for approval prior to delivery of masonry

C. Product Data:

1. Provide data for masonry units, mortar, reinforcement, wall ties, anchors, grout, and all specified masonry products and accessories.
2. Manufacturer's Installation Instructions: Provide connection requirements and installation procedures.

D. Samples:

1. Coordinate and submit the color samples for products specified under this section with the submission of color samples for all other products specified in other Divisions of these Specifications.
2. Color Samples:
 - a. Submit two sets of a full pallet of available colors, patterns and surface finish for masonry scheduled to have an exposed architectural finish, for selection by Engineer and Owner.
 - b. Submit two full size samples of each type and color of Owner selected masonry products, each basic shape, accent, trim and specialty shapes for Engineer and Owner final selection.
 - c. Furnish two sets of a full pallet of available colors, patterns and surface finish of mortar for selection by Engineer and Owner.
 - d. Color selections by Owner may exceed manufacturer's standard range of colors.

E. Design Data

1. Submit mix designs for grout for masonry reinforcement. Provide test results from an independent testing laboratory certifying conformance to

grout strength requirements and IBC Standard 21-18.

F. Certificates

1. Submit qualifications of masonry subcontractor, independent special inspector and testing laboratory
2. Manufacturer's Certificate:
 - a. Provide certificates stating compliance with specifications for masonry unit grades, types, and classes indicating that the products meet or exceed the specified requirements.
3. Supplier's Certificate
 - a. At time of, or prior to delivery of materials to jobsite a certification letter from supplier of the materials shall be provided to assure materials used in construction are representative of materials used to develop prism test records in accordance with IBC Standard 21, Section 2105.3.3, Item 1

- G. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.

1.06 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Comply with all requirements of local building codes and all supplements as adopted by governing agency in which jurisdiction the masonry Work is performed.
- C. Special inspections and testing will be performed in accordance with Chapters 17 and 21, International Building Code except as indicated otherwise herein.
- D. Masonry subcontractor: Company specializing in masonry Work with a minimum of 5 years of recent relevant experience.
- E. Independent special inspector:
 1. Person certified by International Conference of Board Officials (ICBO) as a qualified masonry inspector.
 2. Qualified person shall demonstrate competence, to the satisfaction of the building official, Engineer and Structural Engineer, for the inspection of masonry Work.
- F. Testing laboratory: Comply with requirements of Section 01400.

1.07 SAMPLE PANEL

- A. Work to be provided under this section is to be incorporated into the work required for the sample panel required in Specification 04 20 01.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Deliver cast stone components secured to shipping pallets and protected from damage and discoloration. Protect corners from damage.
- B. Number each piece individually to match shop drawings and schedule.

- C. Store cast stone components and installation materials in accordance with manufacturer's instructions.
- D. Store cast stone components on pallets with nonstaining, waterproof covers. Ventilate under covers to prevent condensation. Prevent contact with dirt.
- E. Protect cast stone components during handling and installation to prevent chipping, cracking, or other damage.
- F. Store mortar materials where contamination can be avoided.
- G. Schedule and coordinate production and delivery of cast stone components with unit masonry work to optimize on-site inventory and to avoid delaying the work.
- H. Provide manufacturer's storage instructions along with shipped materials.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Architectural Cast Stone:
 - 1. Any current producer member of the Architectural Precast Association.
 - 2. Any current producer member of the Cast Stone Institute.

2.02 ARCHITECTURAL CAST STONE

- A. Cast Stone: Architectural concrete product manufactured to simulate appearance of natural sandstone, complying with ASTM C1364.
 - 1. Compressive Strength: As specified in ASTM C1364; calculate strength of pieces to be field cut at 80 percent of uncut piece.
 - 2. Freeze-Thaw Resistance: Demonstrated by laboratory testing in accordance with ASTM C1364.
 - 3. Surface Texture: Medium grained texture, with no bugholes, air voids, or other surface blemishes visible from distance of 20 feet.
 - 4. Color: Selected by Engineer from manufacturer's full range.
 - 5. Remove cement film from exposed surfaces before packaging for shipment.
- B. Shapes: Provide shapes indicated on drawings.
 - 1. Variation from Any Dimension, Including Bow, Camber, and Twist: Maximum of plus/minus 1/8 inch or length divided by 360, whichever is greater, but not more than 1/4 inch.
 - 2. Unless otherwise indicated on drawings, provide:
 - a. Wash or slope of 1:12 on exterior horizontal surfaces.
 - b. Drips on projecting components, wherever possible.
 - c. Raised fillets at back of sills and at ends to be built in.
- C. Reinforcement: Provide reinforcement as required to withstand handling and structural stresses; comply with ACI 318.
 - 1. Pieces More than 24 inches in Any Dimension: Provide full length two-way reinforcement of cross-sectional area not less than 0.25 percent of unit cross-sectional area.

2.03 MATERIALS

- A. Cement: ASTM C595/C595M Type 1L.
- B. Coarse Aggregate: ASTM C33/C33M, except for gradation; granite, quartz, or limestone.
- C. Fine Aggregate: ASTM C33/C33M, except for gradation; natural or manufactured sands.
- D. Pigments: ASTM C979, inorganic iron oxides; do not use carbon black.
- E. Admixtures: ASTM C494/C494M.
- F. Water: Potable.
- G. Reinforcing Bars: ASTM A615/A615M deformed bars, galvanized.
 - 1. Galvanized in accordance with ASTM A767/A767M, Class I.
- H. Steel Welded Wire Reinforcement: ASTM A1064/A1064M, galvanized or ASTM A884/A884M, epoxy coated.
- I. Embedded Anchors, Dowels, and Inserts: ASTM A123/A123M hot-dip galvanized steel, of type and size as required for conditions.
- J. Mortar: Portland cement-lime, ASTM C270, Type N; do not use masonry cement.
- K. Cleaner: General-purpose cleaner designed for removing mortar and grout stains, efflorescence, and other construction stains from new masonry surfaces without discoloring or damaging masonry surfaces; approved for intended use by cast stone manufacturer and by cleaner manufacturer for use on cast stone and adjacent masonry materials.

2.04 SOURCE QUALITY CONTROL

- A. Test compressive strength and absorption of specimens selected at random from plant production.
 - 1. Test in accordance with ASTM C642.
 - 2. Select specimens at rate of 3 per 500 cubic feet, with a minimum of 3 per production week.

PART 3 EXECUTION

3.01 GENERAL

- A. Hot and cold weather requirements: Per Specification 04 20 01.

3.02 EXAMINATION

- A. Examine construction to receive cast stone components. Notify Engineer if construction is not acceptable.
- B. Do not begin installation until unacceptable conditions have been corrected. Commencement of installation indicates acceptance of all conditions.

3.03 INSTALLATION

- A. Install cast stone components in conjunction with masonry, complying with requirements of Section 04 20 01.
- B. Mechanically anchor each cast stone unit.
- C. Setting:
 - 1. Drench cast stone components with clear, running water immediately before installation.
 - 2. Set units in a full bed of mortar unless otherwise indicated.
 - 3. Fill vertical joints with mortar.
 - 4. Fill dowel holes and anchor slots completely with mortar or non-shrink grout.
 - 5. Installation holes and inserts are not acceptable. All installation shall be done with soft slings and hoisting loops.

3.04 TOLERANCES

- A. Joints: Make all joints 3/8 inch, except as otherwise detailed.
 - 1. Rake mortar joints 3/4 inch for pointing.
 - 2. Remove excess mortar from face of stone before pointing joints.
 - 3. Point joints with mortar in layers 3/8 inch thick and tool to a slight concave profile.
 - 4. Leave the following joints open for sealant:
 - a. Head joints in top courses, including copings, parapets, cornices, sills, and steps.
 - b. Joints labeled "expansion joint".
- B. Installation Tolerances:
 - 1. Variation from Plumb: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet or more.
 - 2. Variation from Level: Not more than 1/8 inch in 10 feet or 1/4 inch in 20 feet, or 3/8 inch maximum.
 - 3. Variation in Joint Width: Not more than 1/8 inch in 36 inches or 1/4 of nominal joint width, whichever is less.
 - 4. Variation in Plane Between Adjacent Surfaces (Lipping): Not more than 1/16 inch difference between planes of adjacent units or adjacent surfaces indicated to be flush with units.

3.05 REPAIR

- A. Repair chips and other surface damage noticeable when viewed in direct daylight at 20 feet.
- B. Repair with matching touch-up material provided by the manufacturer and in accordance with manufacturer's instructions.
- C. Repair methods and results subject to Engineer 's approval.

3.06 CLEANING

- A. Clean completed exposed cast stone after mortar is thoroughly set and cured.

1. Wet surfaces with water before applying cleaner.
2. Apply cleaner to cast stone in accordance with manufacturer's instructions.
3. Remove cleaner promptly by rinsing thoroughly with clear water.
4. Do not use acidic cleaners.

3.07 PROTECTION

- A. Protect completed work from damage.
- B. Clean, repair, or restore damaged or mortar-splashed work to condition of new work.

END OF SECTION

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DIVISION 05

METALS

SECTION 05 50 00
METAL FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Shop fabricated steel and aluminum items.
- B. Miscellaneous metals.
- C. Prefabricated ladders and ship ladders.
- D. (1) Portable davit crane and (4) mounting sockets, and related fall restraint devices.

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements and product substitution requirements.
- B. Section 03 30 00 - Cast-in-Place Concrete.

1.03 REFERENCE STANDARDS

- A. AA DAF-45 - Designation System for Aluminum Finishes; 2003.
- B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2014 (2015 Errata).
- C. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels; 2021.
- D. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2020.
- E. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2020.
- F. AISC - Steel Construction Manual; 16th Edition.
- G. AISC - Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings; 2022
- H. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 2008.
- I. ANSI A202.1 - Metal Bar Grating Manual for Steel and Aluminum Gratings and Stair Treads; 2000.
- J. ANSI B18.22.1 - Plain Washers; 2016.
- K. ANSI B18.2.1 - Square and Hex Bolts and Screws, Inch Series; 2021.

- L. ANSI Z359.16 – Safety Requirements for Climbing Ladder Fall Arrest Systems; 2016.
- M. ASME B18.16.3 - Dimensional Requirements for Prevailing-Torque-Type Steel Metric Hex, Nuts and Hex Flange Nuts; 1998.
- N. ASME B18.21.1 - Lock Washers (Inch Series); 2016.
- O. ASTM A36/A36M - Standard Specification for Carbon Structural Steel; 2014.
- P. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2012.
- Q. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- R. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- S. ASTM A167/A167M - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip; 1999.
- T. ASTM A240/A240M - Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2016.
- U. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014 (Editorial 2017).
- V. ASTM A325 - Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength; 2014.
- W. ASTM A490 - Heat-Treated Steel Structural Bolts, 150 Ksi Minimum Tensile Strength; 2012.
- X. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2013.
- Y. ASTM A780/A780M - Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings; 2020.
- Z. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.
- AA. ASTM B210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2012.
- BB. ASTM B210M - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes (Metric); 2012.
- CC. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.
- DD. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2012.

- EE. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- FF. AWS D1.2/D1.2M - Structural Welding Code - Aluminum; 2014, with Errata.
- GG. AWS D1.6 - Structural Welding Code - Stainless Steel; 2017.
- HH. OSHA 1910.140 – Personal Fall Protection Systems; current edition.
- II. OSHA 1926.502 – Fall Protection Systems Criteria and Practices; current edition.
- JJ. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); 2002 (Ed. 2004).
- KK. SSPC-SP 2 - Hand Tool Cleaning; 1982, with Editorial Revision (2004).

1.04 PERFORMANCE AND DESIGN REQUIREMENTS

- A. Structural performance of handrails and railings:
 - 1. Comply with ASTM E 985, based on testing per ASTM E 894 and ASTM E 935.
 - 2. Capable of withstanding structural loads required by ASCE 7 without exceeding allowable design working stress of materials involved.
 - 3. Capable of withstanding following structural loads without exceeding allowable design working stress of materials involved.
 - 4. Top rails of guards: Concentrated load of 200 lbf (890 N) applied at any point and in any direction, and uniform loads of 50 lbf/ft. (730 N/m) applied horizontally and concurrently with uniform load of 100 lbf/ft. (1460 N/m) applied vertically downward. Concentrated and uniform loads need not be assumed to act concurrently.
 - 5. Handrails not serving as top rails: Concentrated load of 200 lbf (890 N) applied at any point and in any direction. Concentrated and uniform loads need not be assumed to act concurrently.
 - 6. Infill area of guards: Horizontal concentrated load of 200 lbf (890 N) applied to 1 sq. ft. (0.09 sq. m) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Load on infill area need not be assumed to act concurrently with loads on top rails.
- B. Regulatory requirements
 - 1. Comply with all applicable provisions of OSHA for handrails and ladders.
 - 2. Comply with ANSI Z359 for all fall protection and fall restraint standards.

1.05 SUBMITTALS

- A. See Section 60 for submittal procedures.
- B. Shop Drawings: Submit complete fabrication, assembly and installation drawing for all products and accessories to illustrate construction and assembly of components and their connection to the work.
 - 1. General Arrangement Drawings
 - a. Include plans, elevations, sections, details of installation, and attachments to other Work.
 - b. Include erection drawings for structural steel.
 - 2. Fabrication Drawings

- a. System fabrication, dimensions, size, locations of connections, connection details and assembled weights.
 - b. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
 - c. Fabricator's detailed requirements for system foundations
 - 3. Furnish setting Drawings, templates, and directions for installation of anchorages, including concrete inserts.
- C. Product Data: Submit sufficient data to verify compliance with specifications to include materials, parts, and accessories:
 - 1. Fabricated Metals and Connections:
 - a. Manufacturer/Fabricator name
 - b. Type and model
 - c. Size
 - d. Net weight of components and total assembly
 - e. Data on shop painting
 - 2. Access Ladders:
 - a. Manufacturer/Fabricator name
 - b. Type and model
 - c. Size
 - d. Net weight of components and total assembly
 - e. Data on shop painting
 - 3. Accessories
 - a. Manufacturer/Fabricator name
 - b. Type and model
 - c. Proof of compliance with regulatory requirements
 - 4. Manufacturer's Installation Instructions: Provide connection requirements and installation procedures.
- D. Design Data
 - 1. Include structural analysis data for platforms, metal stairs, handrails, bridge crane and rails and all other structural steel assemblies signed and sealed by a registered North Dakota professional engineer.
- E. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- F. Welders' Certificates: For aluminum welding only - Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.01 MATERIALS - STEEL

- A. Sheets: ASTM A1008 or A1011, zinc coated
- B. Steel Sections: ASTM A36/A36M or A992.
- C. Steel Tubing: ASTM A500/A500M, Grade B cold-formed structural tubing.
- D. Plates and Shapes: ASTM A36.

- E. Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
- F. Fasteners: See general structural notes for post-installed fasteners to concrete structures.
- G. Bolts, Nuts, and Washers: ASTM A307, Grade A, galvanized to ASTM A153/A153M where connecting galvanized components.
- H. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.
- I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.02 MATERIALS – STAINLESS STEEL

- A. Plates: ASTM A167
- B. Bolts: ANSI B18.2.1, Grade 303 or 305

2.03 MATERIALS - ALUMINUM

- A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.
 - 1. 6061 alloy, T1 temper is also acceptable
- B. Aluminum-Alloy Drawn Seamless Tubes: ASTM B210 (ASTM B210M), 6063 alloy, T6 temper.
 - 1. 6061 alloy, T1 temper is also acceptable
- C. Aluminum-Alloy Bars: ASTM B211 (ASTM B211M), 6061 alloy, T6 temper.
- D. Sheet and plate: ASTM B209, alloy 6061-T6
- E. Rolled sections: ASTM B308, alloy 6061-T6
- F. Pipe: ASTM B429, alloy 6061-T6 or 6063-T6
- G. Rivets: ASTM B316, alloy 6061-T6
- H. Bolts, Nuts, and Washers: Stainless steel.

2.04 FABRICATION

- A. General:
 - 1. In accordance with dimensions, arrangement, sizes, and weights or thicknesses indicated on the shop drawings or as specified.
 - 2. All members free of winds, warps, local deformations, or unauthorized bends.
 - 3. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
 - 4. Holes and other provisions for field connection accurate and shop checked for proper fit.
 - 5. Fit and shop assemble items in largest practical sections, for delivery to site.
 - 6. Fabricate items with joints tightly fitted and secured.

7. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
8. Mark each piece according to the erection drawing.
9. Provide all field connection materials.
10. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
11. As applicable and shown on plans: As detailed; galvanized finish unless noted otherwise.

B. Connections:

1. As indicated on the Drawings, as specified or as required by manufacturers standards.
2. Continuous Welds: Butt and miter welds, grind smooth exposed welds where welding is permitted or required.
3. Intermittent welds: Provide 2 inch minimum effective length with 6 inch minimum spacing.
4. Structural: If not indicated on the drawings, as defined in Tables I and II "Framed Beam Connections" of the AISC manual, shop connections may be bolted, welded or riveted.
5. All others: If not indicated on the drawings, unfinished bolts with self locking nuts or lock washers.
6. Bolted: Slotted or over-sized holes for adjustment.

2.05 PREFABRICATED LADDERS:

- A. Prefabricated Ladder: Welded metal unit complying with ANSI A14.3; factory fabricated to greatest degree practical and in the largest components possible.
1. Designed for permanent exterior installation as well as within water conveyance structures and subject to flowing water.
 2. Components: Manufacturer's standard ladder up, rails, rungs, treads, handrails, returns, platforms and safety devices complying with the requirements of the MATERIALS article of this section.
 3. Materials: Aluminum; ASTM B221 (ASTM B221M), 6063 alloy, T52 temper.
 4. Fabrication:
 - a. Comply with OSHA Standard 29CFR1910.27.
 - b. Stand-off length shall be 7 inches (flat wall mounted).
 - c. Ladder rungs shall be McNichols traction tread, or equal.
 - d. Telescoping ladder-up handhold for hatch entrance location shown on plans.
 5. Connections: Provide with holes for post installed anchors to structural surfaces.
 6. Finish: Mill finish aluminum. Provide bituminous coating, mylar isolators, or other approved material on aluminum surfaces in contact with concrete, grout or dissimilar metals.

2.06 DAVIT CRANE ANCHOR (ANTI-FALL DEVICE)

- A. Provide one (1) flush mounted davit crane sleeve for use between multiple locations.

- B. Required product is a PortX Davit crane by Reid Lifting US, model # US-PTXDR800-20
- C. Davit crane system shall meet all OSHA requirements for personnel fall restraint and ANSI Z359.18 2017
- D. Installation Location (three total locations):
 - 1. Gate well SD-200, SD-201, and SD-202.
- E. Davit Base Sleeve:
 - 1. Manufacturer standard embedded, flush sleeve.
 - 2. Style: flush mounted cast-in-place with built in pins for fresh concrete (four minimum)
 - 3. Operation: 360 degree mast rotation
 - 4. Material: stainless steel
- F. Accessories - Personal Fall Arrest System:
 - 1. Provide two (2) autocoil self-retracing lifeline devices (50' tether length) and two (2) compatible harness that comply with OSHA 29 CFR 1910 and 1926 regulations.
 - a. Manufacturer: Werner or approved equal.

2.07 SHOP FINISHING

- A. Preparation
 - 1. All surfaces to be at the proper temperature, dry, and free of grease, oil, dirt, dust, grit, rust, loose mill scale, weld flux, slag, weld spatter, and other objectionable substances.
 - 2. Scrape, chip, and brush welds as required to remove all splatter.
 - 3. Dull sharp corners of cut or sheared edges with at least one pass of a power grinder.
- B. Castings: Coat with coal tar epoxy paint, 10 mils minimum
- C. Steel
 - 1. Prepare surfaces to be primed in accordance with SSPC-SP2.
 - 2. Apply after fabrication as soon after cleaning is practicable. Apply in a heated structure if outside air temp is below 50 degrees F, do not move or handle until coating is dry and hard.
 - 3. Galvanizing of Steel Members: Galvanize after fabrication to ASTM A123/A123M requirements. Provide minimum 1.7 oz/sq ft (530 g/sq m) galvanized coating.
 - 4. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A123/A123M requirements.
- D. Aluminum
 - 1. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.
 - 2. Coat all surfaces to come in contact with concrete, cement, mortar, or dissimilar metals with coal tar epoxy paint, 10 mils minimum.

- E. Repair damaged galvanized surfaces: ASTM A780, cold galvanizing compound manufactured by ZRC or equal.

2.08 FABRICATION TOLERANCES

- A. Unless noted otherwise in this specification the following tolerances shall govern.
- B. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.
- C. Maximum Offset Between Faces: 1/16 inch (1.5 mm).
- D. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).
- E. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m).
- F. Maximum Deviation From Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field conditions are acceptable and are ready to receive work.

3.02 PREPARATION

- A. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
- B. Before assembly, thoroughly clean all parts which will be in contact with each other.

3.03 INSTALLATION

- A. Assemble all parts accurately as indicated on the Drawings.
- B. Install items plumb and level, accurately fitted, free from distortion or defects.
- C. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- D. Obtain approval prior to site cutting or making adjustments not scheduled.
- E. Set baseplates level and grout in place.
- F. Welded Connections:
 - 1. As indicated on the shop drawings.
 - 2. Where welding is permitted or required, use continuous butt and miter welds.
 - 3. Where intermittent welds are permitted, provide minimum effective length of 2 inches and maximum spacing of 6 inches.
 - 4. Light drifting is permitted to draw parts together.
 - 5. No drifting to match unfair holes.
 - 6. Enlarge holes, if necessary, by reaming with twist drills.
 - 7. No burning to enlarge holes.
 - 8. Grind smooth exposed welds.
 - 9. Perform welding in accordance with AWS D1.1/D1.1M.

G. Structural steel:

1. High strength bolts, turn-of-nut tightening as described in "Specifications for Structural Joints Using ASTM A325 or A490 Bolts" in the AISC manual.
2. Use beveled washers when the bearing faces of bolted parts have a slope of 1:20 or greater with respect to a plane perpendicular to the bolt axis.
3. No field welding of structural steel, except as indicated on the drawings.

3.04 FIELD QUALITY CONTROL

A. Structural Steel Connections

1. Provide a platform or other means of access for inspection of each field connection.
2. Leave in place until inspected by approved special inspector and Engineer.

END OF SECTION

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DIVISION 07 THERMAL AND MOISTURE PROTECTION

SECTION 07 19 19
SILICONE WATER REPELLANT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Liquid silicon water repellant for exterior surfaces of unit masonry

1.02 RELATED REQUIREMENTS

- A. Division 01 for submittal requirements and product substitution requirements.
- B. Section 04 20 01 – Masonry Veneer.
- C. Section 04 72 00 - Cast Stone Masonry.

1.03 REFERENCE STANDARDS

- A. ASTM C140/C140M – Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units; 2022.
- B. ASTM D412 – Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers; 2021.
- C. ASTM D746 – Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact; 2020.
- D. ASTM D2240 – Standard Test Methods for Rubber Property - Durometer Hardness; 2021.
- E. ASTM E96 – Standard Test Methods for Water Vapor Transmission of Materials; 2017.
- F. ASTM G-23 – Standard Practice for Operating Light-Exposure Apparatus (Carbon-Arc Type) With and Without Water for Exposure on Nonmetallic Materials; 2017.

1.04 PERFORMANCE AND DESIGN REQUIREMENTS

- A. General:
 - 1. Water-sealant shall be used as supplied by Distributor without addition of any solvents, catalysts, pigments, or curing agents.
 - 2. Must be compatible for application on concrete and masonry block units.
 - 3. Water repellant shall penetrate surface a minimum of 0.25 inches and bond with substrate material.
 - 4. Masonry surface shall not be stained or darkened by repellant material after application.
 - 5. Provide as a minimum, a 5 year manufacturer warranty on materials.
 - 6. Comply with following design parameters:
 - a. Water repellency rating for masonry ASTM C141: must achieve 95 percent minimum.
 - b. Perm Rate ASTM E96, Method B: Perm 7.06 must achieve 95 percent minimum.
 - c. Durometer Hardness, ASTM D2240, Shore A: 32.

- d. Tensile Strength psi (MPa) - ASTM D412: 270.
- e. Elongation, percent - ASTM D412: 415.
- f. Brittle Point, ASTM D746: -100 degrees F (-73 degrees C).
- g. Volume Coefficient of Thermal Expansion - 32 – 212 degrees F (0 degrees - 100 degrees C): 9.3 by 10-4.
- h. Thermal Conductivity, Cal/(cm) (degrees C) - (sec): 0.45 by 10-3.
- i. B.T.U. per (ft) (degrees F) (hr): 0.11.
- j. Accelerated Weathering, ASTM G-23: 10,000 hrs Atlas Twin arc. Weatherometer, after that NO CHANGE.

B. Environmental conditions:

- 1. Do not proceed with application of materials when ambient temperature is less than 50 degrees F.
- 2. Do not apply water repellant in rainy, wet, damp, or foggy conditions.
- 3. Do not apply materials when low temperature of 40 degrees F or less is predicted within a period of 24 hours after application.
- 4. Do not apply when rain is predicted within a period of 6 hours after application.
- 5. Allow at least 3 bright, warm days to dry substrate after any precipitation before applying water repellant.
- 6. Protection:
 - a. Protect plants and vegetation which might be affected by water repellant fumes or alkalinity of the materials.
 - b. Positively protect adjacent surfaces of aluminum and glass.

1.05 SUBMITTALS

- A. See Section 01 33 00 - SUBMITTAL PROCEDURES, for general requirements for submittals.
- B. Product Data: Submit sufficient data to verify compliance with specifications to include materials, parts, devices, and accessories including but not limited to:
 - 1. Data indicating material characteristics.
 - 2. Performance criteria.
 - 3. Limitations.
 - 4. Manufacturer's installation instructions: Provide manufacturer's instructions to installer, marked up to show exactly how all components will be installed; where instructions allow installation options, clearly indicate which option will be used.
- C. Certificates:
 - 1. Manufacturer's Certificate
 - a. Provide certificates stating that Products meet or exceed specified requirements.
- D. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- E. Field Test Reports:

1. Provide field quality control testing reports detailing results of the tests. Indicate compliance or non-compliance with Contract Documents. Identify corrective action for materials and equipment which fails to pass field tests.
2. Submit concrete delivery tickets.

1.06 QUALITY ASSURANCE

- A. Perform work in accordance with manufacturer's requirements for preparation of surfaces and material installation instructions.
- B. Mock-Up:
 1. Apply to masonry sample panel.
 2. Verify that substrate is coated with sufficient water repellant to effectively repel moisture from surface.
 3. Verify that application of water repellant materials to substrate material will produce no surface stains.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
- B. Provide manufacturer's storage instructions along with shipped materials.

1.08 WARRANTY

- A. Comply with all warranty procedures required by manufacturer, including notifications, scheduling, and inspections.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Acceptable Manufacturers:
 1. Professional Water Sealant "Sein Silicone"
 2. Or approved equal

PART 3 EXECUTION

3.01 INSPECTION

- A. Examine surfaces to receive water repellant treatment to assure conditions are satisfactory for application of materials.
- B. Verify that masonry joints found to be unsound, hollow, or otherwise defective, have been raked out to a depth of 1/2 inch, pointed with mortar and mortar cured for at least 3 days.
- C. Verify that cracks which exceed 1/64 inch wide have been filled with pointing mortar and cured for at least three days.

3.02 PREPARATION

- A. Clean surfaces to remove dust, dirt, oil, wax, grease, asphalt, tar, stains, clinging mortar, efflorescence and other foreign materials, in accordance with water repellent manufacturer's instructions.
- B. Remove dust and dirt from exposed aggregate surfaces by lightly scrubbing with detergent solution and thoroughly rinsing with clean water.
- C. Allow three days drying time following washing down of substrate surfaces.

3.03 APPLICATION

- A. Thoroughly agitated drums of sealant prior to use in order to re-disperse any solid material that may have settled during storage.
- B. Apply water repellent with low pressure, airless spray coarse nozzle, flooding surface. Do not use aspirator type spray equipment which atomizes the liquid to fog.
- C. Apply water repellent materials at a rate of not more than 100 sq ft per gal.
- D. Start application at top of wall and work down surface, keeping a wet edge at all times.

3.04 ADJUST AND CLEAN

- A. Immediately clean spillage and overspray from adjacent surfaces as recommended by water repellent manufacturer.

3.05 FIELD QUALITY CONTROL

- A. Spray test: After water repellents have cured at least 2 hours, spray coat surfaces with water.
- B. Recoat surfaces that show water.

END OF SECTION

DIVISION 08 OPENINGS

SECTION 08 31 13
PROCESS RELATED ACCESS DOORS AND HATCHES

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Floor access door and frame units.
- B. Coordination with other trades and the prime contractor to install hatches into plant-fabricated precast concrete concrete lids.

1.02 RELATED SECTIONS

- A. Div 01 sections for submittal requirements and product substitution requirements.

1.03 REFERENCE STANDARDS

- A. AASHTO – American Association of State Highway and Transportation Officials; current edition.
- B. OSHA 1918.31 – Hatch Coverings; current edition.
- C. UL (FRD) – Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.04 SUBMITTALS

- A. Shop Drawings and Product Data shall be submitted in accordance with specification Section 01 33 00 and shall include detailed specifications, drawings, and data covering all materials, parts, devices, equipment, and other accessories forming part of equipment for the complete operational system.
- B. Shop Drawings: Submit complete fabrication, assembly and installation drawing for all products and accessories to illustrate construction and assembly of components and their connection to the work.
 - 1. General Arrangement Drawings
 - a. For each door type, indicate door and frame elevations, door and frame sizes, closure method, assembled weights, scheduled location of installation and finish.
 - b. Include plans, elevations, sections, details of installation, and attachments to other Work.
 - c. Include erection drawings for framing.
 - 2. Furnish setting Drawings, templates, and directions for installation of anchorages, including concrete inserts.
- C. Product Data: Submit sufficient data to verify compliance with specifications for each door to include materials, parts, devices, and accessories including but not limited to:
 - 1. Performance characteristics
 - 2. Cover
 - 3. Frame
 - 4. Handle

5. Lifting mechanism
 6. Hinges
 7. Springs
 8. Hardware
 9. Manufacturer's Installation Instructions
- D. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.
- E. Operations and Maintenance Data shall be submitted in accordance with specification Section 01 33 00.
- 1.05 QUALITY ASSURANCE
- A. The equipment and material to be furnished under this Contract shall be in accordance with Section 01 33 00.
- B. Perform Work in accordance with UL requirements.
- C. Field measurements.
1. Verify that field measurements are as indicated on shop drawings.
- 1.06 WARRANTY REQUIREMENTS
- A. A written warranty shall be provided for the equipment specified in this Section. The warranty shall be for a minimum period identified herein and shall begin from the date of Substantial Completion . Such warranty shall cover all defects or failures of materials or workmanship that occur as the result of normal operation and service. No prorated warranty will be accepted.
1. Contractor's Warranty: Two (2) Year.
 2. Manufacturer's Warranty: Minimum of two (2) year but not less than manufacturer's standard warranty period.

PART 2 PRODUCTS

2.01 FLOOR ACCESS DOOR AND FRAME UNITS

- A. Approved Manufacturers:
1. Bilco Company.
 2. Halliday Products H1R Series.
 3. Approved Equal.
- B. Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assembly's units are to be installed in.
1. Refer to Drawings for size(s) and quantity of access doors.
 2. Refer to Drawings for single leaf or double leaf styles.
 3. Access door(s) shall be pre-assembled from the manufacturer.
 4. Design Load: Design to support AASHTO HS-20 uniform live load with deflection less than 1/240 of span.

5. Cover shall be minimum 1/4" aluminum checkered plate reinforced with structural aluminum channels as required for design load.
6. Angle frame with minimum 1/4" thick extruded aluminum with continuous anchor flange.
7. Anchor flange for casting into concrete shall be provided on hatches in new floors.
8. Drainage channels or gutters are not required on any hatch.
9. Hinges, slam locks, brackets, and hardware shall be type 316 stainless steel.
10. Doors shall include stainless steel lifting device with integral hold open devices. Doors shall open a minimum of 90 degrees.
11. Provide a removable exterior stainless steel turn/lift handle for all hatches.
 - a. Provide stainless steel flush, gasketed, removable plug to protect hatch release.
12. Finish shall be factory mill finish with bituminous coating applied to exterior of frame and surfaces in direct contact with concrete.
13. Provide with aluminum grating fall protection. Provide 100 PSF load rating.
 - a. Fall protection shall be safety orange powder coated grating.
 - b. Fall protection grating shall be hinged for easy removal with a positive latch to maintain an upright position.
14. All hatches are mounted flush to the concrete surface in which they are mounted.

2.02 HATCH ENTRY LADDERS

- A. See Section 05 50 00.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that rough openings are correctly sized and located.

3.02 INSTALLATION

- A. Hatch supplier shall arrange to ship the hatches to the precast fabricator for all hatches shown to be embedded into precast concrete.
- B. Install units as shown in Drawings, in accordance with manufacturer's instructions.
- C. Repair nicks or other damage to bituminous surface of frame prior to installation.
- D. Install frames plumb and level in openings or within wall forms. Secure rigidly in place to eliminate movement during concrete placement.
- E. Position units to provide convenient access to the concealed work requiring access. Verify positions with Engineer before finalizing installation.
- F. Lubricate and adjust for proper operation.

END OF SECTION

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DIVISION 09 FINISHES

SECTION 09 91 13
EXTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish exterior steel sheet pile surfaces and attached fabrications surfaces exposed to view, unless fully factory-finished and unless otherwise indicated, including the following:

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements and product substitution requirements.
- B. Section 05 50 00 - Metal Fabrications
- C. Section 08 31 13 - Process Related Access Doors and Hatches
- D. Section 33 05 13 – Manholes and Covers
- E. Section 33 10 00 – Waterline Utilities
- F. Section 33 41 11 – Storm Drainage Utilities
- G. Section 40 27 30 – Process Gates

1.03 DEFINITIONS

- A. Comply with ASTM D16 for interpretation of terms used in this section.

1.04 REFERENCE STANDARDS

- A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.
- B. ASTM D16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications; 2016.
- C. MPI (APL) - Master Painters Institute Approved Products List; Master Painters and Decorators Association; Current Edition.
- D. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.
- E. NACE (National Association of Corrosion Engineers)—Industrial Maintenance Painting; Current Edition.
- F. NPCA (National Paint and Coatings Association)—Guide to U.S. Government Paint Specifications; Current Edition.
- G. PDCA (Painting and Decorating Contractors of America)—Painting—Architectural Specifications Manual; Current Edition.

- H. SSPC V2 (PM2) - Systems and Specifications: Steel Structures Painting Manual, Volume 2; 2015.
- I. SSPC-SP 6 - Commercial Blast Cleaning; 2007.

1.05 PERFORMANCE AND DESIGN REQUIREMENTS:

- A. Regulatory requirements
 - 1. Conform to applicable fire code for flame and smoke rating requirements for finishes.
 - 2. Comply with all health and fire regulations of agencies having jurisdiction for storage of materials.
 - 3. Comply with current state requirements for air quality control permit and OSHA standards for sandblasting.
 - 4. Comply with current state requirements for Volatile Organic Compounds (VOC's) of less than 3.5 pounds per gallon for all coatings.
- B. Pre-application conference
 - 1. Coating manufacturer or manufacturer's representative will conduct a meeting to establish specific surface preparation procedures acceptable to Engineer and application and protection procedures of finished surfaces.
 - 2. Contractor will coordinate meeting 7 days prior to the start of work in this section.

1.06 SUBMITTALS

- A. See section 01 33 00 - SUBMITTAL PROCEDURES for general requirements of submittals.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Painting Schedule - to accomplish final color selection by Engineer and Owner, prepare painting schedule identifying:
 - a. All surfaces to be painted.
 - b. Surface preparation used.
 - c. Type of primer coating, film thickness, shop or field applied.
 - d. Type of finish coating, film thickness, shop or field applied.
 - e. Provide area for color selection of each surface by Engineer and Owner.
 - 2. Manufacturer's name, product name and/or catalog number, and general product category (e.g. "alkyd enamel").
 - 3. MPI product number (e.g. MPI #47).
 - 4. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
 - 5. Manufacturer's installation instructions. Indicate special surface preparation procedures and substrate conditions requiring special attention.
- C. Samples:
 - 1. Coordinate and submit the color samples for products specified under this section with the submission of color samples for all other products

specified in the Contract Documents.

2. Submit three paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating full range of colors and finishes available for each product specified for selection by Engineer and Owner.
 - a. Where sheen is specified, submit samples in only that sheen.
 - b. Where sheen is not specified, submit each color in each sheen available.
 - c. Allow 30 days for approval process, after receipt of complete samples by Engineer.
 - d. Engineer will prepare color schedule after resubmittals.
Contractor will provide colors in accordance with Schedule.
Selections by Owner may exceed manufacturer's standard range of colors
3. After initial selection by Owner, Submit two painted samples, illustrating selected colors and textures for each color and system selected with specified coats cascaded. Submit on carbon steel plate, 8 inch by 8 inch in size for final selection. Should the samples not meet the Owners expectations, reselection of paint and resubmittal of all samples will resume until approval by Owner is attained.
4. Field Samples: Submit two samples of each selected color and finish, minimum of 8 by 8 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

D. Certificates:

1. Applicators Qualifications
2. Manufacturers Qualifications
3. Manufacturer's Certificate: Certify that Products meet or exceed specified requirements

E. Bill of Lading: Provide for all products and components furnished under this section. At the time of delivery, contractor shall provide resident representative with a copy of each bill of lading.

F. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, repair of painted and finished surfaces, and color samples of each color and finish used.

1.07 MAINTENANCE MATERIALS:

- A. Furnish the following for City of Fargo's use in maintenance of project.
1. See Section 01 60 00 - Product Requirements, for additional provisions.
 2. Extra Paint and Finish Materials: 2 gallons of each color; from the same product run, store where directed.
 3. Label each container with color in addition to the manufacturer's label.

1.08 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 10 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 10 years experience and approved by manufacturer.

1.09 MOCK-UP

- A. See Section 01 40 00 - Quality Requirements, for general requirements for mock-up.
- B. Provide panel, 3 feet long by 3 feet wide, illustrating paint color, texture, and finish.
- C. Locate where directed.
- D. Accepted sample may remain as of the Work.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.11 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Do not apply exterior paint and finishes during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- D. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Paints:
 - 1. Tnemec: www.tnemec.com
 - 2. Diamond Vogel Paints: www.diamondvogel.com.
 - 3. PPG Porter Paints: www.ppgpaints.com.
 - 4. Sherwin-Williams Company: www.sherwin-williams.com
 - 5. IPC - Integrated Protective Coatings: www.ipccoatings.com.
- B. Rust inhibitive general purpose primer:
 - 1. Tnemec—Series 37H-77 Chem Prime
 - 2. IPC—Interlac 290 Rust Inhibitive Primer

3. Or equal
- C. Rust inhibitive zinc-rich primer:
 1. Tnemec-Hydro Zinc 94-H2O
 2. Or equal
- D. Coal tar epoxy:
 1. Tnemec—Series 46H-413 Hi-Build Tneme-Tar
 2. IPC—Intertuf 708 HS High Build Coal Tar Epoxy
 3. Or equal
- E. Polyurethane finish coatings:
 1. Tnemec—Series 73 Endura-Shield III
 2. IPC—Interthane 870 HS High Build Polyurethane
 3. Or equal
- F. Field catalyzed epoxy primer coatings:
 1. Tnemec—Series 66 Hi-Build Epoxoline
 2. IPC—Intergard 447 High Build Epoxy
 3. Or equal
- G. Galvanized surface repair where directed by Engineer:
 1. Tnemec—Series 90-97 Tneme-Zinc
 2. ZRC—Cold Galvanizing Compound
 3. Brite Products—Brite Zinc Galvanizing Compound
 4. Or accepted substitution
- H. Special purpose primer where directed by Engineer:
 1. Tnemec—Poly-Ura-Prime
 2. IPC—Interplus 880 Surface Tolerant Urethane
 3. Or equal

2.02 PAINTS AND FINISHES - GENERAL

- A. Provide paints and finishes used in any individual system from the same manufacturer; no exceptions.
- B. Primer Sealers: Same manufacturer as top coats.
- C. Use only mercury-free, fume-proof paint for intermediate and finish coats.
- D. Use only lead-free paint or paint that does not cause discoloration in treatment plant atmosphere.
- E. Paints:
 1. Ready mixed, unless required to be a field-catalyzed paint.
 2. Where MPI paint numbers are specified, provide products listed in Master Painters Institute Approved Product List, current edition available at www.paintinfo.com, for specified MPI categories, except as otherwise indicated.
 3. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good

- flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 4. Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - 5. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 6. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- F. Volatile Organic Compound (VOC) Content:
- 1. Provide paints and finishes that comply with the most stringent requirements specified in the following:
 - a. 40 CFR 59, Subpart D--National Volatile Organic Compound Emission Standards for Architectural Coatings.
 - b. Architectural coatings VOC limits of the State in which the Project is located.
 - 2. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction.
- G. Colors: To be selected from manufacturer's full range of available colors.
- 1. Selection to be made by Engineer after award of contract.
 - 2. Allow for minimum of three colors for each system, unless otherwise indicated, without additional cost to City of Fargo.
- H. Finishes:
- 1. Refer to schedule at end of section for surface finish and schedule to be used if MPI is not otherwise indicated.
 - 2. Use paint by same manufacturer for successive field coats.
 - 3. Field coats to be compatible with shop applied undercoats.

2.03 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Sacrificial Anti-Graffiti Coating: Clear, wax emulsion for coating porous or painted surfaces; capable of being removed from substrate with only hot water.
- C. Patching Material: Latex filler.
- D. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been properly prepared.

- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially effect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces for finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- F. Galvanized surfaces:
 - 1. SSPC-SP1
 - 2. Spot prime defects after repair
- G. Ferrous Metal:
 - 1. Shop-Primed Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
 - 2. Remove rust, loose mill scale, and other foreign substances using using methods recommended in writing by paint manufacturer and blast cleaning according to SSPC-SP 6 "Commercial Blast Cleaning". Protect from corrosion until coated.

3.03 MIXING AND TINTING

- A. Deliver paints ready-mixed to job site.
- B. Mix only in mixing pails, suitably sized, non-ferrous or oxide metal pans.
- C. Use tinting colors recommended by manufacturer for specific type of finish.
- D. Do not add any adulterants or unauthorized thinners.
- E. Thoroughly mix each time paint withdrawn from container.
- F. Keep containers closed tightly except while paint is withdrawn.
- G. All paint factory mixed.
- H. Thinning only permitted to obtain recommended coverage at lower application temperatures.

3.04 APPLICATION

- A. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- B. Do not apply initial coating until moisture content of surface is within moisture limitations recommended by manufacturer's instructions.
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance free of visible brush marks, streaks, laps and missed areas.
- E. Apply coating with suitable brushes, rollers, or spraying equipment:
 - 1. Do not exceed rate of application recommended by manufacturer for the type of surface involved.
 - 2. Keep brushes, rollers, and spraying equipment clean, dry, free from contaminants and suitable for the finish required.
- F. Sand metal lightly between coats to remove defects to achieve smooth uniform finish acceptable to Owner.
- G. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- H. Allow applied coat to dry before next coat is applied.
- I. Provide tie coats where recommended by manufacturer's instructions and acceptable to Owner.
- J. Do not apply additional coats until completed coat has been inspected by the Engineer:
 - 1. Only inspected coats of paint will be considered in determining number of coats applied.
- K. Make edges of paint adjoining other materials or colors clean and sharp with no overlapping.
- L. Rate of application:
 - 1. Coverage not greater than value recommended by manufacturer's instructions.
 - 2. Use of paint thinner not to be used as means of extending coverage of paint.
- M. Refinish whole wall, structure or item where portion of finish has been damaged or is not acceptable.
- N. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection.
- B. City of Fargo will provide field inspection.
- C. Comply with inspection and film thickness testing requirements of this section, SSPC Volume 1, Chapter 6 and SSPC-PA 2.
- D. General inspection sequence as follows:
 - 1. Pre-surface preparation observation.
 - 2. Measurement of ambient conditions.
 - 3. Evaluation of compressor (air cleanliness) and surface preparation equipment.
 - 4. Determination of surface preparation cleanliness and profile.
 - 5. Review of application equipment.
 - 6. Witnessing of coating mixing.
 - 7. Observing coating application.
 - 8. Determination of wet film thickness (non-metallic substrates).
 - 9. Determination of dry film thickness (metallic or non-ferrous metal substrates).
 - 10. Pinhole and holiday testing of shop coatings as required.
 - 11. Adhesion testing as required.
 - 12. Evaluating cure.
- E. Wet film thickness (WFT) testing:
 - 1. Standard "notch" configuration or circular dial gauges.
 - 2. Use for concrete, wood or other non-metallic substrates.
 - 3. Determine dry film thickness per the following:
 - a.
$$\text{WFT} = \frac{(\text{SPECIFIED DRY FILM THICKNESS})}{(\% \text{ SOLIDS BY VOLUME})}$$
 - 4. Decrease percent solids by volume if coating is thinned per the following:
 - a.
$$\text{WFT} = \frac{(\text{SPECIFIED DRY FILM THICKNESS})}{(\% \text{ SOLIDS BY VOLUME} / (100\% + \% \text{ THINNER ADDED}))}$$
 - 5. Calibrate gauge per manufacturers instructions acceptable to Engineer.
- F. Dry film thickness (DFT) testing:
 - 1. Type 1: Magnetic pull-off type gauge.
 - 2. Type 2: Fixed probe magnetic flux gauge with microprocessor.
 - 3. Calibrate gauge per manufacturers instructions and SSPC-PA 2 acceptable to Engineer.
 - 4. Use eddy current type gauge or probe attachment for non-ferrous metal substrates.
 - 5. Gauge accuracy: ± 10 percent.
- G. Number of measurements and minimum thickness in accordance with SSPC-PA 2:
 - 1. Make five (5) separate spot measurements (average of three readings for each spot measurement) spaced evenly over each 100 square feet (9.3

- square meters) of area to be measured.
2. The average of five spot measurements for each such 100 square foot area shall not be less than the specified thickness.
 3. No single spot measurement in any 100 square foot area shall be less than 80 percent of the specified thickness.
 4. Any one of three readings which are averaged to produce each spot measurement may under-run by a greater amount.
 5. The five spot measurements shall be made for each 100 square feet of area as follows:
 - a. For surfaces not exceeding 300 square feet in area, each 100 square foot area shall be measured.
 - b. For surfaces not exceeding 1,000 square feet in area, three 100 square foot areas shall be randomly selected and measured.
 - c. For surfaces exceeding 1,000 square feet in area, the first 1,000 square feet shall be measured as stated above and for each additional 1,000 square feet of area or increment thereof, one 100 square foot area shall be randomly selected and measured.
 6. If the dry film thickness for any 100 square foot area is not in compliance with the requirements above, then each 100 square foot area shall be measured.
 7. Contractor shall reimburse Owner for additional time required to inspect each 100 square foot area in addition to the above spot measurement requirements. An additional coat may be applied in lieu of additional testing.
- H. Other size areas or number of spot measurements may be adjusted as appropriate for the size and shape of the structure to be measured as determined by Engineer.

3.06 CLEANING

- A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.
- B. Remove spilled or splattered paint from all finished surfaces

3.07 PROTECTION

- A. Protect finishes until completion of project.
- B. Use drop cloths, masking tape and other measures to protect all surfaces from accidental spraying, spattering, or spilling of paint.
- C. Prepare surface and re-coat surfaces damaged during delivery and installation or by construction activity.
- D. Repair all damage caused by coating other items of work:
 1. Immediately remove paint deposited on surfaces not to be coated.
- E. Protect galvanized steel finishes and repair damaged surfaces as follows:
 1. Power tool clean foreign matter, rust, slag residue, weld splatter from both damaged and contiguous undamaged area.
 2. Clean with phosphoric acid base.

3. Brush apply two coats of cold galvanizing compound and overlap at least two inches onto contiguous undamaged area.

F. Touch-up damaged finishes after Substantial Completion.

3.08 SURFACES NOT TO BE PAINTED

A. Except as otherwise required or directed, do not paint the following surfaces:

1. Items factory-finished unless otherwise indicated; materials and products having factory-applied primers are not considered factory finished.
2. Prefabricated decorative fencing posts, rails, pickets.
3. Items indicated to receive other finishes.
4. Items indicated to remain unfinished.
5. Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
6. Brick, glass unit masonry, architectural concrete, cast stone, integrally colored plaster and stucco.
7. Glass.
8. Exposed surfaces of aluminum, except ductwork and conduit.
9. Polished or finished stainless steels. Unfinished or dull stainless steel shall be painted.
10. Nickel or chromium.
11. Galvanized surfaces, except piping, conduit, duct work, and other items specifically noted.
12. Rubber and plastics that flex.
13. Copper instrument or pressure gauge tubing.
14. Exterior colored CMU.
15. Surfaces specified to be factory finished.
16. Exterior concrete not identified in this schedule or elsewhere to receive paint.

3.09 SCHEDULE—METAL SURFACES

A. All non-submerged surfaces of structural and miscellaneous steel exposed in exterior locations including galvanized surfaces, doors and frames, steel handrails, pumps, motors, and other machines and process equipment:

1. Primer: One coat catalyzed epoxy primer—4 mils
2. Finish: One coat polyurethane—4 mils
3. Total dry film thickness: 8 mils

B. All non-submerged and exposed interior and exterior surfaces, unless otherwise specified, including valves, cast iron pipe, ductile iron pipe and steel pipe in pump rooms, pipe galleries, utilidor, headworks and other process piping areas including but not limited to supports, fittings, flanges, and bolts:

1. Primer: One coat catalyzed epoxy primer—4 mils
2. Finish: One coat polyurethane—4 mils
3. Total dry film thickness: 8 mils

C. All submerged or partially submerged and exposed interior and exterior surfaces, unless otherwise specified, including valves, cast iron, and steel pipe in wet wells or basins, including but not limited to weir plates, supports, fittings, flanges, and

bolts:

1. Primer: One coat rust inhibitive zinc-rich shop primer—3 mils
2. Finish: One coat coal tar epoxy—18 mils
3. Total dry film thickness: 20 mils minimum

D. Miscellaneous castings, including manhole rings and covers and manhole steps:

1. Finish: One coat coal tar epoxy—16-20 mils
2. Total dry film thickness: 16-20 mils

3.10 SCHEDULE—CONCRETE AND MASONRY SURFACES

A. Concrete masonry block surfaces in exterior locations: Reference Section 07 19 19.

B. All submerged or partially submerged and exposed interior surfaces, unless otherwise specified, including but not limited to the following:

1. Channels, wetwells, basins, splitter boxes and tanks
 - a. Bottoms
 - b. Walls
 - c. Bottom of suspended decks and walkways
 - d. Grout rub: Per section 03 30 00
 - e. Finish: One coat coal tar epoxy-16-20 mils
 - f. Total dry film thickness: 16-20 mils

C. Exterior foundation walls:

1. Per section 07160

3.11 SCHEDULE—OTHER EXTERIOR SURFACES

A. Steel—Galvanized:

1. Primer: One coat galvanize primer 3 mils
2. Finish: Two coats alkyd enamel, semi-gloss 3 mils
3. Total dry film thickness: 9 mils

3.12 SCHEDULE—COLORS

A. Colors to be selected by Owner and Engineer from Contractor provided paint schedule after approved paint submittal.

END OF SECTION

DIVISION 31 EARTHWORK

SECTION 31 05 13
SOILS FOR EARTHWORK

GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Subsoil materials.
 - 2. Topsoil materials.
- B. Related Sections include:
 - 1. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
 - 2. Division 01 - General Requirements.
 - 3. Division 31 - Earthwork.
 - 4. Division 32 - Exterior Improvements.

1.02 SUBMITTALS FOR REVIEW

- A. See Section 01 33 00 - Submittal Procedures.
- B. Samples: In accordance with Section 01 45 00 - Quality Control.

1.03 QUALITY ASSURANCE

- A. Section 01 45 00 - Quality Control: Field Samples.
- B. Material Source: Provide materials from the same source throughout the Work. Change of source requires Engineer approval.

PART 2 PRODUCTS

2.01 SOIL FILL MATERIALS

- A. Engineered Fill or Structural Fill - Fill Type S1: Imported borrow.
 - 1. Fine sand and gravel, including fine sands, sand-clay mixtures, and gravel-clay mixtures.
 - 2. Graded free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
 - 3. Conforming to ASTM D2487 Group Symbols GM, GC, SW, SP, SM, SC, or dual symbol groups.
 - a. Type S1 gradation: 100% passing 2" Sieve, 0% - 40% passing #40 Sieve, 0% - 10% passing a #200 Sieve.
- B. Select Fill - Fill Type S2: Imported borrow or Re-Used On-Site. Used as Clay Cap for pipe trenching beneath pavement.
 - 1. Inorganic clays, conforming to ASTM D2487 Group Symbols CH, CL, or dual symbols thereof with a liquid limit of 50 or less, plasticity index of less than 15 percent and organic content less than 2 percent.
 - 2. Graded free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

- C. General Fill - Fill Type S3: Imported borrow or Re-Used On-Site. Unacceptable as backfill or embankment material beneath pavement or structures. May be used as backfill in lawn or landscaped areas.
 - 1. Inorganic clays, conforming to ASTM D2487 Group Symbols CH, CL, or dual symbols thereof with liquid limit greater than 50.
 - 2. Graded free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
- D. Topsoil - Fill Type S4: Imported borrow or Re-Used On-site.
 - 1. Organic silts and clays, conforming to ASTM D2487 Group Symbols OL and OH, or dual symbols thereof.
 - 2. Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, taken from drained site; free of subsoil, clay or impurities, plants, weeds, and roots; pH value of minimum 5.4 and maximum 7.5.
 - 3. Containing a minimum of 4 percent and a maximum of 25 percent organic matter.
 - 4. Free of rocks larger than ¾ inches.
 - 5. Topsoil: Excavated/stripped from site and free of weeds.
- E. Impervious Fill – Fill Type S5: Clay for Levees and Inspection Trench
 - 1. Impervious Fill shall be cohesive and consist of material classified by ASTM D-2487 as CL or CH.
 - 2. Gradation shall not have less than 40% by weight passing the No. 200 sieve.
 - 3. The liquid limit (L.L.) shall be greater than 25% and plasticity index (P.I.) greater than 10 percent.
 - 4. The material shall be free of ice, snow, frozen earth, trash, debris, sod, roots, organic matter including silts which are unstable, inorganic materials too wet to be stable or stones larger than 3-inches in any dimension.
- F. Unsuitable Soil - Unacceptable as soil material and/or embankment or backfill.
 - 1. All frozen material, vegetation, trash, rocks, and concrete or bituminous pieces larger than 3 inches.
 - 2. Not acceptable as backfill or embankment material: silts of ASTM D2487 Group Symbols ML and MH.
 - 3. Materials otherwise not meeting the specifications of soil materials.

2.02 SOURCE QUALITY CONTROL

- A. Section 01 45 00 - Quality Control: Testing and analysis of soil material.
- B. Testing and Analysis of Subsoil Material: Perform in accordance with ASTM D698 and ASTM D6938.
- C. Testing and Analysis of Topsoil Material: Perform in accordance with ASTM D2487.
- D. Provide materials of each type from same source throughout the Work.

- E. Contractor shall coordinate with Engineer and Owner's independent geotechnical soil classification technician and laboratory to monitor soils installed. Contractor is responsible for scheduling and complying with geotechnical requirements.
- F. Borrow Source: All borrow material and/or rip rap must come from a ND State Historical Preservation Office (SHPO) approved source. If the applicant chooses to use a borrow source that is not NDDOT Certified and/or from an existing stockpile, the following must occur prior to digging:
 - 1. SHPO approval including completion and FEMA approval of required archaeological surveys.
 - 2. The applicant shall notify the FEMA Regional Environmental Officer if any listed species or designated critical habitat might be affected or is in the vicinity of the project and shall not begin work until notified by the FEMA Regional Environmental Officer that the requirements of the Endangered Species Act have been satisfied.
 - 3. Applicant is required to coordinate borrow pit locations with the USFWS Wetland District Manager to avoid project impacts to easements or public lands.
 - 4. Applicant is responsible for ensuring that no borrow pit activity occurs in Waters of the United States, wetlands or a river listed on the Nationwide Rivers Inventory (NRI). Borrow pit activity occurring in a floodplain must not affect pre-existing hydrological profiles. If activities occur in prime farmland ground disturbance must be temporary, one-time use, and no permanent loss of farmland may occur.

PART 3 EXECUTION

3.01 NOT USED.

END OF SECTION

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SECTION 31 05 16
AGGREGATES FOR EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Coarse and fine aggregate materials.
- B. Related Sections include, but are not limited to:
 - 1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
 - 2. Division 1 - General Requirements.
 - 3. Division 31 - Earthwork.
 - 4. Division 32 - Exterior Improvements.
 - 5. Division 33 - Utilities.
 - 6. City of Fargo Standard Specifications for Construction

1.02 SUBMITTALS FOR REVIEW

- A. Section 01 33 00 - Submittals: Procedures for submittals.
- B. Samples: Submit, in air-tight containers, 40 pound sample of each type of aggregate to testing laboratory. Submit Laboratory Results to Engineer.

1.03 QUALITY ASSURANCE

- A. Section 01 45 00 - Quality Control: Field Samples.
- B. Material Source: Submit name of imported material supplier(s). Provide materials from the same source throughout the Work. Change of source requires Engineer approval.

PART 2 PRODUCTS

2.01 AGGREGATE MATERIALS

- A. Aggregate Materials General: Provide material consisting of sound, durable particles of gravel or sand which may include limited quantities of fine soil particles as binding material. Use material that is free of any deleterious material or organic material.
- B. Sand or Class 44:
 - 1. Sand shall meet NDDOT Class 44 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
5/8 inch	100
No. 4	90 - 100
No. 200	0 - 20

- C. Aggregate Special Class 1:

1. Special Class 1 in accordance with gradation as indicated in the table below:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	92 - 100
3/8 inch	36 - 64
No. 4	19 - 28
No. 16	9 - 16
No. 200	0 - 2

D. Aggregate Class 2:

1. NDDOT Class 2 with gradation as indicated in the tables below:

Sieve Size	Percent Passing
3/4 inch	100
3/8 inch	50 - 95
No. 10	0 - 15
No. 30	0 - 4

E. Aggregate Class 3:

1. NDDOT Class 3 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
3 inch	100
3/4 inch	80 - 100
No. 4	35 - 85
No. 30	20 - 50
No. 200	0 - 15
Testing Method	Testing Requirement
ND T 113, Shale (max %)	12%

F. Aggregate Class 3M:

1. NDDOT Class 3M with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	80 - 100
No. 4	35 - 85
No. 30	20 - 50
No. 200	4 - 10
Testing Method	Testing Requirement
ND T 113, Shale (max %)	12%

G. Aggregate Class 4:

1. NDDOT Class 4 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
3/4 inch	100
No. 4	35 - 85
No. 30	10 - 50
No. 200	7 - 17
Testing Method	Testing Requirement
ND T 113, Shale (max %)	15%
AASHTO T 96, L.A. Abrasion (max%)	50%
NDDOT 4, Fractured Faces	10%

- 1) NDDOT 4, Fracture Faces is the minimum weight percentage allowable for the portion of the aggregate retained on a No. 4 sieve having at least 1 fractured face.

H. Aggregate Class 5:

1. NDDOT Class 5 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	90 - 100
No. 4	35 - 70
No. 30	16 - 40
No. 200	4 - 10
Testing Method	Testing Requirement
ND T 113, Shale (max %)	12%
AASHTO T 96, L.A. Abrasion (max%)	50%
NDDOT 4, Fractured Faces	10%

- 1) NDDOT 4, Fracture Faces is the minimum weight percentage allowable for the portion of the aggregate retained on a No. 4 sieve having at least 1 fractured face.
2. The maximum plasticity index (PI) for Class 5 aggregate is based on the material gradation and is derived from the following formula:
 - a. $\text{Max PI} = 10 - (\% \text{ passing the No. 40 sieve} \times 0.10)$
 - b. The PI of the material will be determined in accordance with test ND T 90, "Determining the Plastic Limit and Plasticity Index of Soils".

I. Aggregate Special Class 6:

1. Special Class 6 in accordance with gradation as indicated in the table below:

Sieve Size	Percent Passing
3/4 inch	100
3/8 inch	90 - 100
No. 30	35 - 75

No. 200	0 - 8
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J. Aggregate Class 7:

1. NDDOT Class 7 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	95 - 100
1/2 inch	85 - 100
3/8 inch	60 - 90
No. 4	15 - 25
No. 8	2 - 10
No. 200	0 - 3
Testing Method	Testing Requirement
ND T 113, Shale (max %)	8%
AASHTO T 96, L.A. Abrasion (max%)	40%
NDDOT 4, Fractured Faces	85%

- 1) NDDOT 4, Fracture Faces is the minimum weight percentage allowable for the portion of the aggregate retained on a No. 4 sieve having at least 2 fractured faces.

K. Aggregate Class 8:

1. NDDOT Class 8 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
1-1/2 inch	100
No. 4	35 - 80
Testing Method	Testing Requirement
ND T 113, Shale (max %)	20%

L. Aggregate Class 13:

1. NDDOT Class 13 with gradation and material properties as indicated in the tables below:

Sieve Size	Percent Passing
1 inch	100
3/4 inch	70 - 100
No. 4	38 - 75
No. 8	22 - 62
No. 30	12 - 45
No. 200	7 - 15
Testing Method	Testing Requirement
ND T 113, Shale (max %)	12%
AASHTO T 96, L.A. Abrasion (max %)	50%

NDDOT 4, Fractured Faces	10%
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- 1) NDDOT 4, Fracture Faces is the minimum weight percentage allowable for the portion of the aggregate retained on a No. 4 sieve having at least 1 fractured face.

M. Fine Aggregate:

1. Provide Fine Aggregate that meets the properties of the table below:

Test	Method	Requirement
Lightweight pieces in Aggregate	AASHTO T104	2% max
Soundness (sodium sulfate)	ND T 113	10% max

2. Provide Coarse Aggregate that meets the gradations from the table below:

Fine Aggregate Size and % Passing by Weight	
Sieve Size	Size 3
3/8 inch	100
No. 4	95 - 100
No. 16	45 - 80
No. 50	10 - 30
No. 100	0 - 10
No. 200	0 - 3.0

N. Well Graded Aggregate:

1. Provide Well Graded Aggregate that meets the gradations from the table below:

Well Graded Aggregate Size and % Passing by Weight	
Sieve Size	Size 3
1-1/4 inch	100
1 inch	95 - 100
3/4 inch	90 - 100
3/8 inch	55 - 70
No. 8	31 - 42
No. 16	18 - 35
No. 50	0 - 10
No. 200	0 - 3

O. Coarse Aggregate:

1. Provide Coarse Aggregate that meets the properties of the table below:

Test	Method	Max % by Weight of Plus No.4 Fraction
Shale	NDDOT 3	0.7
Iron oxide particles	NDDOT 3	4.0
lignite and other coal	NDDOT 3	0.5

Soft Particles (excluding the above)	NDDOT 3	2.5
Thin or Elongated Pieces	NDDOT 3	15
L.A. Abrasion	AASHTO T96	40.0
Soundness (sodium sulfate)	AASHTO T104	12

2. Provide Coarse Aggregate that meets the gradations from the table below:

Coarse Aggregate Size and % Passing by Weight			
Sieve Size	Size 3	Size 4	Size 5
1-1/2 inch	100		
1 inch	95 - 100	100	
3/4 inch		90 - 100	100
1/2 inch	25 - 65		90 - 100
3/8 inch	15 - 55	20 - 55	40 - 70
No. 4	0 - 10	0 - 10	0 - 15
No. 8	0 - 5	0 - 5	0 - 5
No. 200	0 - 1	0 - 1	0 - 1

- P. Foundation Rock:

1. Crushed rock meeting ASTM C33 1.5" nominal size aggregate sizes #4 through #57.

- Q. Underdrain Aggregate

1. Provide Underdrain Aggregate that meets the gradations from the table below:

Underdrain Aggregate Size and % Passing by Weight	
Sieve Size	Size 3
3/8 inch	100
No. 4	95 - 100
No. 16	45 - 80
No. 50	10 - 30
No. 100	0 - 10
No. 200	0 - 3

2.02 SOURCE QUALITY CONTROL

- A. Section 01 45 00 - Quality Control: Source testing and analysis of aggregate material.
- B. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D698.
- C. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136 and ASTM D698.

- D. If tests indicate materials do not meet specified requirements, change material or material source and retest.
- E. Provide materials of each type of aggregate from the same source throughout the Work.

PART 3 EXECUTION

3.01 STOCKPILING

- A. Stockpile materials in accordance with Section 31 10 00.

3.02 STOCKPILE CLEANUP

- A. Cleanup stockpiles in accordance with Section 31 10 10.

END OF SECTION

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SECTION 31 05 19
GEOSYNTHETICS FOR EARTHWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Woven Geotextile Fabric
 - 2. Non-Woven Geotextile Fabric.
 - 3. Geotextile Drainage Sock
- B. Related Sections include, but are not limited to:
 - 1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
 - 2. Division 1 – General Requirements Specification Sections.
 - 3. Division 31 – Earthwork Specification Sections.
 - 4. Division 32 – Exterior Improvements.

1.02 REFERENCES

- A. Reference Standards include, but are not limited to:
 - 1. North Dakota Department of Transportation Standard Specifications for Road and Bridge Construction - Latest Edition.
 - 2. ASTM D3786 – Mullen Burst, Latest Edition.
 - 3. ASTM D4355 – UV-Resistance, Latest Edition.
 - 4. ASTM D4491 – Water Permeability, of Geotextiles by Permittivity, Latest Edition.
 - 5. ASTM D4595 – Wide Width Tensile Strength, Latest Edition.
 - 6. ASTM D4632 – Grab Tensile Strength and Elongation, Latest Edition.
 - 7. ASTM D4751 – Apparent Opening Size (AOS), Latest Edition.
 - 8. ASTM D4833 – Puncture and Trapezoidal Tear, Latest Edition.
 - 9. ASTM D4873 – Guide for Identification, Storage, and Handling of Geosynthetics, Latest Edition.

1.03 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Provide product data on Geotextile Fabric including a certificate stating the name of the manufacturer, product name and style, chemical composition of the yarns and any other pertinent information to fully describe the geotextile. The Manufacturer's certificate shall state that the furnished geotextile meets MARV requirements of the Specifications.
- C. Submit manufacturer's installation instructions. Indicate special procedures and conditions requiring special attention.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. The geotextile rolls shall be furnished with suitable wrapping for protection against moisture and extended ultraviolet exposure prior to placement.

- B. Rolls shall be stored in a manner which protects them from the elements. At no time shall the geotextile be exposed to ultraviolet light for a period exceeding fourteen days.
- C. The geotextile rolls shall be labeled as per ASTM D 4873, "Guide for Identification, Storage, and Handling of Geosynthetics".

PART 2 PRODUCTS

2.01 MATERIAL

- A. Geotextile fabrics shall conform to the Standard Specification for Geotextile Specification for Highway Applications- AASHTO Designation M 288-96 or the latest revision thereof. All property values, with the exception of apparent opening size (AOS) represent minimum average roll values (MARV) in the weakest principal direction. Values for AOS represent maximum roll values.
- B. Woven Geotextile Fabric: The geotextile fabric for reinforcement/separation shall be woven, consisting of a continuous chain of polymeric filaments or yarns of polyester, polypropylene, polyethylene, polyamide, or polyvinylidene chloride formed into a stable network that is water permeable. The material shall meet the following requirements:
 - 1. Grab Tensile Strength (ASTM D-4632) 300 lbs. min.
 - 2. Elongation (ASTM D-4632) 15% max.
 - 3. Trapezoidal Tear Strength (ASTM D-4533) 113 lbs. min.
 - 4. AOS Sieve Size (US Sieve) (ASTM D-4751) 40
 - 5. Permittivity (ASTM D-4491) 0.02 - 0.05 sec.-1
 - 6. CBR Puncture Strength (ASTM D-6241) 900 lbs. min.
- C. Nonwoven Geotextile Fabric: Where specified, the geotextile fabric for separation shall be a nonwoven, AASHTO M 288 Class 2 having the following minimum average roll values (MARV) in the weakest principle direction:

- 1. AASHTO M 288 Class 2 requirements:

Weight	D 5261	6 oz/SY			
ASTM Test Method		Elongation < 50%		Elongation >= 50%	
		N	LBS	N	LBS
Grab Strength	D4632	1100	250	700	160
Sewn Seam Strength	D4632	990	220	630	140
Tear Strength	D4533	400	90	250	56
CBR Punc. Strength	D6241	3500	800	1780	400

- D. Geotextile Drainage Sock: The geotextile sock shall meet or exceed the requirements of ASTM D6707. Sock shall be knit of polymeric materials, exhibit minimum snag, or run potential, be factory-applied so as to maintain uniform installed mass, and conform to the outside diameter of the tubing with a snug fit

throughout.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify subgrade has been inspected, gradients and elevations are correct, surface is dry, and ready to receive Work.
- B. Verify subgrade beneath pavement and structures have been prepared in accordance with Section 31 23 13 – Subgrade Preparation.

3.02 PLACEMENT FOR PAVEMENT

- A. Install in accordance with manufacturer's instructions. Install in accordance with manufacturer's instructions.
- B. Install in the location as indicated on drawings.
- C. Place the geosynthetic on a surface that is smooth and free of stones, sticks, and other debris or irregularities that could damage the geosynthetic.
- D. The geotextile shall be laid out smooth without wrinkles or folds on the prepared subgrade in the direction of the construction traffic. If sewn, place geosynthetic with all seams up.
- E. Unroll geosynthetic parallel to the centerline of the road. Place the geosynthetic taut and pin the geosynthetic using pins at least 6 inches in length. Place pins at all corners and at 15-foot intervals along all edges, before placing material on the geosynthetic.
- F. Adjacent geotextile rolls shall be overlapped a minimum of 2.5-feet; ends of rolls shall be overlapped 3 feet.
- G. On curves, the fabric may be folded or cut to conform to the curves. The fold or overlap shall be in the direction of construction and shall be held in place by staples, pins or aggregate piles.
- H. If placement of the backfill causes damage to the geotextile, the damaged area shall be repaired. Patch damaged areas by overlapping the tear a minimum of 3-feet with geosynthetic and secure the perimeter of the patch area with pins or staples. Patched area shall overlap on all edges by at least 2.5-feet.
- I. After laydown, cover geosynthetic material within 5 days. Remove and replace material that is not covered within 5 days.
- J. The aggregate base material shall be placed by end dumping onto the geotextile from the edge or over previously placed base aggregate. Construction equipment will not be allowed directly on the geotextile fabric.
- K. A minimum of 6 inches of aggregate must be placed on the geotextile prior to the movement of construction equipment above the fabric.
- L. Turning movements must be carefully monitored to avoid rutting of the aggregate. Any ruts occurring during construction shall be filled with additional

gravel aggregate and compacted to the specified density.

3.03 PLACEMENT BENEATH TRENCHES OR STRUCTURES

- A. Install in accordance with manufacturer's instructions.
- B. Install in the location as indicated on drawings.
- C. Geotextile panels shall be oriented parallel with proposed aggregate placement activities and occur in such a manner that the overall number of individual panels are kept to a minimum.
- D. As placed, individual panels of geotextile should have a width equal to or greater than 12 feet.
- E. Contractor shall overlap longitudinal and butt seams of adjacent panels a minimum of 18 inches with such joints oriented to follow initial construction traffic (shingles profile with traffic).

3.04 FIELD QUALITY CONTROL

- A. Section 01 45 00 – Quality Control: Field inspection.

END OF SECTION

SECTION 31 05 23
CEMENT AND CONCRETE FOR EARTHWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Controlled low strength material (CLSM) for use in the following:
 - 1. Flowable Fill or Controlled Density Fill (CDF) for pipe trenching/bedding or as indicated on the drawings.

1.02 REFERENCES

- A. Reference Standards
 - 1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification unless a date is specifically cited.
- B. ASTM International (ASTM):
 - 1. C31 - Standard Practice for Making and Curing Concrete Test Specimens in the Field.
 - 2. C33 - Standard Specification for Concrete Aggregates.
 - 3. C39 - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
 - 4. C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
 - 5. C231 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
 - 6. C260 - Standard Specification for Air-Entraining Admixtures for Concrete.
 - 7. C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

1.03 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements for submittal procedures.
- B. All submittals shall be approved by the City prior to delivery and/or fabrication for specials.
- C. Controlled Low Strength Material (CLSM):
 - 1. Certified mix design and test results. Include material types and weight per cubic yard for each component of mix along with 2-day and 28-day compressive strength in accordance with ASTM D4832.
 - 2. For Native Soil Used in Production of CLSM: Certified test results and reports from independent testing agency (quality control) along with 2-day and 28-day compressive strength in accordance with ASTM D4832. Provide results of laboratory classification and corrosion testing along with description of sample location (referenced to the Project stationing) for each native soil sample obtained.

PART 2 PRODUCTS.

2.01 CONTROLLED LOW STRENGTH MATERIAL (CLSM)

- A. Select and proportion ingredients to obtain compressive strength between 50 psi and 150 psi at 28 days in accordance with ASTM D4832.
- B. Materials:
 1. Portland Cement: ASTM C150, Type V (or Type II/V) up to 75 pounds per cubic yard
 2. Aggregate: Concrete sand, processed material from the excavation, imported sand, or a combination thereof meeting the grading requirements of ASTM C33 sand for fine aggregate. A combination of ASTM C33 fine aggregate and Table 2 size 7 or 8 coarse aggregate is also acceptable. The soluble sulfate content shall not exceed 0.3 percent by dry weight.
 3. Fly Ash: Class C or Class F per ASTM C618, up to 300 pounds per cubic yard.
 4. Admixture: Air entraining admixture in accordance with ASTM C260.
 5. Water: Clean, potable, containing less than 500 ppm of chlorides.
- C. Mixes
 1. Performance requirements
 2. Total calculated air content
 - 1) Not less than 8.0 percent or greater than 12.0 percent.
 - b. Minimum unconfined compressive strength
 - 1) Not less than 50 psi measured at 28 days.
 - c. Maximum unconfined compressive strength
 - 1) Not greater than 150 psi measured at 28 days.
 - 2) Limit the long-term strength (90 days) to 200 psi such that material could be re-excavated with conventional excavation equipment in the future if necessary.
 - d. Wet density
 - 1) No greater than 132 pounds per cubic foot.
 - e. Color
 - 1) No coloration required unless noted.
 - 2) Submit dye or other coloration means for approval.
 3. Suggested design mix

Material	Weight	Specific Gravity	Absolute Volume Cubic Foot
Cement	30 pounds	3.15	0.15
Fly Ash	300 pounds	2.30	2.09
Water	283 pounds	1.00	4.54
Coarse Aggregate	1,465 pounds	2.68	8.76
Fine Aggregate	1,465 pounds	2.68	8.76
Admixture	4-6 ounces	-	2.70
TOTAL	3,543 pounds	-	27.00

PART 3 EXECUTION

3.01 PLACEMENT OF CLSM

- A. The aggregate, cement, and water shall be proportioned either by weight or by volume. The water content shall be sufficient to produce a fluid, workable mix that will flow and can be pumped without segregation of the aggregate while being placed. Prepare CLSM in accordance with ASTM C94.
- B. Provide batching equipment to obtain the proper weights of soil, cement, water, and admixtures. All measuring devices should be sensitive to a 2 percent variation above or below the actual weights required. Volumetric batching may be used, provided the same accuracy required for weight batching is maintained.
- C. Design and operate the mixtures used for mixing the CLM so that the CLSM as discharged from the mixer is uniform in composition and consistent throughout each batch.
- D. Place the CLSM such that it flows easily into all open spaces and voids between the pipe and the excavated trench. In some cases, such as trenches on a slope, a stiffer mix may be required to prevent it from flowing down the trench. In this case, use vibration to be sure that the CLSM completely fills all open spaces and voids.
- E. Lay the pipe on the sandbags and place the CLSM bedding as shown on Drawings. Bedding shall be placed under pipe from one side and vibrated, as necessary, so that it flows under the pipe until it appears on the other side. CLSM shall then be added to both sides of the pipe and vibrated until it completely fills the space between the pipe and the excavated trench bottom. This operation shall follow as closely behind pipelaying operations as possible. Place CLSM in such a way as to prevent uplift or buckling of the pipe. CLSM shall be deposited as nearly as practicable in its final position and must in no way disturb the pipe trench or cause foreign material to become mixed with the cement slurry. CLSM shall be deposited into the trench to fill the voids when the shoring is removed.
- F. Do not place and compact pipe zone backfill around the pipe until the CLSM has reached the initial set. Place and maintain a 6-inch cover of moist backfill cover until additional backfill is placed. If the ambient temperature is 40 degrees F or less, an additional 6-inch cover of backfill shall be placed over the 6-inch moist backfill cover prior to the end of the working day.
- G. Whenever freezing temperatures are imminent, maintain the CLSM at a temperature of not less than 50 degrees F for 7 days after placement. The temperature of the mix shall be 50 degrees F or greater at the time of placement. The temperature shall be monitored by placing a thermometer in the CLSM immediately after sampling at the placement site. When freezing weather appears imminent, make ready at the placement site materials which may be required for protection of CLSM. Placement of CLSM shall be delayed until adequate provisions for protection against weather are made.
- H. No CLSM bedding shall be placed in pipe trenches when the trench bottom or walls are frozen or contain frozen material. Backfill placed as cover over the

CLSM is prohibited from containing any frozen material.

3.02 INSTALLATION

3.03 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Requirements for additional requirements.
- B. CLSM Mix Design Information Required:
 - 1. If the Contractor elects to utilize select earthfill in place of, or in conjunction with, commercial aggregate in CLSM, the Contractor shall obtain samples of each principal type of select earthfill anticipated to be used in CLSM, as discussed previously, and submit a mix design for each principal type of select earthfill that conforms with the requirements for CLSM.
 - 2. Additional mix designs shall be submitted during the Work if the material to be used as select earthfill in CLSM deviates from the submitted samples as determined by the Contractor or the Engineer, or if other CLSM mix components are modified.

END OF SECTION

SECTION 31 10 00
SITE CLEARING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Grubbing.
- C. Scalping.
- D. Stripping.
- E. Topsoil removal.
- F. Stockpiling of materials.
- G. Stockpile cleanup.
- H. Disposal of waste materials.
- I. Removal of existing debris

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions, apply to work of this section.
- B. Section 01 50 00 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.
- C. Division 31 - Earthwork.
- D. Section 32 97 00 - Restoration of Disturbed Areas.

1.03 SUBMITTALS

- A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.
- B. Site Plan:
 - 1. Showing: Areas for temporary construction and field offices.

1.04 SEQUENCING AND SCHEDULING

- A. Prepare Site only after adequate erosion and sediment controls are in place.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Topsoil: Refer to Section 31 05 13.

PART 3 EXECUTION

3.01 PROTECTION

- A. Locate, identify, and protect utilities that remain from damage.

- B. Protect trees, plant growth, and features designated to remain, as final landscaping.
- C. Protect benchmarks, survey control points, and existing structures from damage.
- D. Prevent surface water and subsurface or groundwater from entering excavations, from ponding on prepared subgrades and from flooding site and surrounding area.
- E. Contractor shall repair or replace, to original condition or better, existing structures and improvements, flora, and landscaping damaged or injured during construction operations. Contractor shall understand the sensitive nature of working on or near developed property and shall endeavor to limit injury or damage both inside the limits of construction and outside the limits of construction.
- F. Protect existing trees and other vegetation indicated to remain from unnecessary cutting, breaking, skinning of roots, skinning and bruising of bark, smothering of trees, by stockpiling construction materials or excavated materials within the drip line, excess foot of vehicular traffic, or parking of vehicles within drip line.
- G. Protect wetlands, rivers, streams, and other waters of the state from all construction activities and contamination by erosion and runoff.
- H. Protect areas that have been finish graded from subsequent construction operations, traffic, and erosion. Remove, provide new, and compact as required, material contaminated by erosion and runoff

3.02 SITE CLEARING

- A. Comply with other requirements specified in Section 01 70 00.
- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

3.03 VEGETATION

- A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.
- B. Do not begin clearing until vegetation to be relocated has been removed.
- C. Do not remove or damage vegetation beyond the limits indicated on drawings.
- D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
 - 1. At vegetation removal limits.
- E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

- F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
 - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
 - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 24 inches.
 - 3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- G. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.04 GRUBBING

- A. Grub the areas 2 ft below natural ground, within the limits of clearing, of all stumps, roots, buried logs, and all other underground obstructions.
- B. Stumps, roots, and non-perishable solid objects may remain in cleared areas of embankment:
 - 1. 2 ft or more above the natural ground
 - 2. at least 2 ft away outside pavement and structures.
- C. Completely grub stumps and roots where a structure is to be constructed, piles are to be driven, or unsuitable material is to be removed.
- D. Backfill all stump holes, cuts, depressions, and other holes resulting from clearing and grubbing within areas to receive embankment.

3.05 SCALPING

- A. Do not remove sod until after clearing and grubbing is completed and resulting debris is removed.
- B. Scalp arfeas within limits shown or specified.

3.06 STRIPPING

- A. Do not remove topsoil until after scalping is completed.
- B. Strip areas within limits to minimum depths shown or specified. Do not remove subsoil with topsoil.
- C. Stockpile strippings, meeting requirements of Section 32 91 13, Soil Preparation, for topsoil, separately from other excavated material.

3.07 TOPSOIL REMOVAL

- A. Remove existing grass and 2" of soil inside area to be disturbed or excavated by Contractor. Protect existing tree roots.
- B. Where trees are to be left standing, stop topsoil stripping a sufficient distance (at least the drip line) from a tree to prevent damage to main root system.

- C. All topsoil shall be stripped to full depth and stockpiled separately to be placed on top of finished grading and all disturbed areas not covered by hardscape such as pavement or gravel, structures or foundations, or landscape rock.
- D. Topsoil removal shall take place immediately before pavement, structure or pipe installation and shall be replaced immediately following installation.
- E. Separate all debris, large roots, and rocks greater than 1-inch from the topsoil and remove from the site in accordance with all applicable Federal, State, and Local regulations to Contractor finished site.

3.08 STOCKPILING OF MATERIALS.

- A. Contractor may temporarily stockpile acceptable materials including topsoil, excess excavated, and delivered materials within the limits of construction where shown on the Drawings. Contractor shall obtain approval from Engineer before stockpiling excess materials.
- B. Stockpile in sufficient quantities to meet Project schedule and requirements.
- C. Separate differing materials with dividers or stockpile apart to prevent mixing.
- D. Direct surface water away from stockpile site to prevent erosion or deterioration of materials.
- E. Apply appropriate erosion control measures to stockpile areas.

3.09 STOCKPILE CLEANUP

- A. Contractor shall remove all excess stockpiles from the site prior to substantial completion of the project.
- B. Remove stockpile; leave area in a clean and neat condition. Grade site surface to prevent freestanding surface water.
- C. Restore stockpile area in accordance with Section 32 97 00 – Restoration of Disturbed Areas.
- D. Temporary Stockpile Area:
 - 1. Contractor shall place material from excavations onsite in are coordinated with Owner.
 - 2. Excess topsoil shall be removed from project site and disposed of in Contractor furnished disposal area.

3.10 DISPOSAL OF WASTE MATERIALS

- A. Remove all clearing and grubbing debris from the site in accordance with the Contract Documents and all permits and regulations. Burning shall not be allowed.

3.11 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

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SECTION 31 22 00
GRADING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Rough Grading
- B. Finish Grading
- C. Topsoil Placement

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 23 13 – Subgrade Preparation.
- I. Section 31 23 16 – Excavation.
- J. Section 31 23 16.13 – Trenching and Backfill.
- K. Section 31 23 19 – Dewatering.
- L. Section 31 23 23 - Fill and Backfill.
- M. Section 31 25 00 – Erosion and Sediment Controls.
- N. Section 31 41 00 – Shoring.

1.03 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

1.04 QUALITY ASSURANCE

- A. Perform Work in accordance with State of North Dakota, Highway Department standards.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Subsoil and Topsoil: See Section 31 05 13.
- B. Aggregate Fills: As specified in 31 05 16.

2.02 SOURCE QUALITY CONTROL

- A. Conduct tests on each material proposed for use prior to start of soils work. Refer to Section 01 45 00 and Section 31 05 13 for source test requirements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmark and intended elevations for the Work are as indicated.
- B. Verify the absence of standing or ponding water.
- C. Verify structure and trench backfilling have been inspected.
- D. Verify subgrade base has been contoured and compacted.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Provide temporary means and methods to remove all standing or ponding water from areas prior to grading.
- D. Provide proper erosion and sediment control for all grading operation.
- E.
- F. Remove material contaminated by erosion and runoff, provide new material and compact.

3.03 ROUGH GRADING

- A. Uniformly grade areas within limits of grading under this Section, including adjacent transition areas. Smooth finish surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.
- B. Grade surface of fill under structures and slabs to required density, free of voids, and to required elevations.
- C. Rough grade areas adjacent to structure lines to drain away from structures and to prevent ponding or increase in soil lateral pressure on the structure.

3.04 FINISH GRADING

- A. Contractor shall provide the degree of finish grading that will be normally obtainable through the use of suitable equipment operated under favorable conditions and by an experienced operator. Deviations from the required tolerance shall be corrected by the Contractor at no additional cost to the Owner.

3.05 TOPSOIL PLACEMENT

- A. Place topsoil in areas where seeding and restoration is required to a nominal depth of 6- inches unless indicated otherwise on drawings.
- B. Place topsoil during dry weather. Use imported topsoil as a supplement to stockpiled topsoil only when a 6-inch depth is unable to be maintained.
- C. Use imported topsoil as a supplement to stockpiled topsoil only when a 6-inch depth is unable to be maintained.
- D. Drag top-soiled areas to remove wheel tracks and provide a uniform texture and appearance.
- E. Fine grade topsoil to eliminate rough or low areas. Maintain profiles and contour of subgrade. Finish grades shall allow for proper drainage without ponding. Remove roots, weeds, rocks, and foreign material while spreading.
- F. Remove roots, weeds, rocks, and foreign material while spreading. Manually spread topsoil close to plant life and buildings to prevent damage.
- G. Manually spread topsoil close to plant life and buildings to prevent damage. Lightly compact placed topsoil.
- H. Lightly compact placed topsoil.

3.06 TOLERANCES

- A. Top of Topsoil: Plus or minus 1 inch.

3.07 FIELD QUALITY CONTROL

- A. See Section 31 23 23 for compaction density testing.

END OF SECTION

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SECTION 31 23 13
SUBGRADE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Scarifying, compacting, and shaping the earth subgrade below pavements and levee embankments.
- B. Subgrade preparation shall apply to all paved and graveled areas, including roads, driveways, parking areas, and sidewalks.
- C. Subgrade preparation shall apply to all areas beneath levee embankments.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 22 00 – Grading.
- I. Section 31 23 16 – Excavation.
- J. Section 31 23 16.13 – Trenching and Backfill.
- K. Section 31 23 19 – Dewatering.
- L. Section 31 23 23 – Fill and Backfill.
- M. Section 31 25 00 – Erosion and Sediment Controls.
- N. Section 31 41 00 – Shoring.

1.03 REFERENCE STANDARDS

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012, with Editorial Revision (2015).

1.04 SEQUENCING AND SCHEDULING

- A. Complete applicable Work specified in Section 31 10 00, Site Clearing; and Section 31 23 16, Excavation, prior to subgrade preparation.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.

- B. Compaction Density Test Reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Suitable Soil Materials per Section 31 05 13 at locations indicated per Section 31 23 23.
- B. Other Materials: Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to approval of the Engineer.

PART 3 EXECUTION

3.01 GENERAL

- A. Perform subgrade preparation on area beneath levee embankment.
- B. Perform subgrade preparation on all areas to receive concrete pavement, aggregate base course, and/or aggregate surface course.
- C. Subgrade preparation is required only in areas of cohesive subgrade soils. In areas where select granular fill has already been installed to finished subgrade elevation, subgrade preparation shall not be required.
- D. Subgrade Preparation shall consist of producing a firm and stable subgrade prior to placement of the surface or base course.

3.02 LEVEE SUBGRADE PREPARATION

- A. Levee embankment material shall not be placed on surfaces that are muddy, frozen, contain frost, or where unsatisfactory material remains in or under the fill.
- B. All soft or yielding material and other portions of the subgrade which will not readily compact shall be removed and replaced with suitable material in accordance with Section 31 05 13 – Soils for Earthwork at locations per 31 23 23 – Fill and Backfill.
- C. The entire subgrade shall then be brought to a line and grade and foundation of uniform compaction which will provide uniform support for fill embankments to be subsequently placed.
- D. The subgrade shall be scarified to a depth of six (6") inches for the full width of the subgrade. The loose materials shall then be spread and manipulated so as to bring all the material to a uniform density.

3.03 PAVEMENT SUBGRADE PREPARATION

- A. The Contractor shall compact and shape the subgrade for its full width as may be necessary to produce, at the time the base course is placed, the required density in the upper 12-inches of the base and the required grade and cross-section.
- B. Contractor shall be responsible for proper moisture conditioning of subgrade soils to obtain the required density. Contractor shall also be responsible for grading the Work area and providing drainage so that accumulating water will drain away from the subgrade.
 - 1. Dry subgrade: Add water, then mix to make moisture content uniform throughout.
 - 2. Wet subgrade: Aerate material by blading, disking, harrowing, or other methods to hasten drying process.
 - 3. After general site stripping and excavation has been completed, exposed soils beneath pavement areas should be observed by the geotechnical engineer or his representative to identify the appropriate means of preparing the exposed subgrade prior to placing structural fill or base material. Depending on stability of subgrade, proof-rolling may be recommended.
 - a. If recommended, subgrade shall be proof-rolled with a tandem axle dump truck loaded to at least 25-ton weight. Truck shall traverse the pavement footprint to detect areas of loose or soft soils as observed by the geotechnical engineer or his representative.
 - b. Loose or soft soils shall be defined as soils exhibiting "excessive rutting" from the truck tires (approximately 1-inch) wheel rut depth.
 - 4. Soft or unstable soils encountered during proof-rolling should be over-excavated and replaced with soil in accordance with Section 31 05 13 – Soils for Earthwork at locations per 31 23 23 – Fill and Backfill.
 - a. The over-excavation depth should extend to competent soil as assessed by the geotechnical engineer.
 - 5. Following proof-rolling, the exposed subgrade soils should be scarified to a minimum depth of 6 inches, moisture-conditioned to near optimum moisture content (+/- 3 percent of optimum) and compacted to a minimum of 95 percent of the maximum dry density.
- C. The finished subgrade surface shall be smooth and uniform and shall not rut, shove, flex, or displace when any construction equipment is placed on it.
- D. The required grade and cross-section for subgrades shall consist of a smooth subgrade surface that conforms to the prescribed elevations for the particular subgrade being prepared, prior to constructing an additional course thereon. The required grade and cross-section for rough graded surfaces shall consist of a smooth graded surface that conforms to the prescribed elevations for that particular rough grade being prepared. The prescribed elevation for any point on the subgrade or rough graded surfaces shall be as determined from the grades staked by the Engineer.
- E. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations, vehicular traffic, or weather

conditions.

3.04 TOLERANCES

- A. Finish pavement subgrade surfaces shall not deviate by more than 1/2 inch from the required section and grade.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Control, for additional requirements.
- B. Where recommended, the pavement subgrade shall be proof rolled.
- C. Surface or base course and embankment fill shall not be placed on subgrades until the subgrade has been tested and Contractor has proven that the requirements specified herein have been met. Upon completion of a successful test, Contractor shall maintain the subgrade and repair any damage prior to placing subsequent materials.
- D. If tests indicate work does not meet specified requirements, remove work, replace, and retest.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.
- B. Excavation for levee inspection trench.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 22 00 – Grading.
- I. Section 31 23 13 – Subgrade Preparation.
- J. Section 31 23 16.13 – Trenching and Backfill.
- K. Section 31 23 19 – Dewatering.
- L. Section 31 23 23 – Fill and Backfill.
- M. Section 31 25 00 – Erosion and Sediment Controls.
- N. Section 31 41 00 – Shoring.

1.03 REFERENCES

- A. 29 CFR 1926 - Safety and Health Regulations for Construction Current Edition.

1.04 SEQUENCING AND SCHEDULING

- A. Clearing, Grubbing, and Stripping: Complete applicable Work specified in Section 31 10 00, Site Clearing, prior to excavating.
- B. Dewatering: Conform to applicable requirements of Section 31 23 19, Dewatering, prior to initiating excavation.
- C. Excavation Support: Install and maintain, as specified in Section 31 41 00, Shoring, as necessary to support side of excavations and prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Bedding and Fill to Correct Over-Excavation:
 - 1. See Section 31 23 23 for bedding and corrective fill materials at general excavations.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmark and intended elevations for the work are as indicated.
- B. Survey existing adjacent structures and improvements and establish exact elevations at fixed points to act as benchmarks.
- C. Determine the prevailing groundwater level prior to excavation. If the proposed excavation extends less than 1 foot into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by Engineer. If the proposed excavation extends more than 1 foot into the prevailing groundwater, control groundwater intrusion with a comprehensive dewatering procedure, or as directed by Geotechnical Engineer.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 10 00 for clearing, grubbing, topsoil removal, and removal of existing debris.
- C. Locate, identify, and protect utilities that remain and protect from damage.
- D. Notify utility company to remove and relocate utilities.
- E. Protect benchmarks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

- A. See Section 31 41 00 – Shoring.

3.04 EXCAVATION DEWATERING

- A. Provide temporary means and methods, as required, to remove all water from excavations per Section 31 23 19 – Dewatering.

3.05 COMMON EXCAVATION

- A. Excavate to accommodate construction operations.

1. Excavate to the specified elevations.
 2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
 - C. Do not interfere with bearing splay of foundations.
 - D. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume.
 - E. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
 - F. Protect excavation bottoms from freezing. Remove frozen materials and provide unfrozen compacted materials prior to placement of materials on them.

3.06 LEVEE INSPECTION TRENCH EXCAVATION

- A. Prior to starting the construction of the levee in its permanent location, the Contractor shall excavate an inspection trench along the total length of the proposed levee centerline per the detail shown in the plans.
- B. Any pipes, tiles, conduits, buried debris, or other unsatisfactory foundation materials encountered shall be removed from within the footprint of the embankment.
- C. The Contractor shall notify the Engineer 48 hours prior to the start of this work.
- D. The inspection trench shall be excavated and maintained free of standing water to the dimensions and locations shown on the plans.
- E. The excavated material may be used for backfill only if it meets the requirements for Impervious Fill per Section 31 05 13 – Soils for Earthwork.

3.07 STRUCTURAL EXCAVATION

- A. Remove unsuitable materials in accordance to the depth recommended by soils testing laboratory beneath structures to obtain the design bearing capacity. Remove unsuitable materials in accordance to the depth recommended by soils testing laboratory beneath structures to obtain the design bearing capacity.
 1. Do not bear any structure partially on bedrock and partially on more compressible soils. Remove bedrock materials and replace them with clean compacted sand or gravel in accordance to the Geotechnical Report. The minimum depth of compacted sand or gravel is 6-inches.
 2. Do not bear any structure on wet silt material. Over-excavate a minimum 2-feet below the bottom of footing and replace with compacted granular fill or as Indicated on the Construction Drawings, compacted to the requirements in Section 01 45 00.
 3. Dewater excavations for special inspector to observe and determine excavation limits.

4. When bottoms of excavations are approved by soils testing laboratory, but are slightly unstable only in relation to Contractor operations or convenience, Contractor may provide a compacted gravel course utilizing materials acceptable to the soil testing laboratory. Such work shall be considered for the Contractor's convenience and at Contractor's own expense.
- B. Slope sides of excavations as required to provide stability and to comply with Federal, State and local laws and regulations. Shore and brace excavation when required by project conditions.
1. Utilize cofferdams, steel sheet piling, shoring, underpinning, and other systems required to prevent damage to existing structures, settlement, slope stability problems, and undermining.
 2. Remove construction related protection systems after their need is complete, in a manner that will not loosen or damage soils, create slope stability problems, and otherwise damage existing and new structures.
 - a. Leave construction-related protection systems in place when their removal would create potential for damage to the soil conditions or to structures.
- C. Excavate to required elevations and dimensions within a tolerance of plus or minus 1 inch, and extending a sufficient distance as required to provide for the work, completion of the structures, observation, and testing.
1. When excavating for footings and foundations, do not disturb soil materials at and below excavation limits. Excavate by hand when necessary to prevent damage to soil materials that will remain.
 2. Trim bottoms to required lines and grades to leave solid dense base of required bearing capacity.
 3. Final removal limits shall be approved by soil testing laboratory prior to concrete placement.
- D. Removal of materials beyond required subgrade elevations or dimensions without specific approval of soils testing laboratory as well as backfilling, compaction and remedial work recommended by soils testing laboratory at the over-excavated area shall be at Contractor's own expense.
1. Under structures and their components fill unauthorized excavation utilizing one of the following systems:
 - a. Extend indicated bottom elevation of footing or base to excavation bottom, without altering required top elevation.
 - b. Install lean concrete fill to bring elevations to required position.
 - c. Fill and compact unauthorized excavations with soil materials and to required density.
 2. Elsewhere, backfill and compact unauthorized excavations as indicated for authorized excavations of same classification.
- E. Protect excavation bottoms from freezing. Remove frozen materials and provide unfrozen compacted materials prior to placement of materials on them.
- F. Excavations of structures shall be widened one foot horizontally beyond the outer edges of the building perimeter footings for each foot the excavations extend below bottom-of-footing elevations.

- G. It is possible that the excavation bottom for any structure may consist of fat clay. These clays shall be maintained within the prescribed moisture content range until successive layers are placed over them. Thus, if the placement of backfill and fill is slowed or delayed during dry or wet weather, re-conditioning of the placed backfill, fill and natural soils may be necessary.
- H. Prior to the placement of engineered fill or construction of structures, any loosened granular materials shall be surface compacted using a vibratory plate compactor. In areas where groundwater is within 3 foot of the subgrade this requirement may be waived in the field by the Engineer if it is found the compaction is pumping up water or creating a temporary "quick" condition and the soils are otherwise suitable for support of the foundations. Areas that yield or pump during surface compaction may require additional subcutting.

3.08 FILLING AND BACKFILLING

- A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.
- B. See Section 31 23 23 for fill and backfill requirements.
- C. See Section 31 23 16.13 for trenching and backfill requirements.

3.09 REPAIR

- A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 23 23.

3.10 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Provide for visual inspection of load bearing excavated surfaces by Engineer before placement of foundations.

3.11 CLEANING

- A. Stockpile excavated material to be re-used in area designated on site in accordance with Section 31 10 00.
- B. Remove excavated material that is unsuitable for re-use from site.
- C. Remove excess excavated material from site.

3.12 PROTECTION

- A. Divert surface flow from rains or water discharges from the excavation.
- B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

- D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.
- E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION

SECTION 31 23 16.13
TRENCHING AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Excavating trenches for utilities.
- B. Compacted bedding and fill of utilities to subgrade elevations.
- C. Backfilling and compaction requirements for trenches.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 22 00 – Grading.
- I. Section 31 23 13 – Subgrade Preparation.
- J. Section 31 23 16 – Excavation.
- K. Section 31 23 16.13 – Trenching and Backfill.
- L. Section 31 23 19 – Dewatering.
- M. Section 31 23 23 – Fill and Backfill.
- N. Section 31 25 00 – Erosion and Sediment Controls.
- O. Section 31 41 00 – Shoring.

1.03 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

- A. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)); 2012, with Editorial Revision (2015).
- B. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.

- C. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2017.

1.05 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.
- B. Materials Sources: Submit name of imported materials source.
- C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- D. Compaction Density Test Reports.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, coordinate location of stockpile with Engineer and Owner.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 GENERAL

- A. Granular materials provided for foundation, bedding, encasement, and backfill or other purposes shall consist of any natural or synthetic mineral aggregate such as sand, gravel, crushed rock, or slag, which shall meet the gradation requirements specified herein for each specific use.
- B. Granular materials provided for foundation, bedding, encasement, or backfill use shall be classified by use in accordance with the following requirements.

2.02 PIPE FOUNDATION

- A. Pipe foundation shall be placed below the bottom of the pipe bedding as replacement for unsuitable or unstable soils to provide better pipe support or in areas of high groundwater. Location and minimum depth as indicated on Construction Drawings.
- B. Pipe foundation material shall be Foundation Rock per Section 31 05 16 – Aggregates for Earthwork.

2.03 PIPE BEDDING

- A. Pipe bedding shall be placed below the pipe invert, prior to pipe installation to facilitate proper shaping and achieve uniform pipe support. Minimum depth as indicated on the Construction Drawings.
- B. Pipe Bedding material shall be as indicated below per Section 31 05 16 – Aggregates for Earthwork.

1. PVC and DIP: Aggregate Class 3M or Aggregate Special Class 6

2.04 PIPE HAUNCHING

- A. Haunching Material shall be placed below the pipe spring line to pipe bedding, following pipe installation to facilitate proper uniform pipe support. Minimum depth as indicated on Construction Drawings.
- B. Haunching material shall be as indicated below per Section 31 05 16 – Aggregates for Earthwork.

1. PVC and DIP: Aggregate Class 3M or Aggregate Special Class 6

2.05 PIPE COVER AND INITIAL BACKFILL

- A. Extends from the spring line to a point 6" min. above the top of the pipe. This zone provides some pipe support and helps to prevent damage to the pipe during placement of the final backfill. The cover extends from the top of the pipe to the top of the initial backfill. The depth of cover should be as much as necessary to protect the pipe during placement of the final backfill. Twelve inches is a common depth of cover.
- B. Cover and Initial Backfill material shall be as indicated below per Section 31 05 16 – Aggregates for Earthwork.

1. PVC and DIP: Aggregate Class 3M or Aggregate Special Class 6

2.06 TRENCH BACKFILL

- A. Fill Beneath Levee Embankment and Levee Inspection Trench: Impervious Fill (Type S5) per Section 31 05 13 – Soils for Earthwork.
- B. Beneath Structures, Manholes or Vaults: Engineered Fill per Section 31 05 16 – Soils for Earthwork.
- C. Controlled Lower Strength Material (CLSM): where indicated on the drawings per Section 31 05 23 – Cement and Concrete for Earthwork.
- D. Fill Beneath Pavement: Engineered Fill (Type S1) per Section 31 05 16 – Soils for Earthwork.
- E. Clay Cap Beneath Pavement: Select Fill (Type S2) per Section 31 05 16 – Soils for Earthwork.
- F. Fill Beneath Landscape, Lawn, or Cultivated Areas: General Fill (Type S3) per Section 31 05 13 – Soils for Earthwork.
- G. Topsoil Fill: As specified in Section 31 05 13 - Soils for Earthwork.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmarks and intended elevations for the work are as indicated.
- B. Examine and verify subgrade is ready for subsequent work.

3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 22 00 for additional requirements.
- C. Grade top perimeter of trenching area to prevent surface water from draining into trench. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by the Engineer.

3.03 EXCAVATING

- A. Clear site, vegetation, and strip topsoil in accordance with Section 31 10 00 – Site Clearing.
- B. Excavate trench to alignment and grade as required to meet foundation and bedding requirements as specified. Trench shall be centered on pipe alignment and no more than 100-feet of trench should be excavated in advance of pipe laying operations.
- C. The trench width may vary and depend on the depth of trench, the diameter of pipe to be laid, and the nature of the material to be excavated, but in any case, shall be of ample width to allow the pipe to be laid and joined properly and the backfill to be placed and compacted properly. The minimum bottom width of unsheeted trench shall be 18-inches. The maximum clear width of trench at the top of the pipe shall be not more than 32- inches greater than the outside diameter of the pipe for pipes 30-inches diameter and larger, or 18-inches greater for pipe under 30-inches in diameter. Wider trench widths at the top of the pipe shall be subject to approval by Engineer. The width of the trench at the ground surface shall be kept to a minimum to prevent unnecessary disruption of service structures.
- D. If the trench width at the pipe zone is excavated to a greater width than the maximum, the Engineer may require the Contractor to provide a higher class of bedding and/or higher strength pipe that that required by the Contract Documents in order to satisfy pipe design requirements. In such case, no additional compensation shall be made for the higher- class bedding or higher strength pipe.
- E. Trench excavation shall be made by open cut methods. Trench sides shall be as vertical as possible and the trench shall be braced, sheeted, and drained such that the work may be performed safely in accordance with OSHA requirements per Section 31 41 00 - Shoring.
- F. Sheet piling, shoring, and bracing shall be put in place and maintained as required due to soil stability or site constraints per Section 31 41 00 - Shoring. Shoring, sheet piling, and bracing shall be provided to prevent disturbance or settlement of adjacent surfaces, structures, foundations, utilities, and other properties. Any damage to the work under contract or to existing adjacent structures or other improvements caused by settlement, water or earth pressures, slides, cave-ins, or other causes due to lack of appropriate sheet piling, shoring, or bracing shall be

repaired at the Contractor's expense at no delay.

- G. Trench sheeting, shoring, and bracing shall be kept in place until pipe has been laid, tested for defects, and repaired if necessary, and the earth around the pipe is compacted. The sheeting, shoring, and bracing shall be removed in such a manner as not to remove the constructed pipe or adjacent structures or other improvements.
- H. It shall be the Contractor's responsibility for proper and adequate placement of sheeting, shoring, and bracing in accordance with all applicable regulations and standards.
- I. Whenever unsuitable or unstable soil for properly supporting the pipe or structures is encountered, a further depth and/or width shall be excavated and replaced with the foundation material specified herewith or other suitable foundation material and thoroughly compacted to assure a firm foundation for the pipe.
- J. Stockpile excavated material in an orderly manner, at sufficient distance from the trench to avoid overloading, to prevent slides and cave-ins.
- K. Contractor shall advise Engineer immediately if any unsuitable materials are encountered during excavation. Unsuitable materials shall be reasonably separated from suitable materials.
- L. If Contractor encounters excess excavation materials which meet the requirements of common fill, Contractor may use those materials as fill in common execution and fill areas. Excess surplus materials shall be stockpiled.
- M. Excavate to and over-depth of a minimum of 6-inches below pipe in areas of bedrock or other extensive rock formations by jack hammer or other approved method.
- N. Remove unsuitable materials in accordance to the depth recommended by the soils testing laboratory beneath structures to obtain desired soil bearing capacity. Contractor shall notify Engineer prior to any additional excavation that is needed. Additional excavation shall be subject to approval by the Engineer.
- O. Removal of materials beyond required subgrade elevations or dimensions without specific approval from soils testing laboratory and Engineer as well as backfilling, compaction, and other work at the over excavated area shall be at the Contractor's own expense.
- P. Excavating and backfilling shall not be conducted in water. All excavations shall be maintained in a well-drained condition at all times per Section 31 23 19 - Dewatering.
- Q. Do not interfere with bearing splay of foundations. Underpin adjacent structures, as necessary, to prevent damage by excavation Work. Do not interfere with 45-degree bearing splay of foundations. Underpin adjacent structures, as necessary, to prevent damage by excavation Work.

- R. Hand trim for bell and spigot pipe joints. Remove loose matter.
- S. Remove lumped subsoil, boulders, and rocks up to 1/3-cubic-yard, measured by volume.
- T. In the event of shrinkage of excavated soils, resulting in shrinkage of backfill along trenches, Contractor shall provide, haul, place, and compact soil as suitable for trench from source at no cost to Owner.
- U. Stockpile excavated material in an orderly manner, at sufficient distance from the trench to avoid overloading, to prevent slides and cave-ins. Remove excess material not being used from site.

3.04 PIPE FOUNDATION

- A. Whenever unsuitable or unstable soil for properly supporting the pipe or structures is encountered, a further depth and/or width shall be excavated and replaced with the foundation material specified herewith or other suitable foundation material and thoroughly compacted to assure a firm foundation for the pipe.
- B. Installation of stabilization-separation geotextile will be required to foundation material and native subgrade materials if foundation material cannot provide a working surface or prevent soil migration
- C. Additional density testing may be required in unstable areas where unsuitable materials are found. Engineer shall determine stability of trench bottom.

3.05 PIPE BEDDING

- A. Trench bottom shall be cut true and even so that the barrel of the pipe will have a bearing over the full length. Bell holes shall be excavated to ensure the pipe is resting for its entire length on the bottom of the trench and required bedding.

3.06 TRENCH BACKFILLING

- A. Embedment Zone
 - 1. Should the materials available within the trench section be unsuitable or insufficient for this portion of the foundation, bedding, haunching, encasement, and initial backfill materials as defined in this Specification, Contractor shall provide an approved material that meets the appropriate specifications.
 - 2. Embedment zone backfill materials shall be placed with care and deposited uniformly on both sides of pipe throughout the entire trench width in maximum 8-inch lifts. Mechanically compact material to required densities.
 - 3. Placement and compaction of foundation, bedding, haunching, encasement, and initial backfill materials shall be considered incidental to the installation of the pipe and shall be in accordance with applicable pipe type and manufacturer's recommendations.

B. Trench Backfill - Intermediate and Final Backfill Zone

1. Use suitable excavated materials from the site prior to importing of Engineered, Select or General Fill material. Any additional borrow material required to be imported shall be provided by the Contractor at no additional cost to the Owner. Contractor shall separate out all unsuitable materials. Excess or unsuitable surplus materials shall be removed from the Site.
2. Provide replacement backfill as required to establish required subgrade elevation.
3. Place backfill materials in uniform layers no more the 8-inches loose depth. Mechanically compact each layer of material to required densities.
4. Do not backfill unless approved compaction equipment is operating. The method of means of placement and type of compaction equipment used is at the discretion of the Contractor, however, all portions of the trench backfill must meet the compaction requirements. Tests to determine the compacted density of the backfill may be ordered by the Engineer if the compaction does not appear to be adequate.
5. The intent of this specification is to compact the backfill sufficiently to prevent large settlements above the pipe, but to use as little effort as possible to avoid disturbing the pipe and bedding at the pipe zone.

C. Backfill trenches to contours and elevations with unfrozen fill materials.

D. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.

E. Aggregate Fill: Place and compact materials in equal continuous layers not exceeding 8- inches loose depth.

F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8- inches loose depth.

G. Employ a placement method that does not disturb or damage utilities in trench.

H. Prevent floatation of pipe.

I. Maintain optimum moisture content of fill materials to attain required compaction density. Use vibratory or special compaction equipment when required.

J. Remove surplus fill materials from site.

K. Leave fill material stockpile areas completely free of excess fill materials. Contractor shall have the responsibility to load, haul, and spread all excess fill off-site.

3.07 TOLERANCES

A. Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.

B. Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

3.08 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Control, for general requirements for field inspection and testing.
- B. Where in-place, soil material is required to be compacted to a percentage of maximum density. The maximum density at optimum moisture content will be determined in accordance with ASTM D698 – Standard Proctor.
- C. Contractor shall provide at least one (1) certified moisture-density relationship test from each different type of on-site native soils and imported material provided to the project site. Certified moisture-density relationship tests shall be performed in accordance with ASTM D698 (Standard Proctor) by the independent testing laboratory hired by the Contractor.
- D. Compaction Schedule:
 - 1. Pipe Foundation Rock: Compacted with vibratory plate compactor to produce stable working platform.
 - 2. Embedment Zone: 8-inch-thick loose lifts and compacted to minimum 95% of the maximum dry density.
 - 3. Intermediate Trench Backfill Beneath Pavement Areas: 8-inch-thick loose lifts and compacted to at least 95% of the maximum dry density. Moisture content at time of compaction near optimum (+/- 3%).
 - 4. Final Trench Backfill Beneath Pavement Areas (Clay Cap): 8-inch-thick loose lifts and compacted to at least 98% of the maximum dry density. Moisture content at time of compaction near optimum (+/- 3%).
 - 5. Intermediate and Final Trench Backfill Beneath Levee Areas: 8-inch-thick loose lifts and compacted to at least 95% of the maximum dry density. Moisture content at time of compaction near optimum (-1% to +3%).
 - 6. Intermediate and Final Trench Backfill Beneath Landscape Areas: 8-inch-thick loose lifts and compacted to at least 90% of the maximum dry density. Moisture content at time of compaction near optimum (+6%).
 - 7. Topsoil Fill: Loosely or lightly compacted. Refer to Section 31 22 00 – Grading for placement.
- E. Frequency Schedule:
 - 1. One in-place density test and one in-place moisture test per 100 linear feet of trench per 1-foot of lift under structures, embankments, and paved areas.
 - 2. One in-place density test and one in-place moisture test per 300 linear feet of trench per 2-feet of lift under landscaped, lawn or cultivated areas.
 - 3. For Trenches Wider Than 6 Feet: One in-place density test and one in-place moisture test per 1,000 square feet of trench per 1-foot of backfill under structures, embankments, and paved areas.
 - 4. For Trenches Wider Than 6 Feet: One in-place density test and one in-place moisture test per 2,000 square feet of trench per 2 feet of backfill under landscaped, lawn or cultivated areas.
- F. Contractor shall re-compact all areas represented by failed density tests.

3.09 CLEANING

- A. Remove unused stockpiled materials, unused materials, rubbish, garbage, and other non-native materials from the site. Leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

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SECTION 31 23 19
DEWATERING

PART 1 **GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Provision and maintenance of an adequate dewatering system to remove and dispose of all surface (runoff) and groundwater (seepage) entering the excavation, trenches, and other parts of the Work.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 22 00 – Grading.
- I. Section 31 23 13 – Subgrade Preparation.
- J. Section 31 23 16 – Excavation.
- K. Section 31 23 16.13 – Trenching and Backfill.
- L. Section 31 23 23 – Fill and Backfill.
- M. Section 31 25 00 – Erosion and Sediment Controls.
- N. Section 31 41 00 – Shoring.

1.03 PERMITS AND LICENSES

- A. The Contractor shall be responsible for obtaining all necessary permits as related to dewatering and water discharge and to comply with all stipulations of such permits.
- B. A permit may be required for construction dewatering from the appropriate watershed district and/or the State.

PART 2 **PRODUCTS**

NOT USED.

PART 3 **EXECUTION**

3.01 GENERAL

- A. The Contractor shall be responsible for the collection, control and removal of seepage and runoff from within project excavations. This is critical to maintaining the bearing capacity of native soils, in-place density of fill/backfill and stability of embankments at project excavations.
- B. The Contractor may use any method or combination of methods for dewatering; however, all dewatering methods and equipment which, in the opinion of the Engineer, are ineffective shall be abandoned, improved, replaced, or otherwise altered to obtain effective dewatering.
- C. Dewatering shall continue until completion of construction or until the Geotechnical Engineer of record indicates such dewatering is no longer necessary for stability of the project footings, excavations, trenches, or related construction.
- D. The Contractor shall provide all power, pumps, sumps, materials, and equipment necessary, and shall be responsible for disposing of the water pumped from the excavation or pond in a manner that will not interfere with other Work within the area and will not damage public or private property. The discharge of pumped water offsite is prohibited. The Contractor will be held responsible for the condition of any pipe, conduit, ditch, channel or natural watercourse utilized for drainage purposes. All erosion, sediment, or other adverse results of its use shall be repaired at Contractor's expense.

3.02 WATER QUALITY CONTROL

- A. All points of concentrated dewatering discharge shall be visually inspected daily by the Contractor to determine that no eroded materials from the Site are being deposited in any natural drainage ways or surface waters.

3.03 DISPOSAL OF WATER

- A. Obtain discharge permit for water disposal from authorities having jurisdiction.
- B. Treat water collected by dewatering operations, as required by regulatory agencies, prior to discharge.
- C. Discharge water as required by discharge permit and in manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property.
- D. Remove solids from treatment facilities and perform other maintenance of treatment facilities as necessary to maintain their efficiency.

END OF SECTION

SECTION 31 23 23
FILL AND BACKFILL

PART 1 GENERAL

1.01 SUMMARY

- A. Filling, backfilling, and compacting for levee embankment and inspection trench.
- B. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and utilities within the building.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 22 00 – Grading.
- I. Section 31 23 13 – Subgrade Preparation.
- J. Section 31 23 16 – Excavation.
- K. Section 31 23 16.13 – Trenching and Backfill.
- L. Section 31 23 19 – Dewatering.
- M. Section 31 25 00 – Erosion and Sediment Controls.
- N. Section 31 41 00 – Shoring.

1.03 DEFINITIONS

- A. Suitable Material: Material that will provide the indicated required soil bearing capacity, soil densities, material requirements or, in the opinion of the soils testing laboratory, will not be subject to future decomposition, subsidence, settlement, or expansion.
- B. Structures: Existing and new construction, including slabs, buildings, footings, tanks, and other structural elements.
- C. Relative Compaction:
 - 1. Ratio, in percent, of as-compacted field dry density to laboratory maximum dry density as determined in accordance with ASTM D698.

2. Optimum Moisture Content:
 - a. Determined in accordance with ASTM standard specified to determine maximum dry density for relative compaction.
 - b. Determine field moisture content on basis of fraction passing $\frac{3}{4}$ -inch sieve.
 3. Complete Course: A course or layer that is ready for next layer or next phase of Work.
 4. Lift: Loose (uncompacted) layer of material.
 5. Well-Graded:
 - a. A mixture of particle sizes with not specific concentration or lack thereof of one or more sizes.
 - b. Does not define numerical value that must be placed on coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.
 - c. Use to define material type that, when compacted, produces a strong and relative incompressible soil mass free of detrimental voids.
 6. Influence Area: Are within planes sloped downward and outward at 60-degree angle from horizontal measured from:
 - a. 1 foot outside outermost edge at base of foundations or slabs.
 - b. 1 foot outside outermost edge at surface of roadways or shoulder.
 - c. 0.5 foot outside exterior of spring line of pipes.
 7. Borrow material: Material from required excavations or from Contractor furnished borrow areas.
 8. Select Backfill Material: Contractor furnished materials suitable for intended use.
 9. Imported Material: Materials obtained and paid for by Contractor from sources offsite, suitable for specified use.
- D. Finish Grade Elevations: Indicated on drawings.
- E. Subgrade Elevations: Indicated on drawings.

1.04 REFERENCE STANDARDS

- A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2019.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)) 2012 (Reapproved 2021).
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method 2015, with Editorial Revision (2016).
- D. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method 2015.
- E. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision (2020).
- F. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) 2017a, with

Editorial Revision (2021).

1.05 SUBMITTALS

- A. See Section 01 33 00 - Administrative Requirements, for submittal procedures.
- B. Soil Samples: 10 pounds sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.
- E. Compaction Density Test Reports.

1.06 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 FILL MATERIALS

- A. Engineered/Structural Fill (Type S1) per Section 31 05 13 – Soils for Earthwork.
- B. Select Fill (Type S2) per Section 31 05 13 – Soils for Earthwork
- C. General Fill (Type S3) per Section 31 05 13 – Soils for Earthwork.
- D. Impervious Fill (Type S5) per Section 31 05 13 – Soils for Earthwork.
- E. Topsoil (Type S4) per Section 31 05 13 - Soils for Earthwork.
- F. CLSM per Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Concrete per Section 03 30 00 – Cast-in-Place Concrete.

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 45 00 - Quality Requirements, for general requirements for testing and analysis of soil material.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Identify required lines, levels, contours, and datum locations.

- B. Verify areas to be filled are not compromised with surface or ground water.
- C. Verify subgrade has been prepared.

3.02 PREPARATION

- A. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.03 BACKFILLING

- A. Use suitable excavated materials from the site prior to importing Engineered, Select or General Fill material.
- B. Contractor shall separate out all unsuitable materials. Excess or unsuitable surplus materials shall be removed from the Site.
- C. Provide replacement backfill as required to establish required subgrade elevation.
- D. Do not backfill against unsupported foundation walls. Employ a placement method that does not disturb or damage structures.
- E. Do not backfill unless approved compaction equipment is operating. The method of means of placement and type of compaction equipment used is at the discretion of the Contractor, however, all portions of the trench backfill must meet the compaction requirements. Tests to determine the compacted density of the backfill may be ordered by the Engineer if the compaction does not appear to be adequate.
- F. The intent of this specification is to compact the backfill sufficiently to prevent large settlements.
- G. Backfill to contours and elevations with unfrozen fill materials.
- H. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen, or spongy subgrade surfaces.
- I. Aggregate Fill: Place and compact materials in equal continuous layers not exceeding 8- inches loose depth.
- J. Soil Fill: Place and compact material in equal continuous layers not exceeding 8- inches loose depth.
- K. Maintain optimum moisture content of fill materials to attain required compaction density. Use vibratory or special compaction equipment when required.

3.04 LEVEE AND INSPECTON TRENCH FILL

- A. All backfill shall be placed and compacted as specified below.
- B. Material shall not be placed on surfaces that are muddy, frozen, contain frost, or where unsatisfactory material remains in or under the fill. All soft or yielding material and other portions of the subgrade which will not readily compact shall be removed and replaced with suitable material. The entire subgrade shall then

be brought to a line and grade and foundation of uniform compaction which will provide uniform support for fill embankments to be subsequently placed.

- C. The subgrade shall be scarified to a depth of six (6) inches for the full width of the subgrade. The loose materials shall then be spread and manipulated so as to bring all the material to a uniform density.
- D. Application of water to the fill materials may be applied by sprinkling the materials after placement if necessary. Uniform moisture distribution shall be obtained by disking.
- E. Material that is above the optimum moisture content shall either be removed or dried to the specified moisture content prior to compaction. If the top layer of the preceding lift of compacted fill becomes too dry to permit a suitable bond it shall be scarified and moistened by the addition of water to an acceptable moisture content prior to placement of the next lift.
- F. The distribution of materials throughout each zone shall be essentially uniform, and the fill shall be free from lenses, pockets, streaks or layers of material differing substantially in texture or gradation from the surrounding material.
- G. Fill shall be placed in uniform loose lifts not to exceed twelve (12) inches in thickness, and thoroughly mixed by disking or other approved methods to obtain uniformity of material.
- H. The Contractor will be required to bench into existing embankments on any slopes greater than 5:1 prior to placement of any additional fill. The benching shall be completed in such a manner to ensure that a minimum vertical face of 18-inches is exposed for the compaction of the new horizontal layer. The vertical face shall not exceed 30-inches in height.
- I. Where density and/or moisture content tests do not meet the minimum requirements as set forth above, the Contractor shall remove, replace, and compact the embankment material at no additional compensation. A retest shall be required for every test that does not meet the minimum requirements for moisture and/or density. The cost of all retests will be deducted from the Contractor's payment.
- J. If the operation is discontinued, the surface of the previous lift shall be scarified to a minimum depth of four (4) inches prior to placing additional lifts. Fill adjacent to structures shall be compacted to a density equivalent to that of the surrounding fill by means of hand tamping, or manually directed power tampers or plate vibrators. Heavy equipment and/or vibrating equipment shall be kept a sufficient distance away from structures to avoid damage to the structure. The Contractor shall employ a non-destructive compaction effort to compact soil adjacent to structures. The Contractor is responsible for any/all damage caused by his equipment and/or forces. Compaction by means of drop weights operating from a crane hoist will not be permitted.
- K. Embankment shall not be constructed during periods when the embankment material freezes while being placed and compacted, nor shall any embankment

material be placed on soil that is frozen. Where the foundation soil is frozen at a time when weather conditions are such that embankment construction could be continued without the material freezing as it is being placed and compacted, the Contractor may be permitted to excavate the frozen foundation soil and proceed with the embankment construction for so long as the weather will permit, but only if and to the extent approved by the Engineer, and with the understanding that the additional costs involved shall be at the expense of the Contractor. The frozen soil shall be removed and replaced with other suitable soil as may be necessary to construct the embankment specified.

3.05 FILL AT SPECIFIC LOCATIONS

- A. Under Lawn, Landscape or Cultivated Areas outside Influence Area:
 - 1. Use General Fill (Types S3).
 - 2. Fill up to bottom of topsoil or landscape subgrade elevations.
 - 3. Maximum depth per lift: 6 inches, compacted.
 - 4. Compact to minimum 90 percent of maximum dry density.
 - 5. Moisture content at time of compaction near optimum (+6%)
- B. Under Pavement Areas (within 3-feet of pavement subgrade):
 - 1. Use Select Fill/Clay Cap (Type S2).
 - 2. Fill up to subgrade elevation.
 - 3. Compact each lift to 95 percent of maximum dry density.
 - 4. Moisture content at time of compaction near optimum (+/- 3%).
- C. Under Pavement Areas (below 3-feet of pavement subgrade):
 - 1. Use Engineered Fill (Type S1).
 - 2. Fill up to subgrade elevation.
 - 3. Compact each lift to 95 percent of maximum dry density.
 - 4. Moisture content at time of compaction near optimum (+/- 3%).
- D. Against Foundation Walls and Footings:
 - 1. Use Engineered Fill/Structural Fill (Types S1) to below 3-feet of subgrade.
 - 2. Use Select Fill (Types S2) within 3-feet of subgrade.
 - 3. Do not backfill against unsupported foundation walls.
 - 4. Maximum depth per lift: 6 inches, compacted.
 - 5. Compact to minimum 98 percent of maximum dry density.
 - 6. Moisture content at time of compaction near optimum (+/- 3%).
- E. Under Structures:
 - 1. Use concrete as specified in Section 03 30 00 – Cast-in-Place Concrete.
- F. Under and For Levee Embankment and Inspection Trench:
 - 1. Use Impervious Fill (Type S5).
 - 2. Compact each lift to 95 percent of maximum dry density.
 - 3. Maximum depth per lift: 12 inches, uncompacted.
 - 4. Moisture content at time of compaction near optimum (-1 to +3%).
- G. Topsoil Fill:

1. Loosely or lightly compacted. Refer to Section 31 22 00 – Grading for placement.

3.06 TOLERANCES

- A. Top Surface of General Backfilling: +/- 1 inch (25 mm) from required elevations.
- B. Top Surface of Backfilling Under Paved Areas: +/- 1 inch (25 mm) from required elevations.

3.07 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Control, for general requirements for field inspection and testing.
- B. Where in-place, soil material is required to be compacted to a percentage of maximum density. The maximum density at optimum moisture content will be determined in accordance with ASTM D698 – Standard Proctor.
- C. Contractor shall provide at least one (1) certified moisture-density relationship test from each different type of on-site native soils and imported material provided to the project site. Certified moisture-density relationship tests shall be performed in accordance with ASTM D698 (Standard Proctor) by the independent testing laboratory hired by the Contractor.
- D. Frequency Schedule:
 1. Structural Backfill: One in-place density test and one in-place moisture test per 50 linear feet with a minimum of two approved density tests indicating soil bearing capacity as required per 8-inch lift.
 2. Pavement Fill: One in-place density test and one in-place moisture test per 100 linear feet per 1-foot of lift.
 3. Levee and Inspection Trench Fill: One in-place density test and one in-place moisture test per 100 linear feet per 1-foot of lift.
 4. Lawn, Landscaped or Cultivated Areas: One in-place density test and one in-place moisture test per 300 linear feet per 2-feet of lift.
- E. Contractor shall re-compact all areas represented by failed density tests.

3.08 CLEANING

- A. Remove unused stockpiled materials, unused materials, rubbish, garbage, and other non-native materials from the site. Leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

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SECTION 31 25 00
EROSION AND SEDIMENTATION CONTROLS

PART 1 GENERAL

1.01 SUMMARY

- A. Prevention of sedimentation of waterways, wetlands, and storm and sanitary sewers due to construction activities.
- B. Restoration of areas eroded due to insufficient preventative measures.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas. 32 - Exterior Improvements
- D. Section 02 41 13 – Selective Site Demolition.
- E. Section 03 30 00 – Cast-in-Place Concrete.
- F. Section 31 05 13 – Soils for Earthwork
- G. Section 31 05 16 – Aggregates for Earthwork.
- H. Section 31 05 19 – Geosynthetics for Earthwork.
- I. Section 31 05 23 – Cement and Concrete for Earthwork.
- J. Section 31 10 00 – Site Clearing.
- K. Section 31 23 13 – Subgrade Preparation.
- L. Section 31 23 16 – Excavation.
- M. Section 31 23 16.13 - Trenching and Backfill.
- N. Section 31 23 19 – Dewatering.
- O. Section 31 23 23 – Fill and Backfill.

1.03 REFERENCES

- A. General Permit Authorization to Discharge Storm Water Associated with Construction Activity under the National Pollutant Discharge Elimination System/State Disposal System Permit Program.
- B. Section 3300, City of Fargo Standard Specifications for Construction.
- C. North Dakota Department of Transportation (NDDOT) Erosion and Sediment Control Handbook - Latest Edition
- D. North Dakota Department of Health (NDDH) - Division of Water Quality - “A Guide to Temporary Erosion Control Measures” - Latest Edition

- E. ASTM D 4355 - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture, and Heat in a Xenon Arc Type Apparatus; 2005.
- F. ASTM D 4491 - Standard Test Methods for Water Permeability of Geotextiles by Permittivity; 1999a (Reapproved 2004).
- G. ASTM D 4533 - Standard Test Method for Trapezoid Tearing Strength of Geotextiles; 2004.
- H. ASTM D 4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles; 1991 (Reapproved 2003).
- I. ASTM D 4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile; 2004.
- J. ASTM D 4873 - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples, 2002.

1.04 SUBMITTALS

- A. Provide product specification sheets for the following erosion control materials to demonstrate that the Contractor's proposed products meet the Contract Document requirements:
 - 1. Fabric proposed for silt fence.
 - 2. Straw wattles.
 - 3. Fabric proposed for inlet protection
 - 4. Inlet protection products, such as storm inlet sediment filters
 - 5. Erosion Control Blanket
 - 6. Bonded Fiber Matrix
 - 7. Gradation tests for Construction Entrance stone material

1.05 PERFORMANCE REQUIREMENTS

- A. Comply with all requirements of the North Dakota Department of Environmental Quality - Division of Water Quality and Section 3300, City of Fargo Standard Specifications for Construction for erosion and sediment control.
- B. Contractor shall obtain coverage under "Authorization to Discharge Under the North Dakota Pollutant Discharge Elimination System" prior to construction, permit no. NDR10-0000, hereafter referred to as the "State's Construction General Permit", with this erosion control plan, the Engineer Has made an attempt to design a plan that reduces the discharges of the storm water pollutants from the site. The contractors shall interpret the erosion control plan as the minimum requirements for stormwater erosion control only, based on the engineer's understanding of the project. The Contractor, however, shall be solely responsible for preparing and implementing the SWPPP. Including additional requirements beyond the scope of the erosion control plan, to be in conformance with the state's Construction general permit. The contractor shall amend the SWPPP whenever there is change in design, construction, operation, or maintenance which has a significant effect on the potential for the discharge of pollutants to waters of the state. The SWPPP shall also be amended if the plan is

found to be ineffective in controlling pollutants present in storm water. All costs for submitting or amending SWPPP with the state are Incidental with the contract.

- C. The contractor is responsible for obtaining an erosion control and sediment control permit from the city prior to undertaking any land-disturbing activities related to this project. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained.
- D. Contractor shall comply with all requirements of all local, state and federal regulations and permits. If erosion, sedimentation, or disturbance occurs due to non-compliance with any of these permits or regulations, contractor shall restore impacted areas at no cost to the owner. If non-compliance with regulations and permits occurs, contractor shall at no additional cost to the owner:
 - 1. Contact the authorities having jurisdiction;
 - 2. Remove sediment and restore impacted areas to the satisfaction of the owner and the authorities having jurisdiction;
 - 3. Install or correct preventative measures to the satisfaction of the authorities having jurisdiction;
 - 4. Pay any fines or other additional requirements of the authorities having jurisdiction; and
 - 5. Meet the contract schedule for project completion.
- E. All temporary perimeter erosion and sediment control devices, such as silt fence/fiber rolls and construction entrances, shall be in place prior to beginning any construction on the project. Temporary erosion control and sediment devices interior to the site, such as inlet protection and ditch checks, shall be installed as construction progresses. The temporary erosion and sediment control devices shall be inspected, monitored and maintained by the contractor consistent with the requirements of the state's construction general permit until final turf cover has been established and accepted by the city and notice of termination has been filed with the state.
- F. Silt fence or other approved perimeter controls, shall be installed in areas indicated on drawings and around all topsoil and subsoil stockpiles created by contractor (not shown on drawings).
- G. All other temporary erosion and sediment control details shall be as shown on the drawings or per manufacturer.
- H. Temporarily stabilize exposed areas where construction activity has temporarily ceased consistent with the state's construction general permit.
- I. Contractor shall remove and reinstall construction fence and silt fence as many times as needed for construction.
- J. Contractor shall provide concrete truck wash-out area as needed at a location approved by the engineer.
- K. Contractor will be required to install a temporary rock or grated construction entrance in conformance with project drawings to access the site.

PART 2 PRODUCTS

2.01 INLET PROTECTION

- A. Material will vary depending on the type of protection needed.
- B. Inlet Protection Type A-1
 - 1. Fence Post- shall be metal, a minimum of 5.0" long and shall be free of excessive deformation. Wire Mesh Reinforcement- shall be free from rust and in good general condition at the time of installation.
 - 2. Geotextile Fabric shall be a woven monofilament product having a water flow rate of 100-110 gpm/sf (ASTM D-4491), a minimum 70% UV resistance (ASTM D-4355), and a minimum mullen burst rating of 300 psi (ASTM D-3786).
- C. Inlet Protection Type A-2
 - 1. 2"X4" Wood Frame- shall be made from hard wood that is sturdy and free from cracking.
 - 2. Geotextile Fabric shall conform to Inlet Protection Type A-1 standards.
- D. Inlet Protection Type B
 - 1. Sediment Control Barrier shall meet the requirements of the following standards: ASTM D 1893, ASTM D 792/1505, ASTM D 968, ASTM D 1248, ASTM D 1308, ASTM D 2152.
 - 2. Frame- shall be as specified by the supplier.
 - 3. Geotextile fabric around the device shall conform to Inlet Protection Type A-1 standards.
- E. Inlet Protection Type C
 - 1. A pre-assembled protection device designed for drop inlet protection.
 - 2. The device shall consist of a reusable, open topped receptacle that rests inside a storm sewer inlet casting allowing the grating to be reinstalled in the casting.
 - 3. If needed a rear deflector plate shall be incorporated into the unit to protect open back castings from sediment.
 - 4. The receptacle shall have a filtration system to filter storm water.
 - 5. The receptacle shall also have an overflow large enough to minimize/eliminate street flooding during rain events.
 - 6. Approved manufacturers shall be Wimco, Lange IPD, Flexstorm, or approved equal.
- F. Inlet Protection Type C-2
 - 1. Type C-2 inlet protection shall consist of a sediment collection plate meeting H20 loading per OSHA 1910.23.
 - 2. ¼" steel plate shall be painted yellow with a perforated steel lid.
 - 3. A two position HDPE basket shall be provided that is able to be fixed in the up or down position.
 - 4. 400 micron filter bag for basket shall be attached to filter sediment.

2.02 FIBER ROLLS, ROCK LOGS & COMPOST ROLLS

- A. Fiber rolls shall be weed free- wheat straw, rice straw, or coconut fiber- wrapped in tubular plastic netting. Fiber rolls shall be a minimum of nine inches in diameter (+/- one inch), with a minimum length of 10 feet, overlapped 1.0' at joints and approximate weight of 1 ¼ pounds per foot. Wood stakes (2" X 2" X 24") or metal pins may be used to secure the fiber roll.
- B. Rock logs shall be adequately sized for controlling sediment. Aggregate shall vary in size between ¼" – 1-1/2" in a fiber wrapped tube.
- C. Compost rolls shall be comprised of a variety of feedstock including yard trimmings, wood chips, leaves or other biosolids.

2.03 SILT FENCE.

- A. Geotextile Fabric shall be a woven monofilament product having a water flow rate of 100-110 gpm/sf (ASTM D-4491), a minimum 70% UV resistance (ASTM D-4355), and a minimum mullen burst rating of 300 psi (ASTM D-3786).
- B. Posts: 5 feet long:

2.04 CONCRETE WASHOUT

- A. Barrier Fence- may use snow fence or silt fence. Purpose is to prevent easy access to excavated area.
- B. 9" Fiber Rolls as described above.

2.05 TEMPORARY CONSTRUCTION ENTRANCE

- A. Crushed Rock- average diameter ranging from 1" to 2" or equivalent sized crushed concrete.
- B. Wood Material- shall be coarse grade consisting of shredded bark of wood ground so that 95% of the material passes through a 5-inch sieve and no more than 45% through a ¾-inch sieve. Wood shall not contain material that would be harmful to equipment nor shall it contain compounds in quantities detrimental to animal, plant life or water quality. The material will have a bulk density of less than 22.2 lbs per cubic foot.

2.06 DEWATERING STRUCTURES

- A. Material will vary depending on the Type of protection needed.
- B. Dewatering Structure Type 1
 - 1. ¼ inch average diameter Pea Gravel
 - 2. Fiber Roll or Silt Fence
- C. Dewatering Structure Type 2
 - 1. Geotextile Fabric – shall have a minimum water flow rate of 8 gpm/sf (ASTM D-4491), a minimum 80% UV resistance (ASTM D-4355), and a minimum mullen burst rating of 300 psi (ASTM D-3786).
 - 2. Rip Rap- 12"-18" inch minimum diameter rock.
 - 3. Aggregate – 3/16" average diameter rock.

4. Stakes shall be a minimum of 5' in height and shall be comprised of hard wood that is sturdy and free from cracking.
- D. Dewatering Structure Type 3
1. Sediment Filter Bag – Non-woven geotextile material of appropriate size and flow characteristics to treat the capacity of water being pumped. To be determined by manufacturer specifications in accordance with the pump being used.

2.07 EROSION CONTROL BLANKET

- A. Shall consist of a uniform web of interlocking fibers sandwiched between an attached top and bottom layer of net backing meeting the requirements of Section 856.01 of the North Dakota Department of Transportation Standard Specifications for Construction, latest edition.
- B. The netting shall be biodegradable containing sufficient UV stabilization for breakdown to occur within a normal growing season.
- C. Staples used to anchor the blankets shall be U-shaped, 11 gauge or heavier steel wire having a span width of 1 inch and a length of 8 inches or more from top to bottom after bending.
- D. The erosion control blankets acceptable for use on this project include:
 1. Propex, LLC. - Landlok S2.
 2. North-American Green - SC150BN.
 3. Or equal.

2.08 MULCHING – TYPE 1 (HYDRO MULCH)

- A. Hydro mulch shall be virgin wood fiber mulch for use in hydraulic planting, cooked cellulose fiber which shall have the property of dispersing readily in water and shall have no toxic effect when combined with seed or other materials.
- B. The mulch shall be treated with a tackifier to enhance mulch placement and adherence to the soil.
- C. A green colored dye which is nontoxic to plant growth shall be used.
- D. Wood cellulose fiber shall be packaged in new, labeled containers, shall have an equilibrium air-dried moisture content of 12% plus or minus 3% at time of manufacture, and shall have a pH range of 3.5 to 5.0.
- E. No sawdust or byproduct mulch will be allowed.
- F. The homogenous slurry or mixture shall be capable of application with power spray equipment.
- G. Hydromulch shall be applied at a rate of 2,000 pounds per acre (45 pounds per 1,000 sq. Ft.).

2.09 MULCHING – TYPE 2 (STRAW MULCH)

- A. Material for straw mulching shall be threshed stalks of native oats, wheat, barley or rye, and shall be weed free to prevent the introduction of noxious weeds as

defined by the North Dakota Department of Agriculture.

- B. At least 50% of the mulch by weight shall be 10 inches or more in length.
- C. Musty, moldy, caked or otherwise low-quality straw is not acceptable.
- D. Dry mulching material that breaks and does not bend is not acceptable.
- E. Hay or chopped cornstalks are not acceptable.
- F. Application rate is 2 tons per acre (90 pounds per 1,000 sq. Ft.).

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

3.02 PREPARATION

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.
- B. The Contractor shall follow all requirements of the current North Dakota Department of Health & Environmental Division of Water Quality regulations.
- C. The Contractor shall develop a Storm Water Pollution Prevention Plan as required by the North Dakota Department of Health & Environmental Division of Water Quality.
- D. The Contractor shall complete and sign the Notice of Intent and submit to the North Dakota Department of Health & Environmental Division of Water Quality.

3.03 SCOPE OF PREVENTITIVE MEASURES

A. INLET PROTECTION

- 1. Newly installed storm sewer inlets shall be protected from sediment – laden runoff by installation of an inlet protection device within a maximum of 48 hours after installation. Under no circumstance shall inlets remain unprotected over a weekend. In addition, existing inlets that will receive water from the construction site shall be protected prior to commencing land disturbing activities.
- 2. Inlet Protection Type A-1
 - a. This shall consist of installing standard preassembled wire mesh reinforced geotextile fabric around inlets. Metal fence posts shall be used to support wire mesh and geotextile fabric. Posts spacing shall not exceed 3 feet. Care must be taken to ensure the assembly provides for the wire mesh and geotextile fabric to be securely in contact with the existing ground to prevent sediment laden water from running under the device.
 - b. This device is intended primarily to protect inlets within the future paving section and is generally disposable upon removal. It will be the responsibility of the Contractor to remove materials as directed by the Engineer. Disposal shall be the Contractor's responsibility.

3. Inlet Protection Type A-2
 - a. This shall consist of installing geotextile fabric securely fastened to a wooden 2"X4" frame or a prefabricated frame. Care must be taken to ensure that the assembly provides for the geotextile fabric to be securely in contact with the existing ground to prevent sediment laden water from running under the device.
 - b. This device is required around all inlets that are not in a street section, such as rear yard inlets. This device remains on site requiring maintenance by the Contractor throughout the project and becomes the responsibility of the developer/property owner to maintain upon final completion of the project.
4. Inlet Protection Type B
 - a. This shall consist of installing a preformed liner low density polyethylene barrier with a mounting frame. The frame fits into the top of the cone section of a catch basin and supports the sediment control barrier. To further protect the storm sewer from fine materials the sediment control barrier shall be wrapped with a geotextile sock approximately 2 times the circumference of the barrel.
 - b. This device is intended primarily to protect inlets within the future paving section. The device is re-useable and may remain the property of the Contractor depending on the project. If the project includes the paving operation devices are removed following paving and become the property of the Contractor responsible for the initial installation. However, if the paving is to be done on a separate project devices need to remain until the paving process is done and will then become the property of the City and will be delivered by the Contractor to a location specified by the Engineer.
5. Inlet Protection Type C
 - a. This shall consist of installing a prefabricated drop in inlet protection device. This shall be installed by inserting the device into the casting and replacing the grate into the frame. This device is required in all inlets that receive water from the project area that are in a street section.
 - b. This device remains on site requiring maintenance by the Contractor throughout the project and becomes the responsibility of the developer/property owner to maintain upon final completion of the project.
6. Inlet Protection Type C-2
 - a. This shall consist of installing a prefabricated plate that will fit into the top of the cone section of a catch basin or manhole. To further protect the storm sewer from fine materials the sediment control plate shall include a 400 micron filter bag around the collection basket.
 - b. This device is intended to protect inlets within the future paving section. The device is re-useable and shall remain the property of the Contractor.

B. FIBER ROLLS, ROCK LOGS & COMPOST ROLLS

1. Fiber rolls, rock logs & compost rolls shall be installed as shown on the plans and/or as directed by the Engineer. They shall be placed on contour

and staked with 24 inch wood stakes or metal pins, at a maximum spacing of four foot on center. The ends of adjacent rolls shall be overlapped on each other a minimum of 1.0'.

2. Rolls remain on site requiring maintenance by the Contractor throughout the project. Sediment buildup shall be removed when it reaches 1/3 the height of the roll. Any ineffective rolls must be replaced immediately. An ineffective roll is a roll that has flattened out to half its original height. Upon final stabilization it will be the responsibility of the Contractor to remove materials as directed by the Engineer. Disposal shall be the Contractor's responsibility.

C. SILT FENCE

1. Excavate a 6" deep by 4" wide trench. Drive posts into ground on downstream side of fence (posts may be alternated on grades less than 2% to provide additional protection against wind damage). Posts shall have a maximum spacing of eight foot on center. Unroll fabric geotextile fabric one section at a time. Lay fabric flap in trench. Backfill with soil, and tamp the ground. Attach fabric to support posts.
2. Silt fence remains on site requiring maintenance by the Contractor throughout the project. Sediment buildup shall be removed when it reaches 1/3 the height of the silt fence. Any ineffective (decomposed, torn, collapsed materials) silt fences must be replaced immediately. Upon final stabilization it will be the responsibility of the Contractor to remove materials as directed by the Engineer. Disposal shall be the Contractor's responsibility.

D. CONCRETE WASHOUT

1. Excavate to required depth (3' to 4' depth). Install a barrier fence around excavated area. Maximum center to center spacing of fence posts for the barrier fence shall be 5'. Install 9" Fiber Roll.
2. Concrete washouts shall be cleaned by the Contractor when they reach 80% of their capacity. All material removed from the structure shall be the responsibility of the Contractor to dispose of. Under no circumstances will concrete chunks removed from the washout during cleaning be left on site for disposal. As directed by the Engineer the concrete washout shall be removed and the ground restored to a compacted, level, and vegetated state at the completion of the project.

E. SURFACE ROUGHENING

1. Using large tired equipment or tracked equipment slopes shall be roughened, as directed by the Engineer, prior to seeding and mulching.
2. Roughening shall be achieved by driving equipment up and down the slope.

F. TEMPORARY CONSTRUCTION ENTRANCE

1. Prior to placing the Engineering fabric, the areas shall be cleared of all trash and debris. Vegetation shall be removed to the ground level. Trash, debris, and removed vegetation shall be disposed of by the Contractor. The ground shall be graded to a uniform plane. Lay the Engineering fabric over the prepared area. Unrolling the fabric in the direction vehicles will be traveling. Crushed rock, crushed concrete, or

wood material to be placed directly over the fabric shall be spread in the direction of traffic, longitudinally and along the alignment of the temporary construction entrance. A layer of crushed rock, crushed concrete, or wood material a minimum 6" thick shall be placed. Fabric damaged during rock placement shall be repaired by placing a new piece of fabric over the damaged area. The piece of fabric shall be large enough to cover the damaged area and provide a minimum 12" overlap on all edges.

2. If buildup of soil and sediment deter the function of the temporary construction entrance, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional crushed rock, crushed concrete, or wood material at the Contractor's expense. The Contractor shall maintain temporary construction entrances throughout the contract or until removed. The Contractor shall prevent displacement or migration of the surfacing. Significant depressions resulting from settlement or heavy equipment shall be repaired by the Contractor, as directed by the Engineer. Temporary construction entrances shall be repaired or replaced on the same day the damage occurs.
3. When no longer required as determined by the Engineer, temporary construction entrances shall be removed and disposed of by the Contractor. While the temporary construction entrance is in use, pavement shall be cleaned and sediment removed at least once a day, and as often as necessary when directed by the Engineer. Soil and sediment or other extraneous material tracked onto existing pavement shall not be allowed to enter drainage facilities by any means, including precipitation events.

G. DEWATERING STRUCTURES

1. Dewatering Structure Type 1
 - a. Determine the appropriate size of the dewatering structure based on the discharge capacity of the pump to be used for dewatering. Find an area of established grass or prepare an area for use by removing all trash and debris. Lay Engineering fabric of appropriate size to cover the entire area to be used for dewatering. Fill the area with 1/4" pea rock to a minimum depth of 6". Surround the perimeter of the drainage area with Silt Fence or Fiber Roll.
 - b. The dewatering structure shall be monitored during pumping activities. Should the Fiber Roll (if used) be overtopped by pumped water, all further pumping activities must cease until the dewatering area has discharged the water pumped into it. If buildup of soil and sediment deter the function of the dewatering structure, the Contractor shall immediately remove and dispose of the soil and sediment, and install additional pea rock to restore functionality. This work is considered normal maintenance and the Contractor shall not be entitled to additional compensation.
2. Dewatering Structure Type 2
 - a. Determine the appropriate size of the dewatering structure based on the discharge capacity of the pump to be used for dewatering. Excavate to required dimensions. Install straw bales butted tightly together and staked in place. Geotextile fabric should be placed as the bales are installed. Locate the pump discharge and place Rip Rap of sufficient size and depth to resist movement and

prevent erosion where pumped water will enter the structure. Build a spillway out of 12"-18" diameter rocks, with a minimum of 6" depth from the top of the structure. Place a 6" thick layer of 3/16" aggregate on the inside of the spillway.

- b. The dewatering structure shall be monitored during pumping activities. Once the water nears the spillway pumping activities must cease until the dewatering area has discharged to the level of the excavated area. When the excavated area is filled to ½ its depth the buildup of soil and sediment shall be removed and disposed of by the Contractor. Any decomposed, torn, or collapsed materials must be replaced immediately. This work is considered normal maintenance and the Contractor shall not be entitled to additional compensation.

3. Dewatering Structure Type 3

- a. A prefabricated Sediment Containment Filter Bag made of non-woven geotextile material may be used to filter pumped water. The bag should be placed on an area of established grass or on a prepared 6" minimum depth aggregate base. The bag should be oriented in such a manner as to divert flow away from construction area and discharge filtered water into a swale, grass field, or secondary sediment containment system.
- b. The sediment containment bag shall be monitored during pumping activities. When the bag is filled (as per the manufacturers' specifications) all further pumping activities must cease until the bag has discharged the water pumped into it. If buildup of soil and sediment deter the function of the bag, the Contractor shall immediately remove and dispose of the soil and sediment, to restore functionality. This work is considered normal maintenance and the Contractor shall not be entitled to additional Compensation.

H. EROSION CONTROL BLANKET

- 1. The Contractor shall install the blanket as per the manufacturer's instructions with the following minimum guidelines:
 - a. The Contractor shall roll out or lay the blankets parallel to the direction of water flow.
 - b. The blankets shall be spread evenly without stretching and so the fibers are in direct contact with the soil over the entire area.
 - c. Adjacent strip edges shall overlap each other at least 4 inches.
 - d. Strip ends shall overlap each other at least 7 inches.
 - e. All overlaps shall be made with the upgrade strip placed over the downgrade strip intervals.
 - f. The Contractor shall bury the upgrade end of each blanket strip at least 6 inches in a vertical slot in the soil with the soil being pressed firmly against the embedded blanket.
 - g. All joints and outer edges of the blanket shall be stapled at 3-foot intervals or less.
 - h. Staples placed at junctures and strip ends shall have a maximum spacing of 16 inches.
 - i. Staples shall be placed throughout the blanket at a maximum spacing of 3 feet.
 - j. All staples shall be inserted flush with the ground surface.

I. MULCHING – TYPE 1 (HYDRO MULCH)

1. Hydro mulch shall be uniformly applied to cover the entire seedbed area up to 95%. The mulch shall permit the percolation of water to the underlying soil.
2. Mix specified fiber mulch with fiber-mulch manufacturer's recommended tackifier in water using equipment specifically designed for hydromulch application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
3. Hydraulic seeding equipment shall be capable of maintaining a continuous agitation so that a homogeneous mixture can be applied through a spray nozzle. The pump shall be capable of producing sufficient pressure to maintain a continuous, non-fluctuating spray capable of reaching the extremities of the seeding area with the pump unit located on the roadbed and applying the slurry under pressure to the designated area. Sufficient hose shall be provided to reach areas not practical to seed from the nozzle unit situated on the roadbed.
4. The Contractor, at his own expense, shall clean all fixtures, buildings, sidewalks and other areas that may receive unwanted mulch spray.

J. MULCHING – TYPE 2 (STRAW MULCH)

1. Mulch shall be placed within 24 hours after the seeding has been completed.
2. Mulching shall not be performed during periods of high winds.
3. Mulch shall be applied uniformly over the seeded area by a mechanical blower that minimizes cutting or breaking of the material.
4. Bales shall be broken up and loosened as they are fed into the blower to avoid placement of matted or unbroken lumps.
5. The mulch shall be anchored by punching with a mulch tiller that anchors the mulch approximately 3 inches into the soil while leaving approximately 10% of the soil surface exposed.
6. Excessive cover not anchored into the soil shall be removed by the Contractor at his own expense.
7. Rutting of slopes during mulching process shall be immediately repaired by the Contractor.

3.04 MAINTENANCE

- A. Inspect preventative measures weekly, within 24 hours after the end of any storm that produces 0.25 inches or more rainfall at the project site, and daily during prolonged rainfall.
 1. All inspections and maintenance conducted during construction shall be recorded in writing and retained in accordance with the storm water general construction permit NDR10-0000.
- B. All removed tree material shall become the property of the Contractor and shall be disposed of off-site in Contractor furnished disposal area.
- C. All erosion prevention and sediment control devices must be repaired, replaced or supplemented when they become non-functional or the sediment reaches 1/3 of the height of the device. These repairs must be made within 24 hours of

discovery, or as soon as field conditions allow.

1. Contractor shall clean and maintain roadways affected by construction activities, including haul routes, to the condition they were in prior to the start of construction on a daily basis, or as needed.
2. Contractor shall maintain existing site drainage and provide erosion control measures at all times. Storm water at the site must be managed to reduce the potential for sediment transport off-site.

3.05 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.
- B. All temporary erosion and sediment control measures shall be removed prior to the notice of termination has been filed with the State. Site disturbance caused by removal of these practices shall be restored consistent with the surface restoration requirements shown on the drawings. Costs for restoration shall be at Contractor's expense.
- C. Where removal of temporary measures would have exposed soil, shape surface to an acceptance grade and finish to match adjacent ground surfaces.

END OF SECTION

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SECTION 31 41 00
SHORING

PART 1 **GENERAL**

1.01 SUMMARY

A. Section includes:

1. Work related to sheeting, shoring, bracing, and excavation support systems needed to accomplish construction of buildings, tanks, facilities, utilities, and piping.

1.02 RELATED REQUIREMENTS

- A. Section 01 45 00 – Quality Control.
- B. Section 01 57 00 – Temporary Controls.
- C. Section 01 55 29 – Staging Areas.
- D. Section 31 05 13 – Soils for Earthwork
- E. Section 31 05 19 – Geosynthetics for Earthwork.
- F. Section 31 05 23 – Cement and Concrete for Earthwork.
- G. Section 31 10 00 – Site Clearing.
- H. Section 31 22 00 – Grading.
- I. Section 31 23 13 – Subgrade Preparation.
- J. Section 31 23 16 – Excavation.
- K. Section 31 23 16.13 – Trenching and Backfill.
- L. Section 31 23 19 – Dewatering.
- M. Section 31 23 23 – Fill and Backfill.
- N. Section 31 25 00 – Erosion and Sediment Controls.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data: Submit, in accordance with Section 01 33 00. In general, include drawings and supporting calculations for shoring for Engineer review and approval.
- B. Submittals shall include:
 1. Excavation support plan.
 2. Movement monitoring plan.
 3. Trench excavation plan.
 4. Movement measurement and data and reduced results indicating movement trends.
 5. Documentation that shoring plan or system has been designed by a registered Professional Engineer if required.

- C. Design calculations of bracing and shoring showing member stresses and connections due to imposed loads. Calculations shall be sealed by a qualified professional engineer.

1.04 QUALITY ASSURANCE

- A. An OSHA approved competent person shall review the soil classification presented in the Geotechnical Report in the field. Excavations shall comply with the requirements of OSHA 29 CFR, Part 2926, Subpart P, "Excavations and Trenches." Excavation safety is the responsibility of the Contractor. All excavations greater than 20-feet in depth shall be designed by a registered Professional Engineer.
- B. Sheeting, shoring, and bracing shall conform to safety requirements of federal, state, and local agencies.
- C. Sheeting, shoring, and bracing shall not affect structural integrity of existing structures, utilities, or Work, and shall allow for sufficient clearances necessary to install associated appurtenances adjacent to new Work.
- D. Sheeting, shoring, and bracing shall not penetrate walls or slabs of new Work unless approved by the Engineer.
- E. Provide surveys to monitor movements of critical facilities.

1.05 REGULATORY REQUIREMENTS

- A. Work outlined in this Section shall conform to OSHA regulations and all applicable codes and regulations for worker safety.

PART 2 PRODUCTS

2.01 SHEETING, SHORING, AND BRACING

- A. Type, design, detail, and installation of sheeting, shoring, and bracing shall be determined by and be the sole responsibility of the contractor.

PART 3 EXECUTION

3.01 GENERAL

- A. Design, provide, and maintain shoring, sheeting, and bracing as necessary to support the sides of excavations and to prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed Work. Shoring, sheeting, and bracing shall also be provided as necessary to protect workers and the public.
- B. Sheeting, shoring, and bracing shall be installed to prevent solids from entering excavation below or through sheeting.
- C. Open cut excavations are to be evaluated by a registered Engineer and protected against surface water intrusion.

3.02 EXCAVATION SUPPORT PLAN

- A. Prepare an excavation support plan addressing the following topics:
 - 1. Select and install shoring system such that no adverse impact occurs on existing structures, utilities, or facilities.
 - 2. Details of shoring, bracing, sloping, or other provisions for worker protection from hazards of caving ground.
 - 3. Design assumptions and calculations.
 - 4. Methods and sequencing of installing excavation support.
 - 5. Proposed locations of stockpiled excavated material.
 - 6. Minimum lateral distance from the crest of slopes for vehicles and stockpiled excavated materials.
 - 7. Anticipated difficulties and proposed resolutions.

3.03 MOVEMENT MONITORING PLAN

- A. Prepare movement monitoring plan addressing following topics:
 - 1. Survey control.
 - 2. Location of monitoring points.
 - 3. Plots of data trends.
 - 4. Interval between surveys.
 - a. Interval shall not be less than once per week during performance of work until the permanent structure is complete to the ground level and shall continue weekly for a period of four (4) weeks after completion of the work (or longer if movement persists).
 - 5. Remedial action and engineer notification plan should movement of existing structures occur during performance of the Work.

3.04 REMOVAL OF EXCAVATION SUPPORT

- A. Leave excavation support and protection systems, used as formwork or within 10 feet of existing foundations, permanently in place, unless otherwise noted.
- B. Remove excavation support in a manner that will maintain support as excavation is backfilled.
- C. Do not begin to remove excavation support until support can be removed without damage to existing facilities, completed Work, or adjacent property.
- D. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities, and utilities.
- E. Remove excavation support in a manner that does not leave voids in the backfill.

3.05 TRENCHES

- A. Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P and Section 31.23.16 - Excavation.
- B. Trench excavation exceeding twenty (20) feet in depth, shall be designed by a registered Professional Engineer.

END OF SECTION

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SECTION 31 62 16.13
SHEET STEEL PILES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Driven steel sheet piling for local flood protection walls.
- B. Barricades, protection, temporary access roadways, maintenance and on-site testing.

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements.
- B. Section 05 50 00 - Metal Fabrications: Miscellaneous metal fabrications.
- C. Section 07 92 00 - Joint Sealants.
- D. Section 09 91 13 - Exterior Painting.
- E. Section 31 23 16 - Excavation: Pre-excavation and excavating.
- F. Section 31 23 23 - Fill: Filling, backfilling, and compacting.
- G. Section 31 62 16.16 - Steel H Piles.

1.03 PRICE AND PAYMENT PROCEDURES

- A. See Section 01 22 00 - Unit Prices, for additional unit price requirements.
- B. Designed Piles:
 - 1. Design Pile Quantity: Determined by the quantity of piles indicated in Contract Documents.
 - 2. Design Pile Length: By the linear foot measured from point to cut-off elevation as indicated.
- C. Adjustments in Contract Price will be made due to changes in number and length of piles, based on unit prices established in the Agreement as follows:
 - 1. Actual pile quantity.
 - 2. Contract unit price per unit length including test piles, multiplied by the Actual Pile Length. Base measurement on total linear measurement of piling from base to cut-off elevation, except for test piles calculated at 5 feet longer.
- D. Determination of Unit Measurements: Identified by site measurements and verified by Engineer.
- E. No additional payment will be made for withdrawn, damaged, rejected, or misplaced piles; for any portion of a pile remaining above the cut-off elevation; for backdriving; for cutting off piles, or for any cut off length of piles.

1.04 REFERENCE STANDARDS

- A. ASTM A307 - Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength; 2014, with Editorial Revision (2017).
- B. ASTM A328/A328M - Standard Specification for Steel Sheet Piling; 2013a (Reapproved 2018).
- C. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015, with Errata (2016).
- D. NASSPA (BP) - NASSPA Best Practices Sheet Piling Installation Guide; 2005.

1.05 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- B. Scheduling: Schedule pile driving to occur between the hours of 7 am and 7 pm.

1.06 SUBMITTALS

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. See section 01 33 00 - Submittal Procedures for general requirements of submittals.
- C. Shop Drawings: Submit drawings for approval of steel sheet piles prior to start of the work or ordering materials. Include details of top protection, special reinforcing tips, tip protection, lagging, splices, fabricated additions to plain piles and driving, cut-off method, and corrosion protection.
 - 1. Include member locations, plans, elevations, dimensions, shapes, and each weld.
 - 2. Show complete dimensions on drawings, including minimum section properties and details of piling and the driving sequence and location of piling.
 - 3. Include details and dimensions of templates and other temporary guide structures for installing the piling.
 - 4. Provide details of the method of handling piling to prevent permanent deflection, distortion or damage to piling interlocks.
 - 5. Include reinforcement required for sheet pile at penetrations.
 - 6. Include relationship of sheet pile units to adjacent materials.
 - 7. Design Modifications: If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and shop drawings. Do not adversely affect the appearance, durability, or strength of units when modifying details or materials and maintain the general design concept.
- D. Certificates: Submit certificates for the following:
 - 1. Welder qualifications.
 - 2. Material certificates.
 - 3. Pile driving equipment.
 - 4. Interlock tension test procedure.
- E. Test Reports:
 - 1. Interlock tension strength test.

- F. Project Record Documents: Accurately record the following:
1. Sizes, lengths, and locations of piles.
 2. Sequence of driving.
 3. Number of blows per foot for entire length of piles and measured set for last 10 blows.
 4. Identify piles requiring drilling, and hole diameters.
 5. Final base and top elevations.
 6. Driving force of each hammer blow.

1.07 QUALITY ASSURANCE

- A. Interlock Tension Test Procedure: Submit the procedure for testing the tension strength of piling interlocks as required herein for approval prior to testing sheet piling.
- B. Pile Driving Equipment: Submit descriptions of pile driving equipment to be employed in the work. Descriptive information includes manufacturer's name, model numbers, capacity, rated energy, hammer details, cushion material, helmet, templates, and jetting equipment.
- C. Welder Qualifications: Qualified within previous 12 months in accordance with AWS D1.1/D1.1M and AWS D1.4/D1.4M.

1.08 DELIVERY, STORAGE, AND HANDLING

- A. Handle piling using handling holes or lifting devices.
- B. Handle long length piles with care to prevent damage.
- C. Support on level blocks or racks spaced not more than 10 feet apart and not more than 2 feet from the ends. Provide supports between multiple lifts in a vertical plane.

PART 2 PRODUCTS

2.01 STEEL SHEET PILES

- A. Heavy gauge hot-rolled sheet piling complying with ASTM A328/A328M.
- B. Interlocking: Free-sliding interlocks, allowing a swing angle of at least 5 degrees when threaded and maintaining continuous interlocking when installed.
- C. Sheet piling, including special fabricated sections: Provide full-length sections of the dimensions shown.
1. Fabricated sections: Comply with requirements included in the Section and the piling manufacturer's recommendations for fabricated sections.
 2. Provide sheet piling with standard pulling holes.

2.02 BOLTS, NUTS, AND WASHERS

- A. Carbon Steel Bolts and Nuts: ASTM A307, Grade A.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine site and the areas adjacent to the site.
- B. Examine Contract Documents, data, and other available information affecting the proposals and work.
- C. Verify existing conditions, dimensions, elevations, and related details.
- D. Field verify underground utility line locations including required pre-installation exploratory excavation to locate existing major utilities. If verified location conflicts with drawings, or undocumented underground utilities are discovered, do not proceed with the Work until conflict is resolved. Notify Engineer.
- E. Do not start the excavation or purchase the materials required until the, plans, and details have been reviewed by the City of Fargo and Engineer.

3.02 PREPARATION

- A. Prevent settlements or damage to existing structures, service lines, utilities, streets, walks, and other areas
- B. Provide connections between sheet pile walls and permanent structural elements including: precast concrete slabs, beams, columns, and walls.
- C. Provide steel bracing at area wells.
- D. Provide temporary shoring, bracing, excavation slopes, or other required protections.

3.03 INSTALLATION

- A. Perform earthwork in accordance with Section 31 23 16. Pre-excavation will be permitted to a maximum depth as indicated. Backfill as indicated.
- B. Install sheet piles per NASSPA (BP).
- C. Pile Hammer: Use a pile hammer having a delivered force or energy suitable for the total weight of the pile and the character of subsurface material to be encountered. Operate hammer at the rates recommended by the manufacturer throughout the entire driving period. Repair damage to piling caused by use of a pile hammer with excess delivered force or energy.
- D. Pile Protection: Use a protecting cap during driving to prevent damage to the top of the sheet piling. Use cast steel shoe to prevent damage to the tip of the sheet piling.
- E. Templates:
 - 1. Prior to driving, provide template or driving frame suitable for aligning, supporting, and maintaining sheet piling in the correct position during setting and driving. Use a system of structural framing sufficiently rigid to resist lateral and driving forces and to adequately support the sheet piling until design tip elevation is achieved. Provide at least two levels of support, not less than 20 feet apart.

2. Do not allow templates to move when supporting sheet piling. Fit templates with wood blocking to bear against the web of each alternate sheet pile and hold the sheet pile at the design location alignment. Provide outer template straps or other restraints as necessary to prevent the sheets from warping or wandering from the alignment. Mark template for the location of the leading edge of each alternate sheet pile. If in view, also mark the second level to assure that the piles are vertical and in position. If two guide marks cannot be seen, other means must be used to keep the sheet pile vertical along its leading edge.
3. Accurately place the piling using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer.

F. Pile Driving:

1. Continuously monitor vibrations, settlements, and movements to prevent damage to permanent structures and to ensure stability of excavations and constructed slopes.
2. Maintain piling vertical during driving. Drive piles in such a manner as to prevent damage to the piles and to provide a continuous closure. Where possible, drive Z-pile with the ball end leading. If an open socket is leading, a bolt or similar object placed in the bottom of the interlock will minimize packing material into it and ease driving for the next sheet.
3. Incrementally sequence driving of individual piles such that the tip of any sheet pile is not more than 4 feet below that of any adjacent sheet pile.

G. Cutting and Splicing:

1. Cut off to the required elevation any piles driven to refusal or to the point where additional penetration cannot be attained and the piles are extending above the required top elevation in excess of the specified tolerance.
2. Extend by splicing any piles driven below the required top elevation and piles damaged by driving and cut off to permit further driving. Splice as required to reach the top elevation when directed by the Engineer.
3. If directed by the Engineer, splice piles as required to drive them to depths greater than shown on drawings and extend them up to the required top elevation. Piles adjoining spliced piles shall be full length unless otherwise approved.
 - a. Remove from the site pile cut-offs, which are the property of Contractor.
 - b. Use a straightedge in cutting by burning to avoid abrupt nicks.
 - c. Drill bolt holes or burn and ream by approved methods that will not damage the surrounding metal. Make holes other than bolt holes reasonably smooth and the proper size for rods or other items to be inserted.
 - d. Make holes in piles on the wet side of cofferdams watertight by welding steel plates over the holes after the piling installation is completed.
 - e. Do not use explosives for cutting.
4. Cut tops of sheet piling to uniform elevation at top of wall as indicated on drawings.

H. Welding: Comply with requirements of AWS D1.1/D1.1M for shop and field welding, qualification of welding procedures, welders, and welding operators.

I. Tolerances in Driving:

1. Drive all piles with a variation from vertical of not more than 1/4 inch per foot.
2. Place piles so the face will not be more than 6 inches from vertical alignment at any point.
3. Top of pile at elevation of cut-off shall be within 1/2 inch horizontally and 2 inches vertically of the location indicated.
4. Manipulation of piles to force them into position will not be permitted. Check all piles for heave. Redrive all heaved piles to the required tip elevation.
5. Align exposed faces of sheet piling to vary not more than 2 inches from a horizontal line and not more than 1:120 out of vertical alignment. If survey results indicate that any piece of steel sheet pile does not meet these requirements, it shall be removed and re-driven.

J. Post Excavation: Prepare inner surface of steel sheet pile walls for welding, joint sealant, and painting by sandblasting.

K. Corrosion Protection:

1. Seal all seams of sheet piling with water tight welds or nonsag tamper-resistant sealant specified in Section 07 92 00 - Joint Sealants.

3.04 FIELD QUALITY CONTROL

A. See Section 01 40 00 - Quality Requirements, for additional requirements.

B. Maintain a pile driving record for each sheet pile. Indicate on the installation record installation dates and times, type and size of hammer, rate of operation, total driving time, dimensions of driving helmet and cap used, blows required per foot for each foot of penetration, final driving resistance in blows for final 6 inches, pile locations, tip elevations, ground elevations, cut-off elevations, and any reheading or cutting of piles. Record any unusual pile driving problems during driving. Submit complete records to Engineer.

C. Perform continuous inspection during pile driving. Inspect all piles for compliance with tolerance requirements. Bring any unusual problems that may occur to the attention of Engineer.

D. Inspection of Driven Piling:

1. Inspect the interlocks of the portion of driven piles that extend above ground. Remove and replace piles found to be out of interlock.
2. Pulling and Redriving: Contractor may be required to pull selected piles after driving to determine the condition of the underground portions of piles. The pile pulling method must be approved by Engineer. Remove and replace at Contractor's expense any pile pulled and found to be damaged to the extent that its usefulness in the structure is impaired. Redrive piles pulled and found to be in satisfactory condition.

E. Vibration Monitoring and Limitations:

1. Driving of steel sheet pile wall may result in vibrations causing detrimental effects on existing adjacent buildings.

2. Testing Agency will coordinate work with their representative and install monitoring devices in existing structures to avoid damage.

3.05 PROTECTION

- A. Provide steel sheet pile walls and all other protections required.
- B. Wherever side slopes in soil are required, but not indicated on drawings, they shall be cut on stable angles, but in no case be steeper than a ratio of 2 horizontal to 1 vertical.
- C. Protect and repair excavation slopes as necessary to maintain stability.
- D. Repair and replace any damage to existing structures that are to remain by the Contractor and without cost to the City of Fargo.
- E. Barricades and Work Protections: Comply with the requirements of OSHA and all other applicable ordinances and codes.

END OF SECTION

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DIVISION 32 EXTERIOR IMPROVEMENTS

SECTION 32 11 23
AGGREGATE BASE COURSE

PART 1 GENERAL

1.01 SUMMARY

- A. The work to be done under this section of the Specifications and the accompanying plans consists of all labor, material, accessories, and equipment necessary to install aggregate base material for the construction of certain streets, avenues or alleys.

1.02 RELATED REQUIREMENTS AGGREGATE BASE COURSE.

- A. Section 31 05 16 – Aggregates for Earthwork: Class 5 aggregate base course material.
- B. Section 31 05 19 – Geosynthetics for Earthwork: woven geotextile fabric.
- C. Section 31 22 00 - Grading: Preparation of site for base course.
- D. Section 31 23 16.13 - Trenching and Backfill: Compacted fill over utility trenches under base course.
- E. Section 31 23 23 - Fill and Backfill: Topsoil fill at areas adjacent to aggregate base course.
- F. Section 31 23 23 - Fill and Backfill: Compacted fill under base course.
- G. Section 32 12 16 - Asphalt Paving: Finish and binder asphalt courses.
- H. Section 32 13 13 - Concrete Paving: Finish concrete surface course.

1.03 REFERENCES

- A. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18 in.) Drop 2021, with Errata (2022).
- B. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates 2019.American Concrete Institute (ACI)
- C. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)) 2012 (Reapproved 2021).
- D. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method 2015, with Editorial Revision (2016).NDDOT Standard Specifications for Road and Bridge Construction, latest edition
- E. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)) 2012 (Reapproved 2021).

- F. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method 2015.
- G. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) 2017, with Editorial Revision (2020).
- H. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth) 2017a, with Editorial Revision (2021).
- I. North Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, Latest Edition.
- J. City of Fargo Standard Specifications for Construction, Latest Edition.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Administrative Requirements for submittal procedures.
- B. Samples: 30-lb sample of each type of aggregate; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Aggregate Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When aggregate materials need to be stored on site, locate where indicated on drawings.
- C. When aggregate materials need to be stored on site, locate where directed by Owner.
- D. Aggregate Storage, General:
 - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
 - 2. Prevent contamination.
 - 3. Protect stockpiles from erosion and deterioration of materials.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Aggregate Base Course
 - 1. Material for aggregate base shall conform to the requirements Aggregate Class 5 in Section 31 05 16 – Aggregate for Earthwork, and shall consist of sound, durable particles of gravel or sand, free of sod, roots, and other organic matter.

B. Crushed Concrete for Base Course

1. Clean crushed concrete may totally replace or be uniformly blended with ND Class 5 aggregate to produce the base material.
2. Provide virgin Class 5 aggregate when blending with crushed concrete.
3. The crushed concrete shall be free of reinforcing steel, soil, scoria and other deleterious materials.
4. The gradation shall be as follows:

Sieve Size	Percent Passing
1 ½ inch	100
1 inch	90 - 100
No. 4	35 – 85
No. 30	16 – 50
No. 200	0 - 12

2.02 SOURCE QUALITY CONTROL

- A. See Section 01 45 00 - Quality Requirements for general requirements for testing and analysis of aggregate materials.
- B. Where aggregate materials are specified using ASTM D2487 classification, test and analyze samples for compliance will be provided before delivery to site.
- C. If tests indicate materials do not meet specified requirements, change material and retest.
- D. Provide materials of each type from same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that survey benchmarks and intended elevations for the work are as indicated.
- B. Verify substrate has been inspected, gradients and elevations are correct, and is dry.

3.02 PREPARATION

- A. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and re-compacting.
- B. Do not place aggregate on soft, muddy, or frozen surfaces.
- C. Any unstable areas of subgrade shall be repaired prior to placing geotextile fabric and aggregate base course per Section 31 23 13 – Subgrade Preparation.
- D. Install woven geotextile fabric, per Section 31 05 19 – Geosynthetics for Earthwork, material beneath areas of aggregate, pavement, or other site surfacing as shown on typical sections, or indicated on drawings.
- E. Install geosynthetic only after receiving approval from the Engineer.

3.03 AGGREGATE PLACEMENT AND COMPACTION

- A. Construction Requirements to conform to NDDOT Standard Specifications for Road and Bridge Construction, latest edition.
- B. Water shall be applied to the base material during the mixing and spreading operations so that at the time of compaction the moisture content meets requirement of paragraph 3.5.
- C. Place aggregate on damp surface in lift not exceeding 6 inches of compacted material.
- D. Uniformly mix aggregate placed in windrows before spreading.
- E. Compact aggregate base material over geosynthetic reinforcement fabric per Section 31 05 19 – Geosynthetics for Earthwork. Place a minimum 8 inch loose initial lift of material above the geosynthetic. Use low ground pressure equipment to spread the initial lift of material. If rutting occurs, fill the ruts with additional material before placing the subsequent lift. Do not blade out ruts. Do not turn construction equipment on the first layer of material.
- F. Compact aggregate utilizing pneumatic-tired rollers, until no rutting or displacement occurs under the roller operation. The Engineer may allow other compaction methods when placing aggregate under sidewalks, driveways or medians.
- G. All compaction equipment shall be operated to produce uniform density throughout the entire section. Base material shall be compacted simultaneously with laydown operations until, in the sole opinion of the Engineer, a tightly bound surface is achieved and there is no further evidence of consolidation, rutting, or displacement under rolling operation.
- H. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.
- I. Level and contour surfaces to elevations and gradients indicated on drawings.
- J. Maintain a smooth and compacted surface on completed courses.
- K. Install aggregate materials to thickness indicated on Drawings.

3.04 TOLERANCES

- A. Flatness: Maximum variation of $\frac{1}{4}$ inch measured with 10-foot straight edge. Scheduled Compacted Thickness: Within $\frac{1}{2}$ inch.
- B. Scheduled Compacted Thickness:
- C. Variation From Design Elevation: Within $\frac{1}{2}$ inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Requirements for general requirements for field inspection and testing.

B. Compaction Density Testing:

1. Compaction density testing will be performed on compacted aggregate base course in accordance with ASTM D698, ASTM D2167, or ASTM D6938.
2. Results will be evaluated in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180 and ASTM D698 ("standard Proctor").
3. Frequency of Tests: One (1) passing field density test per 4,000 square feet of aggregate base.
4. Compact each lift to 95 percent of maximum dry density. Moisture content at time of compaction near optimum (+/- 3%).

C. If tests indicate work does not meet specified requirements, remove work, replace, and retest.

D. Proof roll compacted aggregate at surfaces that will be under slabs-on-grade.

3.06 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION

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SECTION 32 13 13
CONCRETE PAVING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Materials and construction requirements for portland cement concrete pavement, reinforcement, joints and joint sealer, pavement surface finish and curing.
- B. Materials and construction requirements for Portland cement concrete sidewalks, curb & gutter and driveway pavement, reinforcement, joints and joint sealer, surface finish and curing.

1.02 RELATED REQUIREMENTS

- A. Section 31 05 16 – Aggregates for Earthwork: Class 5 aggregate base course material.
- B. Section 31 05 19 – Geosynthetics for Earthwork: woven geotextile fabric.
- C. Section 31 22 00 - Grading: Preparation of site for paving and base and preparation of subsoil at pavement perimeter for planting.
- D. Section 31 23 13 - Subgrade Preparation:
- E. Section 31 23 23 - Fill: Compacted subbase for paving.
- F. Section 32 11 23 - Aggregate Base Courses:

1.03 REFERENCE STANDARDS

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; 1991 (Reapproved 2009).
- B. ACI 301 - Specifications for Structural Concrete; 2016.
- C. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- D. ACI 305R - Guide to Hot Weather Concreting; 2010.
- E. ACI 306R - Guide to Cold Weather Concreting; 2016.
- F. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2016.
- G. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2017.
- H. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2014.
- I. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2016, with Editorial Revision (2016).

- J. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens; 2017b.
- K. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2017a.
- L. ASTM C150/C150M - Standard Specification for Portland Cement; 2017.
- M. ASTM C173/C173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 2016.
- N. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2010a (Reapproved 2016).
- O. ASTM C309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 2011.
- P. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2017.
- Q. ASTM C618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete; 2015.
- R. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types); 2004, with Editorial Revision (2013).
- S. American Association of State Highway Transportation Officials (AASHTO).
- T. North Department of Transportation (NDDOT) Standard Specifications for Road and Bridge Construction, latest edition.
- U. City of Fargo Standard Construction Specifications.

1.04 SUBMITTALS

- A. See Section 01 33 00 - Submittal Procedures, for submittal procedures.
- B. Product Data: Provide data on portland cement, air-entraining agent, joint filler, admixtures, curing compound, and plant mix design at least 14 days prior to beginning paving operations.
- C. Engineer must approve mix formula prior to its use on Project.
- D. Where jointing plan is not shown, prepare and furnish jointing plan for review and approval of Engineer

1.05 PERFORMANCE REQUIREMENTS AND QUALITY ASSURANCE

- A. Perform Work in accordance with the Standard Construction Specification of Fargo, North Dakota, latest edition and the Contract Documents, including but not limited to Divisions II and III, Articles 23.01, 25.04, 25.06, and 33.01.
- B. Perform Work in accordance with the North Dakota Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

- C. Batch Plant and Mixing Operations: Conform to North Dakota Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition; ACI 304R; and the Standard Construction Specifications of Fargo, North Dakota.

1.06 REGULATORY AND ENVIRONMENTAL REQUIREMENTS

- A. Conform to applicable standards for paving Work on public and private property.
- B. Perform concrete paving Work in accordance with ACI 301.
- C. Conform to Section 01 55 00 - Vehicular Access and Parking Areas. Minimize interference with traffic.
- D. Perform concrete paving Work during extreme temperature conditions in accordance with ACI 305R for Hot Weather Concreting and ACI 306R for Cold Weather Concreting.
- E. Perform Work when ambient air temperature is rising and above 35 degrees F (measured in the shade and away from artificial heat). Discontinue Work when ambient air temperature is falling and reaches 40 degrees F (measured in the shade and away from artificial heat). Submit details of Contractor's means of cold weather, frost protection for newly deposited concrete to Engineer for approval.
- F. Do not place concrete when base or foundation is wet or frozen or when atmospheric conditions exist that would cause abnormal shrinking and checking of the pavement.

PART 2 PRODUCTS

2.01 PAVING ASSEMBLIES

- A. Comply with applicable requirements of ACI 301.
- B. Thickness as shown on the drawings.

2.02 FORM MATERIALS

- A. Form Materials to conform to ACI 301.
- B. Forms shall be of such cross-section and strength, and so secured as to resist the pressure of the concrete when placed, impacted, and by vibration of any equipment, which they support, without spring or settlement.
- C. Except for metal forms, use new material, as needed. Previously used forms may be reused during the progress of the work, provided they are completely cleaned, reconditioned, recoated for each use, and capable of producing formwork of the required quality.
- D. For exposed concrete surfaces, provide forms that will give an aesthetically pleasing look when completed.
- E. Form Coating Materials: Shall be light commercial oil or other suitable substance that will prevent adherence of the concrete to the forms and will not reduce the

strength of the concrete. In addition, the materials used for treating forms that will be in contact with concrete surfaces that are exposed to view in the finished work shall be a substance that will not appreciably affect the color of the concrete.

2.03 REINFORCEMENT

- A. All reinforcing materials and accessories shall be new, no exceptions.
- B. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) yield strength; deformed billet steel bars; unfinished.
- C. Dowels: ASTM A615/A615M, Grade 60 - 60,000 psi yield strength; deformed billet steel bars; unfinished finish.

2.04 CONCRETE MATERIALS

- A. Obtain cementitious materials from same source throughout.
- B. Cement: ASTM C150/C150M, Type I, II, or III Portland cement, gray color.
- C. Fine and Coarse Mix Aggregates: ASTM C33/C33M.
- D. Fly Ash: ASTM C618, Class C.
- E. Water: Clean, and not detrimental to concrete.
- F. Air-Entraining Admixtures: ASTM C260/C260M.
- G. Chemical Admixtures: ASTM C494/C494M, non-chloride accelerating admixtures shall be used.
 - 1. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.
 - 2. Other admixtures only with the written approval of Engineer.

2.05 ACCESSORIES

- A. Curing Compound: ASTM C309, Type 1, Class A.
- B. Joint Sealer: Joint sealer shall be hot pour on all new paving unless otherwise shown on plans.
 - 1. Hot Pour sealant shall be composed of a combination of polymeric materials, fully reacted chemically to form a homogeneous compound. The sealant shall conform to the following properties when heated in accordance with ASTM D5167:
 - a. Cone penetration, 25 degrees C (77 degrees F), dmm (ASTM D5329): 100-150
 - b. Cone penetration, -18°C (0 degrees F), dmm (ASTM D5329 modified): 25 min.
 - c. Flow, 60 degrees C (140 degrees F), 5h (ASTM D5329): 10 mm max.
 - d. Resilience (ASTM D5329): 30 - 60%
 - e. Bond, -29°C (-20°F), 200% extension (ASTM D5329): Pass 3 cycles
 - f. Asphalt Compatibility (ASTM D5329): Pass
 - 2. Follow melting procedures recommended by supplier so sealant is free of any dispersed or settling component and be of a uniform consistency

suitable for filling joints and cracks without inclusion of large air holes or discontinuities.

- C. Equipment: Equipment and tools necessary for handling materials and performing all parts of the Work shall be sufficient as to design, capacity, and mechanical condition. The equipment shall be at the job site sufficiently before the start of construction operations.

2.06 CONCRETE MIX DESIGN

- A. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.
- B. Concrete Properties:
 - 1. Compressive strength, when tested in accordance with ASTM C39/C39M at 28 days; 4000 psi.
 - 2. Fly Ash Content: Maximum 30 percent of cementitious materials by weight.
 - 3. Cement Content: Minimum 564 lb per cubic yard.
 - 4. Water-Cement Ratio: Maximum 45 percent by weight.
 - 5. Total Air Content: Between 5 and 8 percent, determined in accordance with ASTM C173/C173M.
 - 6. Maximum Slump: 3 inches before addition of admixtures.

2.07 MIXING

- A. Transit Mixers: Comply with ASTM C94/C94M.

2.08 SOURCE QUALITY CONTROL

- A. See Section 01 45 00 - Quality Control, Provide concrete mix design and testing and analysis of aggregate material.
- B. Contractor shall submit samples, obtain aggregate gradation analyses, and submit for Engineer's approval. Minimum frequency for aggregate gradation analyses shall be one test per 1,000 tons of concrete mix produced or fraction thereof.
- C. Coarse Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136/C136M.
- D. Fine Aggregate Material - Testing and Analysis: Perform in accordance with ASTM C136/C136M.
- E. If tests indicate materials do not meet specified requirements, change material or material source and retest.
- F. Provide materials of each type from the same source throughout the Work.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify compacted granular base is acceptable and ready to support paving and imposed loads.

- B. Verify gradients and elevations of base are correct. Verify that drainage pattern matches storm water intake locations.
- C. Verify Work of others affected has been completed and will not be adversely affected by paving operations.
- D. Verify that elevations of manhole and valve box castings in street or sidewalk are correct.
- E. Verify that curb depressions for sidewalks and driveways have been accommodated.

3.02 SUBBASE

- A. See Section 32 11 23 for construction of base course for work of this Section.

3.03 PREPARATION

- A. Moisten base to minimize absorption of water from fresh concrete.
- B. Adjust valve boxes, curb stops, manhole castings, and other utility structures to grade.
- C. Coat surfaces of manhole and catch basin frames with oil to prevent bond with concrete pavement.
- D. Notify Engineer minimum 24 hours prior to commencement of concreting operations.
- E. Place no concrete until subgrade preparation, forms, and reinforcement have been inspected and approved and until elevations of castings have been verified.

3.04 FORMING

- A. Comply with ACI 301.
- B. Curb and gutter shape shall conform to the dimensions shown on the Drawings.
- C. Use approved flexible forms on all curves where the radius is less than 20 times the length of the form.
- D. In the event of rain, forms shall be removed and reset as may be necessary to comply with above requirements.
- E. Clean forms prior to placement. Place and secure forms to correct size, location, dimension, profile, and gradient for sidewalk, driveway, and roadway paving thickness shown on the Drawings and for curbs and gutters.
- F. Forms shall have a height equal to the edge thickness of the sidewalk or pavement slab. Assemble formwork to fully support loading exerted by concrete placement and finishing operations without deflection, displacement, or settlement and to permit easy stripping and dismantling without damaging concrete. Forms shall be well oiled on the contact faces. Use light commercial oil or other suitable substance that will prevent adherence of the concrete to the forms and will not reduce the strength of the concrete.

- G. Provide formwork sufficiently tight to prevent leakage of cement paste during concrete placement. Solidly butt joints and provide backup material at joints as required, to prevent leakage.
- H. Place no concrete until Engineer has approved subgrade and forms. Forms for paving shall be set to the proper alignment and grade for a distance equal to at least 3 hours paving time prior to Engineer approval.
- I. Moisten forms and subgrade immediately before placing concrete.
- J. Do not disturb or remove forms until the concrete has hardened sufficiently to permit removal with complete safety or unless otherwise approved by Engineer. Remove forms only during daylight hours and in a manner that avoids damage to pavement and curbs.

3.05 REINFORCEMENT

- A. Comply with ACI 301.
- B. Reinforcement shall be clean and free of rust scale, shall be of the type, style, and dimensions shown on the Drawings.
- C. Place reinforcement as shown on Drawings within a tolerance of plus or minus ½ inch.
- D. Provide reinforcement No. 4 bars at 12 inches on center both ways for pavement slabs.
- E. Provide No. 4 x 16 inch deformed tie bar at 24 inches on center where new concrete pavement joins existing pavement.

3.06 COLD AND HOT WEATHER CONCRETING

- A. Follow recommendations of ACI 305R when concreting during hot weather.
- B. Follow recommendations of ACI 306R when concreting during cold weather.
- C. Do not place concrete when base surface temperature is less than 40 degrees F, or surface is wet or frozen.

3.07 PLACING CONCRETE

- A. Do not place concrete outside of regular working hours, unless Engineer has been notified properly and is present.
- B. Deposit concrete in a manner to form a continuous, full-width mass requiring a minimum of rehandling and/or redistribution and to a sufficient depth to provide excess for finishing operations.
- C. Deposit concrete so that the surface is kept level throughout, a minimum being permitted to flow from one position to another, and place as rapidly as practicable after mixing.
- D. Do not dump or discharge concrete on or against a joint, reinforcement, insert, embedded part, or other assembly in a manner causing displacement or damage

of the assembly.

- E. Do not permit concrete to drop freely more than 6 feet. The concrete shall be placed in forms by means of a chute or hand shoveling.
- F. Thoroughly work concrete around reinforcements, and embedded fixtures, and into corners of forms during placing operations.
- G. Ensure reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- H. Before new concrete is deposited upon or against concrete that has taken its initial set or has hardened, remove all encrustations from forms and reinforcement.
- I. Do not use in this Work any concrete not placed within 30 minutes after leaving the mixer.
- J. If concrete placement is suspended for 30 minutes or less, cover the unfinished forward face of placed concrete with wet burlap until placement operations resume. When operations resume, break down forward face of placed concrete and thoroughly merge with fresh concrete. Continue consolidations and finishing operations on placed concrete throughout suspension period.
- K. Do not break or interrupt successive pours such that cold joints occur. If the suspension of concrete placement exceeds 30 minutes, a standard head joint shall be constructed; provided, however, that no header joint will be permitted within a distance of 10 feet from any adjacent transverse joint.
- L. Consolidating Concrete:
 - 1. Consolidate concrete by an approved mechanical vibrator using a uniform rate of forward progress as soon as possible after placement of concrete on subgrade.
 - 2. Vibrate only once thoroughly and uniformly consolidate concrete throughout its entire depth and width without damaging or displacing joint assemblies and reinforcing.
 - 3. Segregation of concrete or undesirable water gain in the upper pavement zone due to excessive vibration will not be permitted.
 - 4. Suspend vibration whenever the forward progress of the machine is interrupted.
 - 5. Suspend concrete paving if vibratory equipment failure occurs.
 - 6. Hand-held vibratory equipment is not approved unless Contractor demonstrates that adequate manpower is dedicated to consolidation operations and Engineer approves Contractor's plan and manpower commitment in writing. Engineer may require the use of hand-held vibrators along the edge of existing pavement and curb.

3.08 JOINTS

- A. Intervals, type, and dimensions shown on Drawings; firmly support rebar off subgrade with chairs.

- B. Construct joints straight and at right angles to pavement surface. Where practical, all joints shall align with like joints in adjoining work. Use joints to outline all panels in sidewalks, making panels square insofar as possible. Maximum joint spacing in feet shall be 1.5 times pavement thickness in inches. Maximum length of panel shall be 1.5 times width.
- C. When placing concrete adjacent to existing working joints, Contractor shall use jointing techniques that will prevent random cracking of new pavement surfaces. Techniques may include soft sawing, placing pre-molded strips, or other approved methods.
- D. After the curing period, joints to be dried and sand cleaned prior to installation of joint material; seal with hot pour material meeting requirements of the City of Fargo "Standard Construction Specifications;" slightly underfill joints by approximately 1/8 inch and remove excess seal material immediately.
- E. Transverse joints: at right angles to pavement:
 - 1. Match existing transverse joints.
 - 2. Saw cut 3/16 inch contraction joints to a depth of 1/4 slab depth at optimum time after finishing to prevent formation of uncontrolled cracks due to contraction of slab;
 - 3. Provide construction joints as shown on Drawings and when concrete placement is suspended more than 30 minutes; no transverse construction joints shall be allowed between normal contraction joint locations; Contractor shall lay out joint locations to ensure that construction joints do not occur at prohibited locations.
- F. Longitudinal joints: parallel to pavement centerline.
 - 1. Match existing longitudinal joints.
 - 2. Placed as shown on Drawings; saw cut 3/16 inch contraction joints to a depth of 1/4 slab depth at optimum time after finishing to prevent formation of uncontrolled cracks due to contraction of slab.
 - 3. Construct longitudinal construction joints, if required, as shown on Drawings. The key shall be constructed by placing a deformed metal plate against the form when the first lane adjacent to the joint is placed. Remove this metal plate with the form. When placing the second slab, no concrete shall be left to overhang the lip formed on the first slab by the edging tool. Before placing the second slab, the entire edge of the first slab shall be sprayed with concrete form oil to completely break the bond between adjacent slabs.
- G. Isolation joints: use to separate thickened edge sidewalk from parking lot and adjacent curb and gutter. Joint shall be full depth of pavement and dimensions shown in Drawings; when extending full width of 5-foot wide or wider pavement, increase depth 2-inches.
 - 1. Sidewalk isolation joints; 5/8-inch wide and full slab thickness; premolded or poured material.

3.09 FINISHING

- A. Produce an initial surface which is relatively free from defects, but which still may show some trowel marks.
- B. When irregularities are discovered, they shall be corrected by adding or removing concrete. The pavement surface shall have no depression in which water will stand.
- C. Ensure that paving grade has a minimum slope of 0.50%.
- D. Brooms shall be clean and free of dry or hardened mortar.
- E. Finishing Schedules:
 - 1. Parking Areas: Medium-to-Coarse Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16" to 1/8" deep with a stiff-bristled broom, perpendicular to line of traffic..
- F. Provide a finished surface essentially free from trowel marks, uniform in texture and appearance, and in a plane of tolerance specified.

3.10 CURING AND PROTECTION

- A. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.
- B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
- C. When removal of formwork occurs before concrete has totally cured, concrete shall be protected from premature drying by covering with polyethylene sheeting.
- D. Cure all horizontal surface with curing compound. Poly fil or wet cure are allowable options also.
- E. Cure concrete by covering all exposed surfaces immediately after finishing for at least 30 hours with curing paper or plastic curing blanket or by application of a liquid-membrane curing-compound.
- F. When liquid membrane curing compound is used, apply at a rate of at least one gallon per 150 square feet in two equal applications 30 minutes apart. Protect joints to be sealed from entry of curing compound.
- G. The Contractor shall insure that the concrete has developed the necessary strength before forms are removed. Apply curing compound to exposed concrete after removal of forms.
- H. Promptly repair damaged curing compounds, paper, or blankets during the 30-hour curing period.
- I. Prevent the temperature of deposited concrete from falling below 50 degrees F. until at least 30 hours of curing has taken place. Engineer may, at his/her discretion, extend this curing time for cold weather operations.
- J. The Contractor shall erect and maintain suitable barricades and lights to protect the pavement from traffic. Any part of the pavement damaged from traffic or

other causes occurring prior to the acceptance of the pavement shall be repaired to the satisfaction of the Engineer at the Contractor's sole expense.

- K. The Contractor shall receive written notice from the Engineer to open the pavement to traffic and shall then dispose of all covering material as directed and remove all barricades.

3.11 OPENING TO TRAFFIC

- A. Newly constructed pavement shall not be opened to Contractor or public traffic until the concrete has attained a compressive strength of 3,000 psi, as determined by breaking test cylinders cured in the field in a manner that replicates as closely as possible the curing conditions of the pavement.
- B. In addition to the strength requirements, the newly constructed concrete pavement shall not be opened to any traffic until all joints have been sealed unless permission is granted by the Engineer
- C. The Contractor shall receive written notice from the Engineer to open the pavement to traffic and shall then dispose of all covering material as directed and remove all barricades.
- D. Clean up paving area prior to opening to traffic.

3.12 TOLERANCES

- A. Maximum Variation of Thickness: 1/4 inch.
- B. Maximum Variation of Surface Flatness: 1/4 inch in 10 ft.
- C. Maximum Variation From True Position: 1/4 inch.
- D. Maximum Variation Transverse Slope of Surface: 1/4 inch in 12 ft.

3.13 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 45 00 - Quality Control.
 - 1. Provide free access to concrete operations at project site and cooperate with appointed firm.
 - 2. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
 - 3. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
 - 4. Notify testing laboratory to perform tests when testing is to be performed during construction.
- B. Compressive Strength Tests: ASTM C39/C39M; for each test, mold and cure four concrete test cylinders. Obtain test samples once per day of paving operation or for every 75 cu yd or fraction thereof of concrete placed, not less than one series per day of paving.
 - 1. Take one additional test cylinder during cold weather concreting (ambient air temperatures are below 45 degrees), cured on job site under same conditions as concrete it represents, and is subsequently tested for 28-

- day compressive strength.
 2. Perform (2) 7-day cylinder compression tests.
 3. Perform (2) 28-day cylinder compression tests.
 4. Perform one slump test for each set of test cylinders taken.
 5. Perform one air entrainment test for each set of test cylinders taken.
- C. Provide computer generated batch tickets showing the weight of each component in the concrete mixture and the batching time with each batch of concrete delivered to the project. Contractor shall collect the batch ticket from each load delivered and shall deliver the batch tickets to the Engineer at the end of each day.
- D. Maintain records of placed concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.
- E. If, during progress of Work, tests indicate that concrete paving materials do not meet specified requirements, remove defective Work, replace and retest. Contractor to bear all costs associated with defective pavement work.

3.14 DEFECTIVE CONCRETE

- A. The following concrete will be deemed to be defective, poor in quality standards, and shall be removed and replaced promptly from the job site at no additional expense to the Owner.
1. All concrete which is not formed as indicated, is not true to intended alignment, is not plumb or level where as intended, is not true to intended grades and levels;
 2. Has voids, honeycombs, or spalling that have been cut, resurfaced, or filled, unless with the approval of the Engineer;
 3. Has uncontrolled cracks greater than 1/32 inch in width.
 4. Has sawdust, shaving, wood, dirt, rocks, or other embedded debris;
 5. The flow line surface of pavement and gutters not finished and shaped as necessary to eliminate low spots and entrapment of water;
 6. Or does not conform fully to provisions of the contract documents.
- B. Repairs and Replacements:
1. Where defective concrete is found after removal of the forms, cut it out, if necessary, and make the surfaces match adjacent surfaces.

END OF SECTION

SECTION 32 31 13
FENCES AND GATES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Fence framework, fabric, and accessories.
 - 2. Excavation for post bases, concrete foundation for posts, and center drop for gates.
- B. Related Sections include, but are not limited to:
 - 1. The General Conditions, Supplementary Conditions, and General Requirements apply to work of this section.
 - 2. Division 01 – General Requirements Specification Sections.
 - 3. Section 03 30 00 - Cast-in-Place Concrete.
 - 4. Division 31 – Earthwork Specification Sections.
 - 5. Division 32 – Exterior Improvements.

1.02 REFERENCES

- A. Reference Standards include:
 - 1. ANSI/ASTM A123 – Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
 - 2. ASTM A90/A90M – Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - 3. ASNI/ASTM F567 – Installation of Chain-Link Fence.
 - 4. ASTM A116 – Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
 - 5. ASTM A120 – Pipe, Steel, Black, and Hot-dipped Zinc Coated (Galvanized) Welded and seamless, for Ordinary Uses.
 - 6. ASTM A121 – Zinc-Coated (Galvanized) Steel Barbed Wire.
 - 7. ASTM A153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 8. ASTM A370 – Mechanical Testing of Steel Products.
 - 9. ASTM A392 – Zinc-Coated Steel chain-Link Fence Fabric.
 - 10. ASTM A428 – Weight of Coating on Aluminum-Coated Iron or Steel Articles.
 - 11. ASTM A491 – Aluminum-Coated Steel chain Link Fence Fabric.
 - 12. ASTM A569 – Steel, Carbon (0.15 Maximum Percent), Hot-Rolled Sheet and Strip Commercial Quality.
 - 13. ASTM A585 – Aluminum Coated Steel Barbed Wire.
 - 14. ASTM C94 – Ready-mixed Concrete.
 - 15. ASTM F552 – Terminology Relating to Chain Link Fencing.
 - 16. ASTM F567 – Installation of Chain Link Fence.
 - 17. ASTM F573 – Residential Zinc-Coated Steel chain Link Fence Fabric.
 - 18. ASTM F626 – Fence Fittings.
 - 19. ASTM F900 – Industrial and Commercial Swing Gates.
 - 20. ASTM F1043 – Specifications for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.

21. ASTM F1083 – Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded for Fence Structures.
22. Chain Link Fence Manufacturers Institute (CLFMI) Product Manual.

1.03 SYSTEM DESCRIPTION

- A. Fence Height: 6 feet with 3-inch clear terminal.
- B. Line Post Spacing: At intervals not exceeding 10 feet.

1.04 SUBMITTALS

- A. Submit in accordance with Section 01 33 00.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- C. Product Data: Provide data on fabric, posts, accessories, fittings, and hardware.

1.05 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 78 23.
- B. Accurately record actual locations of fence perimeter post relative to project site.

1.06 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI/ASTM F567.

1.07 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum of three years experience.

1.08 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on Shop Drawings.

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Delivered materials shall be stockpiled and stored at locations approved by the Owner until required for installation. Materials shall be stored in accordance with manufacturer's instructions.
- B. Contractor shall inspect materials upon delivery for loss or damage in transit. Contractor shall be responsible for the replacement of damaged materials; damaged materials shall be removed from the site.

PART 2 PRODUCTS

2.01 FENCE MATERIALS

- A. Fence Components
 1. Fabric Wire: ASTM A392 zinc coated wire fabric woven in a 2-inch mesh from 9-gauge wire. Top selvage twist and bottom selvage knuckle end closed.
 2. Line Posts: 2-3/8 inch O.D. galvanized steel Type I or Type II round posts in accordance with the requirements of the CLFMI Product Manual.

3. Corner and Terminal Posts: 2-7/8 inch O.D. galvanized steel Type I or Type II round posts in accordance with the requirements of the CLFMI Product Manual.
 4. Top Rails and Post Braces: 1-5/8 inch O.D. galvanized steel tube weighing 1.83 lbs per foot.
 - a. Top rails shall be in lengths not less than 18 feet and shall be fitted with galvanized steel couplings for connecting the lengths into a continuous run. The couplings shall not be less than 6 inches long, with 0.070 inches minimum wall thickness, and shall allow for expansion and contraction of the rail.
 - b. Post braces shall be provided for each gate, corner pull, and end post, and shall consist of a brace rail extending to each adjacent line post at approximately mid-height of the fabric, and a truss consisting of a galvanized steel rod not less than 3/8 nominal diameter from the line post back to the gate, corner, pull, or end post, with a turnbuckle or other equivalent provision for adjustment.
 5. Post Tops: Galvanized steel ornamental tops provided with a hole suitable for the through passage of the top rail. The post tops shall fit over the outside of posts and shall exclude moisture from posts.
 6. Tension Bars: 3/16 inch by 3/4 inch galvanized steel, not less than 2 inches shorter than the normal height of the fabric with which they are to be used. One tension bar shall be provided for each end and gate post, and two for each corner and pull post.
 7. Ties or Clips: Aluminum or galvanized steel of sufficient strength for application.
 8. Bands or Clips: Aluminum or galvanized steel per ASTM F-626. Attachment bolts shall be 5/16 x 1-1/4 inch galvanized carriage bolts with nuts.
 9. Tension Wire: 7-gauge coil spring wire, galvanized, located at the bottom of fabric.
- B. Coatings:
1. Fence components shall be coated in black vinyl provided by fence fabricator.

2.02 ELECTRICAL GROUNDS.

- A. Electrical grounds consisting of copper coated steel rods having a nominal diameter of five-eighths inch or more and a minimum length of eight feet shall be provided along each fence line.
- B. Grounds rods shall be driven to an elevation approximately flush with the ground surface, at points directly below or adjacent to the fence wire, and each ground rod shall be connected to the fence with a solid No. 6 gauge copper wire. The ground wire shall be attached to the ground rod and to the fence wires with approved type metal clamps in such a manner that each longitudinal fence wire is electrically grounded. No more than one connection will be required on woven wire and chain link fabric, that being near the bottom at each ground rod.

2.03 CONCRETE

- A. Concrete shall have minimum compressive strength of 3,000 psi at 28 days, using three- fourths inch maximum size aggregate.
- B. Non-shrink grout shall consist of one part Portland cement to three parts clean, well-graded sand, non-shrinking grout additive and the minimum amount of water to produce a workable mix.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation framework, fabric, accessories, and gates shall be done by skilled mechanics in accordance with ANSI/ASTM F567.
- B. Terminal posts shall be set at the beginning and end of each continuous length of fence and at changes in vertical or horizontal alignments.
- C. Terminal posts shall be set in concrete with a hole diameter of three (3) times the diameter of post being set (minimum), at post embedment depth required for an 6-foot fence, 48 inches minimum or as indicated by manufacturer.
- D. Line posts shall be set in concrete with a hole diameter of 9 inches minimum, at a depth and post embedment to a depth of 36-inches minimum. Line post shall be set equidistant at intervals not exceeding 10 feet. Measure the interval parallel to the grade of the proposed fence and in the line of the fence from center to center of the posts.
- E. Gate posts shall be set in concrete with a minimum hole diameter of three (3) times the diameter (minimum) of post being set, at a post embedment depth required for the size and type of gate installed, 48 inches minimum or as indicated by the manufacturer.
- F. Sleeves may be used in order to leave voids in new concrete construction. Half-fill the void with non-shrink hydraulic cement and force the post to the bottom of the hole and plumb. Thoroughly work additional grout into the hole so as to leave no voids. Crown the grout to shed water.
- G. Top rail shall be supported at each post so that a continuous brace from end to end of each stretch of fence is formed. Securely fasten the top rail to the terminal posts and join with couplings to allow for expansion and contraction.
- H. Tension wire shall be stretched from end to end of each stretch of fence. Place tension wire within the bottom 4-inches of the fabric. The tension wire shall be taut and free of sag.
- I. Chain link fabric shall be placed on the outside of the area enclosed. Place the fabric by securing one end, applying sufficient tension to remove all slack before making attachments elsewhere. Tighten the fabric to provide a smooth uniform appearance free from sag. Use stretcher bars with tension bands or other suitable devices at 15 inch maximum intervals. The fence fabric shall be installed 3 inches above finished grade level. Ground clearance shall be

measured at each post, with a tolerance of ± 2 inches. Fabric shall be fastened to the line posts at intervals not exceeding 15 inches vertically. Fasten the fabric to the rail or tension wire at intervals not exceeding 24 inches horizontally.

- J. Fence sides shall run parallel with adjacent City streets, avenues, or roads where applicable.
- K. Gate fabric shall be fastened to the frame on all four sides with tension rods per manufacturer's recommendations.
- L. Install all gate accessories and hardware per manufacturer's recommendations.
- M. Install barbed wire on supporting arms above the fence posts. Extend each end member of gate frames sufficiently above the top member to carry three stands of barbed wire in horizontal alignment with the fence. Pull each strand taut and securely fasten to each supporting arm and extended member.

3.02 ERECTION TOLERANCES

- A. Maximum Variation from plumb: $\frac{1}{4}$ inch.
- B. Maximum offset from true position: 1 inch.
- C. Components shall not infringe adjacent property lines.

END OF SECTION

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SECTION 32 31 19
DECORATIVE METAL FENCES AND GATES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. The Contractor shall provide all labor, materials, and appurtenances necessary for installation of the welded ornamental steel fence and gate system defined herein.

1.02 RELATED REQUIREMENTS

- A. Div 01 sections for submittal requirements and product substitution requirements.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 31 62 16.13 - Sheet Steel Piles.

1.03 PRICE AND PAYMENT PROCEDURES

- A. Allowances: See Section 01 21 00 - Allowances, for cash allowances affecting this section.
- B. Unit Prices: See Section 01 22 00 - Unit Prices, for additional unit price requirements.
 - 1. Provide the work under the unit price method.
 - 2. Fencing: Measurement and payment by the linear foot, to the fence height specified, based on the specified post spacing. Includes posts, rails, fabric, accessories, attachments, fasteners for base plates.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to start of work of this section; require attendance by affected installers.

1.05 SUBMITTALS

- A. See section 01 33 00 - SUBMITTAL PROCEDURES for general requirements of submittals.
- B. Product Data: Submit manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings:
 - 1. Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, and schedule of components.
- D. Manufacturer's Installation Instructions: Indicate installation requirements, and post foundation anchor bolt templates.

- E. Maintenance Materials: Furnish the following for City of Fargo's use in maintenance of project:

- 1. See Section 01 61 00 for additional provisions.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: Experienced with type of construction involved and materials and techniques specified approved and licensed as a certified vendor by the manufacturer.

PART 2 PRODUCTS

2.01 DECORATIVE FENCES

- A. System shall include all components (i.e. panels, posts, accessories, and hardware)
- B. Manufacturer: Ameristar Perimeter Security, USA or approved equal
 - 1. Product Type: Montage Plus
 - 2. Style: Majestic 3-Rail Panels with Flush Bottom Rail and Standard (4") Picket Spacing
- C. Color: Black
- D. Height: 6-feet or as indicated on Drawings
- E. Post Mounting: As shown on Drawings or as recommended by Manufacturer.
 - 1. Concrete Footer, min 48" depth
 - 2. 4-bolt plated base

2.02 DECORATIVE GATES

- A. System shall include all components (i.e. panels, posts, latch assembly, guide assembly, truck assembly, accessories, and hardware)
- B. Manufacturer: Ameristar Perimeter Security, USA or approved equal
 - 1. Product Type: Transport II Cantilever Gate
 - 2. Style: Majestic 3-Rail Panels with Flush Bottom Rail and Standard (4") Picket Spacing
- C. Color: Black
- D. Height: 6-feet or as indicated on Drawings
- E. Nominal Opening: As indicated on Drawings
- F. Post Mounting - as shown on Drawings or as recommended by Manufacturer.
 - 1. Concrete Footer, min 60" depth

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.

- B. If substrate preparation is the responsibility of another installer, notify Engineer of unsatisfactory preparation before proceeding.

3.02 PREPARATION

- A. Clean surfaces thoroughly prior to installation.

3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Set fence posts in accordance with the manufacturer recommended spacing not to exceed 8'-0" on-center.
- C. When cutting rails immediately seal the exposed surfaces by:
 - 1. Removing metal shavings from cut area.
 - 2. Apply zinc-rich primer to thoroughly cover cut edge and drilled hole; allow to dry.
 - 3. Apply two coats of custom finish spray paint matching fence color.
 - 4. Failure to seal exposed surfaces in accordance with manufacturer's instructions will negate manufacturer's warranty.

3.04 TOLERANCES

- A. Maximum Variation From Plumb: 1/4 inch.
- B. Maximum Offset From Indicated Position: 1/2 inch.

3.05 FIELD QUALITY CONTROL

- A. See Section 01 45 00 - Quality Requirements, for additional requirements.
- B. Layout: Verify that fence installation markings are accurate to design, paying attention to gate locations, underground utilities, and property lines.
- C. Post Settings: Randomly inspect three locations against design for:
 - 1. Hole diameter.
 - 2. Hole depth.
 - 3. Hole spacing.
- D. Fence Height: Randomly measure fence height at three locations or at areas that appear out of compliance with design.

3.06 CLEANING

- A. Leave immediate work area neat at end of work day.
- B. Clean jobsite of excess materials; scatter excess material from post hole excavations uniformly away from posts. Remove excess material if required.
- C. Clean fence with mild household detergent and clean water rinse well.
- D. Remove mortar from exposed posts and other fencing material using a 10 percent solution of muriatic acid followed immediately by several rinses with clean water.

- E. Touch up scratched surfaces using materials recommended by manufacturer.
Match touched-up paint color to factory-applied finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstrate proper operation of equipment to City of Fargo's designated representative.
- B. Demonstration: Demonstrate operation of system to City of Fargo's personnel.
 - 1. Use operation and maintenance data as reference during demonstration.
 - 2. Briefly describe function, operation, and maintenance of each component.

3.08 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair, or replace damaged products before Date of Substantial Completion.

END OF SECTION

SECTION 32 92 19
SEEDING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Preparation of subsoil
- B. Landscape grading
- C. All materials and labor needed to furnish a finished turf area
- D. Maintenance and clean-up of work
- E. Warranty and replacement of unsatisfactory materials
- F. Seeding

1.02 RELATED SECTIONS

- A. 01 52 00 – Construction Facilities
- B. 01 55 00 – Vehicular Access and Parking Areas
- C. 01 55 29 – Staging Areas
- D. 01 56 00 – Temporary Barriers and Enclosures
- E. 01 57 00 – Temporary Controls
- F. 01 77 00 – Closeout Procedures
- G. 31 25 00 – Temporary Erosion and Sediment Controls
- H. 31 05 13 – Soils for Earthwork
- I. 31 23 16.13 – Trenching and Backfill
- J. 31 23 23 – Fill and Backfill
- K. 31 22 00 – Grading
- L. 32 97 00 - Restoration of Disturbed Areas

1.03 REFERENCE STANDARDS

- A. TPI (SPEC) - Guideline Specifications to Turfgrass Sodding; Turfgrass Producers International
- B. AASHTO: American Association of State Highway and Transportation Officials
- C. AOAC: Association of Official Agricultural Chemists www.aoac.org
- D. ASTM: American Society of Testing Materials www.astm.org
- E. USDA: United States Department of Agriculture www.usda.gov
- F. ASTM: American Society for Testing and Materials

1.04 DEFINITIONS

- A. Weeds: Include Dandelion, Jimsonweed, Quackgrass, Horsetail, Morning Glory, Rush Grass, Mustard, Lambsquarter, Chickweed, Cress, Crabgrass, Canadian Thistle, Nutgrass, Poison Oak, Blackberry, Tansy Ragwort, Bermuda Grass, Johnson Grass, Poison Ivy, Nut Sedge, Nimble Will, Bindweed, Bent Grass, Wild Garlic, Perennial Sorrel, and Brome Grass.

1.05 SUBMITTALS

- A. Submit in accordance with Section 01 3000 - Administrative Requirements
- B. Product data
 - 1. Submit certification of grass species and location of sod sources prior to use or installation
 - 2. Submit container label of each seed mix certifying that the product meets the specified requirements prior to use or installation
 - 3. Material Test Reports for imported or manufactured topsoil
 - 4. Product certifications of soil amendments and fertilizers, from manufacturer
- C. Work Schedules - Submit work schedule prior to start of work
 - 1. Anticipated dates for seeding and/or sodding installation
 - 2. Anticipated maintenance schedule as required in Part 3
 - 3. Anticipated watering schedule as required in Part 3
- D. Contract Closeout Submittals
 - 1. As-Built Plans: After the work is complete submit to the Owner "as-built" plans including a listing of all species installed, and quantities installed. Mark in red ink on the original planting plan any field changes or deviations from the original plans.
 - 2. Submit Owner Manual: Submit before expiration of required initial maintenance period.
 - a. Recommended procedures for maintenance of turf during a calendar year including:
 - 1) Cutting method and maximum turfgrass height
 - 2) Irrigation requirements of turfgrass
 - 3) Types, application frequency, and recommended coverage of fertilizer

1.06 QUALITY ASSURANCE

- A. Protection of Property: Contractor is responsible for damage to areas adjacent to planting area resulting from planting operations and shall bear full cost to repair damage. Accomplishment of repairs shall be equal to original installation prior to damage. Immediately report damage to Architect and Owner and repairs shall be approved by both.
- B. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful turf establishment.
 - 1. Contractor experience: contractor shall have successfully installed at least three projects similar to that of this project within the last two years.

2. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 3. Utilize experienced personnel familiar with equipment, methods and procedures for the job.
 4. Pesticide Applicator (Herbicide): State licensed, commercial.
- C. Utilize mechanical equipment of proper size and in good working condition to prosecute the work to full completion in a satisfactory manner.
- D. Soil Analysis
1. For each unamended soil type, furnish soil analysis and a written report by the Soil-Testing Laboratory.
 2. The testing laboratory shall conduct a comprehensive soil analysis to determine suitability of soils for horticultural purposes.
 3. The analysis shall be made in accordance with methods established by AOAC. Perform soil analysis to determine type and quantity of soil amendments; test enough soil samples to obtain a comprehensive analysis; submit reports.
- E. Soil Analysis: For each unamended soil type, furnish soil analysis and a written report by the Soil-Testing Laboratory.
1. The testing laboratory shall conduct a comprehensive soil analysis to determine suitability of soils for horticultural purposes.
 2. The analysis shall be made in accordance with methods established by AOAC. Perform soil analysis to determine type and quantity of soil amendments; test enough soil samples to obtain a comprehensive analysis; submit reports.
 3. The analysis report shall include at a minimum, soil texture, soil pH, macro and micronutrient levels, organic content, salinity, estimated infiltration rate and recommendations regarding amendments to the soil.
 4. Commercial test from an independent testing laboratory including basic soil groups (moisture and saturation percentages, Nitrogen Phosphorus-Potassium (N-P-K) ratio, pH (ASTM D 4972), soil salinity), secondary nutrient groups (calcium, magnesium, sodium, Sodium Absorption Ratio (SAR)), micronutrients (zinc, manganese, iron, copper), toxic soil elements (boron, chloride, sulfate), cation exchange and base saturation percentages. and soil amendment and fertilizer recommendations with quantities for plant material being transplanted.
 5. Recommendations for amendments shall include initial amendments, maintenance fertilization and long-term practicality regarding pH adjustments with quantities for plant material being transplanted.
 6. Analysis shall include mention of any soil characteristics that may adversely affect the long- term growth of healthy plants.
 7. Report presence of problem salts, minerals, or heavy metals; if present, provide additional recommendations for corrective action.
 8. If area to be planted will be filled by on-site excavations, stockpiled soils or imported soils, an adequate number of samples shall be taken from this/these materials
 9. All tests to be performed by a Soil Testing Laboratory arranged and paid for by the Contractor.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Products
 - 1. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
 - 2. Provide seed mixture in containers showing percentage of seed mix, year of production, net weight, date of packaging and location of packaging.
 - 3. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.
 - 4. Deliver packaged products in original containers showing product name, weight, analysis, instructions for use and name of manufacturer.
 - 5. Protect products from deterioration during delivery and storage on site.
- B. Protection of Soils
 - 1. Prevent compaction of topsoil and planting soils by vehicles, mechanical equipment and storage of materials during all phases of work.
- C. Protection of Materials
 - 1. Protect stockpiled materials to keep free of contamination from construction debris and windborne seed. Protect against loss by wind and erosion.
 - 2. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 3. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 PRODUCTS

2.01 SEED MIXTURE

- A. All seed shall be labeled in accordance with U. S. Department of Agriculture rules and regulations under the Federal Seed Act in effect on the date of the invitation to bids.
- B. Seed shall be furnished separately or in mixture in standard sealed containers. Damaged, wet, or moldy seed will not be accepted.
- C. All seed shall meet the minimum requirements for purity and germination. No purity or germination tolerance will be allowed.
- D. Weed seed shall not exceed 0.5% of the total mixture, and seed shall contain no noxious weed seed of the state from which seed is to be shipped.
- E. Seed tags shall be provided with each bag of seed used on the project and shall be given to the Engineer. Seed certifications from seed supplier shall be provided upon request. Labels for seed shall contain the following:
 - 1. Name and address of supplier
 - 2. Lot number
 - 3. Seed name and origin for each kind of seed

4. Percentages of purity and of germination for each kind of seed & percentage of weed seed content in the mixture.
 5. Date of last test
 6. Pounds of bulk seed for total mix in each bag
- F. Seed mixtures shall conform to the following types per Section 3100 of the Fargo Standard Specifications for Construction, latest edition.
1. Seed Type A: Ditches, Side Slopes and Pond Slopes
 2. Seed Type B: Parks, Boulevards, Private Property, Built-up Areas
- 2.02 SOIL MATERIALS
- A. Topsoil: See Section 31 05 13 – Soils for Earthwork.
- 2.03 ACCESSORIES
- A. Fertilizer
1. Fertilizer shall be a standard commercial grade product, free flowing and suitable for application with mechanical equipment, delivered in clean, sealed, moisture-proof & properly labeled containers bearing the name, trade name or trademark and warranty of the producer.
 2. Fertilizers shall be recommended for grass, supplied separately or in mixtures.
 3. Fertilizer shall conform to all State and Federal regulations.
 4. All fertilizer shall contain slow-release nitrogen in the form of inorganic chemicals amounting to at least 50% of the available nitrogen specified.
 - a. Type A & Type B Seeding Starter Fertilizer: Fertilizer shall be 12-24-12 at an application rate of 220 pounds per acre (5 pounds per 1,000 sq. Ft.).
- B. Weed Control
1. Type A – Non-Selective Herbicide: Round-up, glyphosate or approved equal.
 2. Type B – Selective Herbicide: Trimec, 2,4-D or approved equal.
- C. Water: Clean, fresh and free of substances or matter that could inhibit vigorous growth of grass.
- D. Mulch: See Section 31 25 00 – Erosion and Sediment Control

PART 3 EXECUTION

3.01 PREPARATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting performance.
- B. Verify that prepared soil base is ready to receive the work of this Section.
- C. Verify that no foreign or harmful material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area. If contamination by foreign or deleterious material or

liquid is present in soil within a planting area, remove the soil and contamination and replace with new planting soil.

- D. Uniformly moisten excessively dry soil that is not workable, and which is too dusty.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.
- F. Place topsoil in accordance with Section 31 22 00.
- G. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- H. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- I. Prior to or during grading and tillage operations, the ground surface shall be raked and cleared of all stumps, brush, sticks, roots, stones larger than 1/2 inch in diameter, concrete chunks, rebar, wire, or other material that may hinder seeding and maintenance operations. Any accumulated material shall be disposed of by the Contractor at no additional cost to the Owner.
- J. If any damage by erosion or other causes has occurred after the completion of grading and before beginning the application of fertilizer, the Contractor shall repair such damage. This may include filling gullies, smoothing irregularities, and repairing other incidental damage.
- K. Areas that may be weedy, un-worked, or packed hard, shall first have any grass and weeds cut & disposed.
- L. The seed bed shall be disked or cultivated to a minimum depth of 3". If compacted soils have developed during construction process in areas where planting will occur, Contractor shall first till and harrow soil to a minimum depth of 6 inches prior to installation of plantings.
- M. A harrow or cultipack shall be used so that the bed is firm, and the seed can be placed at the proper depth. The seed bed shall be smooth and firm, and all lumps or clods exposed shall be broken up to an inch in diameter or less.

3.02 PLANTING RESTRICTIONS AND LIMITATIONS

- A. Planting Restrictions: Coordinate planting periods with initial maintenance periods to provide required maintenance from date of substantial completion.
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.
- C. All seedbed preparation and seeding shall be done between the dates of April 15th and July 1st or between the dates of August 15th and September 15th or

the contract deadline, whichever occurs first.

- D. Any planting done between the dates of July 1st and August 15th will be allowed only with prior written permission of the Engineer and will be at the Contractor's own risk. The addition of 10 pounds of oats per acre to the specified amount of seed shall be added at no additional cost to the Owner.
- E. If seeding fails to produce a uniform growth, seeding shall be repeated until the required growth is achieved.
- F. Dormant fall seeding will be allowed with approval from the Engineer. Typical times of dormant seeding are from late October to early November with the soil in a cool condition.
- G. No seed shall be sown on frozen ground.

3.03 FERTILIZING PRIOR TO SEEDING

- A. Starter Fertilizer: Either immediately prior to or after seeding, Starter Fertilizer conforming to the above requirements shall be applied at the rate specified above and raked into the soil.
- B. Turf Fertilizer: When the grass has been evenly established to a height of 2", or eight weeks after the Starter Fertilizer application, whichever occurs sooner, Turf Fertilizer conforming to the above requirements shall be applied at the rate specified above. Contractor shall water the turf immediately after application of Turf Fertilizer.
- C. Apply fertilizer in accordance with manufacturer's instructions.

3.04 PLANTING SEED

- A. Prior to planting of the seed, fertilizer shall be applied at the specified rate & shall be incorporated into the soil to a minimum depth of two inches.
- B. All seeding shall be done when the ground is open, not frozen or covered with snow, except as otherwise directed in writing by the Engineer.
- C. Seed shall be mechanically sown using approved equipment. Application rates shall be checked periodically using approved methods.
- D. When drill seeding, provisions shall be made to assure overlap. If inspection shows strips have been missed or skipped, these areas will be reseeded at no additional cost.
- E. When delays in operation or unfavorable weather conditions indicate that seeding will not have satisfactory results, the Engineer will stop the work.
- F. Only in areas where drill seeding equipment is unable to perform the work required, broadcast seeding shall be allowed at a 20% increase in application rate. Mechanical spreaders, landscape seeders, fertilizer spreaders, or other mechanical spreading equipment may be used.
- G. The area shall be raked or dragged after seed placement to the satisfaction of the Engineer prior to placement of mulch.

H. Broadcast Seeding

1. Seed shall be broadcast by approved sowing equipment or by hand for small areas or on extreme slopes.
2. Seed shall be uniformly distributed with half the seed being sown with the sower moving in one direction, and the remaining half-sown at right angles to the first sowing.
3. Seed shall be covered to an average depth of 1/2 inch by a harrow or approved device.
4. Broadcast seeding will not be allowed in windy conditions.

I. Drill Seeding

1. Drill seeding shall be done with grass drills not more than 6 inches apart and shall be sown uniformly over the designated area.
2. Seed shall be sown to an average depth of 1/2 inch.

J. Hydroseeding

1. **Mix of seed within hydromulching equipment will be allowed only in special circumstances and when approved by the Engineer. This project is expected to utilize drill seed method.**
2. The seed, water and mulch shall be combined and kept under constant agitation so that a slurry of seed, mulch and fertilizer and water can be applied hydraulically to the areas to be seed.
3. The equipment used will provide sufficient agitation to insure a uniform mixture of the ingredients throughout the application of each given quantity of slurry mixture.
4. Uniform coverage and seeding ratios shall be obtained and spot checks of seed distribution may be made by random placing of paper plates on areas to be seeded. After seeding, comparison of actual count of seed on the plates will verify the uniformity and application rate of the seeding distribution.
5. Hydroseeding will not be allowed after September 15th.

3.05 WEED CONTROL

A. Regulations

1. Herbicide applications will be performed according to federal, state, and local regulations.
2. Herbicide products shall be used consistent with their labeling.
3. Herbicide applications will be pursued as a vegetation management tool when needed.
4. All herbicide products, mixes and applications must be approved by the Engineer.
5. Applicators must use extreme caution when applying herbicides near water, adjacent properties with crops that might be damaged, or other landscaped areas.

B. Applications

1. Type A – Non-Selective Herbicide shall be uniformly applied at the rate as labeled by the manufacturer prior to soil preparation to reduce organic materials, to areas requested and designated by the Engineer to control

unwanted vegetation.

2. Type B – Selective Herbicide shall be uniformly applied at the rate as labeled by the manufacturer after seed germination during turf establishment to reduce broad leaf weeds to areas requested and designated by the Engineer to control unwanted vegetation.

C. Reports

1. The Contractor making the application is responsible for the purchase, storage, record keeping and disposal of herbicides.
2. Herbicides will only be applied by qualified applicators, following herbicide labels and manufacturers recommendation for application rates. A qualified applicator is an individual who has been trained regarding the product and application method, and meets any federal, state, and local laws and regulations. This individual is required to hold a certified applicator's license or be under the direct supervision of a certified applicator. Supervisors of qualified applicators are required to hold a certified applicators license in the state of North Dakota.
3. All herbicide applications will be reported to the Engineer using the Contractor's herbicide report. Reports will be submitted to the Engineer on a weekly basis. It is the herbicide Contractor's responsibility to maintain reports for review by the State Department of Agriculture.

3.06 TEMPORARY STABILIZATION

- A. Immediately following seed planting, and initial fertilizer and herbicide placement, Contractor shall cover all seeded areas with erosions control blanket, hydro-mulch, or straw mulch as specified in Section 31 25 00 and as shown in the Drawings.

3.07 WATERING

- A. Immediately upon completion of the seeding and temporary stabilization, the seeded areas shall be given sufficient watering to moisten the seedbed to a depth of 2 inches.
- B. Water shall be applied in a manner that provides uniform coverage and prevents erosion and damage to the final surface.
- C. The Contractor shall provide daily watering for the first five days and sufficient water thereafter, to maintain surface moisture in the top 2 inches of the soil until such time as the grass (not cover crop) has been evenly established to a height of 2".
- D. After the Engineer determines the terms of the contract have been met regarding seed establishment, the Contractor shall notify adjacent residents/property owners of the transfer of maintenance responsibility.

3.08 PROTECTION & CLEAN-UP

- A. The Contractor shall protect all seeded areas from traffic by placing warning signs or erecting barricades immediately after seeding is complete. Any damage that may occur prior to final acceptance by the Engineer shall be repaired to re-establish the conditions or grade of the soil prior to the damage and shall then be

re-planted by the Contractor at no additional cost.

- B. The Contractor shall repair erosion-damaged areas. Damaged areas shall be re-graded, seeded & mulched.
- C. The Contractor shall control growth of weeds by applying herbicides in accordance with the manufacturer's instructions.
- D. Mowing shall be done by the Contractor at no cost to the Owner prior to final acceptance of seeding.
- E. Protect adjoining pavements, walks, structures from dirt and staining during completion of work. Removal of such dirt and staining is required.
- F. During and after landscaping, keep pavements clean and work area in orderly condition. Remove promptly soil and other extraneous material brought onto paved areas by work operations.
- G. Remove and restore temporary erosion control BMPs per Section 31 25 00 – Erosion and Sediment Controls.
- H. Leave site free of debris from this Section of Work.
- I. Restore ground areas disturbed as a result of seeding operations to their original condition or to desired new appearance.

END OF SECTION

SECTION 32 97 00
RESTORATION OF DISTURBED AREAS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Restoration of all areas disturbed during construction.
 - 2. Restoration of all items not specifically identified for restoration, but damaged through construction.
- B. Restore all areas disturbed by construction to a condition equal to or better than existed prior to construction prior to final completion review.

1.02 RELATED SECTIONS

- A. 01 52 00 – Construction Facilities
- B. 01 55 00 – Vehicular Access and Parking Areas
- C. 01 55 29 – Staging Areas
- D. 01 56 00 – Temporary Barriers and Enclosures
- E. 01 57 00 – Temporary Controls
- F. 01 73 29 – Cutting and Patching
- G. 01 77 00 – Closeout Procedures
- H. 31 25 00 – Temporary Erosion and Sediment Controls
- I. 31 05 13 – Soils for Earthwork
- J. 31 05 16 – Aggregates for Earthwork
- K. 31 10 00 – Site Clearing
- L. 31 22 00 – Grading
- M. 31 23 13 – Subgrade Preparation
- N. 32 11 23 – Aggregate Base Course
- O. 32 13 13 – Concrete Paving
- P. 32 92 19 – Seeding

PART 2 PRODUCTS

2.01 MATERIALS

- A. Materials for replacement, restoration, and repair shall be of equal or greater quality and condition prior to construction if not covered by these specifications.

PART 3 EXECUTION

3.01 EXECUTION

- A. Observe all surface features requiring protection, removal and replacement, and/or restoration prior to construction.
- B. The Contractor shall be responsible for the preservation of all public and private property and shall protect carefully from disturbance or damage all land monuments and property marks until the Engineer has witnessed or otherwise referenced their location and shall not move them until directed.
- C. The Contractor shall be responsible for all damage or injury to property of any character during the prosecution of the Work, resulting from any act, omission, neglect, or misconduct in this manner or method of executing the Work, or at any time due to defective Work or materials, and said responsibility will not be released until the Project shall have been completed and accepted.
- D. When any direct or indirect damage or injury is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the Work, or in consequence of the non-execution thereof by the Contractor, he shall restore, at his own expense, such property to the condition similar or equal to that existing before such damage or injury was done by repairing, rebuilding, or otherwise restoring as may be directed or he shall make good such damage or injury in an acceptable manner.

3.02 RESTORATION

- A. Restore all areas disturbed by construction to a condition equal to or better than existed prior to construction.
- B. Replace, restore, repair, or otherwise make good any damage done to any tree, bush, or shrub that is not specifically designated for removal.
- C. Restore items such as culverts, road signs, power poles, sodding, fences, driveways, mailboxes, and like, whether or not specifically identified on the drawings, to a condition equal to or better than existed before construction.
- D. Replace or repair all concrete or asphalt driveways, concrete sidewalks, and curb and gutter removed or damaged during construction with equal or better materials. Replace or repair to match existing conditions.
- E. All disturbed areas shall be returned to the original grade on the Contract Drawings after completion of construction. Disturbed areas shall be reclaimed to match and blend with characteristic landforms. When feasible, these areas shall be re-contoured, and slopes rounded along access roads and wetland structures to blend with surrounding natural contours.
- F. Stabilize subgrade sufficiently to prevent mixing of granular material with subgrade prior to application of base material.
- G. Place topsoil per Section 31 05 13 and seed areas disturbed by construction in grassed areas per Section 32 92 19.

- H. Prior to re-opening any section to full public access, all sidewalks, driveways, curb ramps, and curb and gutter shall be installed.
- I. All damage to streets, driveways, berms, etc. due to the Contractor's construction techniques and equipment shall be repaired at the Contractor's expense prior to final payment.
- J. Remove all excess dirt, concrete, and other debris from project site immediately upon completion of Work. Contractor shall be required to clean site to the condition prior to the start of construction before final payment will be made.

END OF SECTION

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DIVISION 33 UTILITIES

SECTION 33 05 09
PIPING SPECIALS FOR UTILITIES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Polyethylene Encasement
2. Valves
3. Valve Boxes
4. Tapping Sleeves
5. Poly-Wrap
6. Nuts and Bolts
7. Couplings
8. Reaction Backing (Thrust Blocking)
9. Trench Insulation
10. Mechanical Joint Thrust Restraint for P.V.C. and D.I.

B. Related Sections include, but are not limited to:

1. Section 01 31 00 – Coordination and Meetings.
2. Section 01 33 00 – Submittal Procedures.
3. Section 01 45 00 – Quality Control.
4. Section 01 61 00 – Common Product Requirements.
5. Section 31 05 13 – Soils for Earthwork.
6. Section 31 05 16 – Aggregates for Earthwork.
7. Section 31 23 16.13 – Trenching and Backfilling.
8. Section 33 05 31 – Thermoplastic Utility Pipe.
9. Section 33 05 37 – Centrifugally Cast Fiberglass-Reinforced Polymer
10. Section 33 11 14 – Ductile Iron Pipe and Fittings
11. Section 33 13 00 – Disinfection of Water Systems.
12. Section 33 13 10 – Pipeline Pressure and Leakage Testing.

1.02 REFERENCES

A. Reference Standards include, but are not limited to:

1. ASTM A536 – Ductile Iron Castings.
2. ASTM B88 – Seamless Copper Water Pipe.
3. ASTM D3139 – Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.
4. ANSI/AWWA C104/A21.4 – Cement-Mortar Lining for Gray-Iron and Ductile-Iron Pipe and Fittings for Water.
5. ANSI/AWWA C105/A21.5 – Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for Water and Other Liquids.
6. ANSI/AWWA C110/A21.10 – Gray-Iron and Ductile-Iron Fittings, 3-Inch through 48-Inch, for Water and Other Liquids.
7. ANSI/AWWA C111/A21.11 – Rubber Gasket Joints for Gray-Iron and Ductile-Iron Pressure Pipe and Fittings.

8. ANSI/AWWA C150/A21.50 – American National Standard for Thickness Design of Ductile-Iron Pipe.
9. ANSI/AWWA C151/A21.51 – Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds for Water or Other Liquids.
10. ANSI/AWWA C153/A21.53 – Ductile-Iron Compact Fittings, 3-Inch through 12-Inch, for Water and Other Liquids.
11. AWWA C509 - Resilient-Seated Gate Valves, 3 through 12 NPS, for Water and Sewage Systems.
12. AWWA C550 - Standard for Protective Epoxy Interior Coating for Valves and Hydrants.
13. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances.
14. AWWA C605 - Underground Installation of PVC Pressure Pipe and Fittings.
15. AWWA C800 - Standard for Underground Service Line, Valves, and Fittings.
16. AWWA C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inch, for Water.
17. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14-inch through 48-inch, for Water Transmission and Distribution.
18. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4-inch through 63-inch, for water distribution.
19. ASTM D1784 - Rigid Poly (Vinyl Chloride) Compounds and Chlorinated Poly (Vinyl Chloride) Compounds.
20. ASTM D1785 - Poly (Vinyl Chloride) Plastic Pipe, Schedules 40, 80, and 120.
21. ASTM D2241 - Poly (Vinyl Chloride) (PVC) Plastic Pipe (SDR-PR).
22. ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe fittings, Schedule 80.
23. ASTM F2306 – 12-inch to 60-inch Annular Corrugated Profile-Wall Polyethylene (PE) Pipe and Fittings for Gravity-Flow Storm Sewer and Subsurface Drainage Applications.
24. ASTM F2648 – 2-inch to 60-inch Annular Corrugated Profile Wall Polyethylene (PE) Pipe and Fittings for Land Drainage Applications.
25. ASTM F477 – Elastomeric Seals (Gaskets) for Joining Plastic Pipe
26. ASTM D3212 – Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
27. NSF Standard No. 14, 60, and 61 - National Sanitation Foundation.
28. WW-T-779c – Federal Specifications
29. AWWA C502 – Dry Barrel Fire Hydrants.
30. AWWA C504 – Rubber-Seated Butterfly Valves.

1.03 SUBMITTALS

- A. Submit Shop Drawings per Section 01 33 00 – Submittal Procedures, for all pipe and fittings indicating: Name of Manufacturer, Materials, Standard Dimensions, References, Joint Data, maximum loadings, and thrust restraints.
- B. Provide a list of materials and corresponding suppliers.
- C. Submit Affidavit of Compliance certifying that materials furnished have been tested and are in compliance with specification requirements.

1. Submit design calculations for structural design of pipe thickness where pipe class or thickness is not specifically called out.
 - D. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories.
 - E. Manufacturer's Instructions: For valves, hydrants, and specialties, furnish in accordance with Sections 01 61 00 – Common Product Requirements, and 01 77 00 – Closeout Procedures, manufacturer's printed instruction for delivery, handling, storage, assembly, installation, adjustment, special tool requirements, and maintenance requirements.
 - F. In accordance with Section 01 77 00 – Closeout Procedures, provide records of measured depths of water mains, service leads, valves, connections, transition couplings, adapters, thrust blocking; measured horizontal and vertical locations of underground utilities and appurtenances referenced to permanent surface improvements; measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work; field changes of dimension and detail.
- 1.04 QUALITY ASSURANCE
- A. Perform Work in accordance with Section 01 45 00 – Quality Control.
 - B. Valves: Manufacturer's name and pressure rating marked on valve body.
- 1.05 DELIVERY, STORAGE, AND HANDLING
- A. Delivered materials shall be stockpiled and stored at locations approved by the Owner until required for installation. Materials shall be transported, delivered, stored, and handled in accordance with Manufacturer's instructions and the requirements of Section 01 61 00 – Common Product Requirements.
 - B. Contractor shall inspect materials upon delivery for loss or damage in transit. Contractor shall be responsible for the replacement of damaged materials; damaged materials shall be removed from the Site.
- 1.06 REGULATORY REQUIREMENTS
- A. All products that may come into contact with water intended for use in a public water system shall meet American National Standards Institute (ANSI)/National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each product. ALL WATER APPURTENANCES SHALL BE CERTIFIED LEAD FREE.

PART 2 PRODUCTS

2.01 POLYETHYLENE ENCASEMENT

- A. Conform to and install per ANSI/AWWA C105/A21.5.

- B. The polyethylene encasement shall consist of co-extruded layers of linear low-density polyethylene (LLDPE), which are fused into a single layer of not less than eight (8) mil thickness. Inside surface shall be infused with an antimicrobial biocide.
- C. Approved Manufacturers
 - 1. V-Bio Enhanced Polyethylene Encasement
 - 2. Approved Equivalent.

2.02 REACTION BACKING (THRUST BLOCKS)

- A. 3,000 psi concrete for pipe, fittings, and plugs unless specifically shown otherwise on Drawings.
- B. Locking restraint devices shall be used in conjunction with concrete thrust blocking.

2.03 BEDDING AND BACKFILLING

- A. As specified in Section 31 23 16.13 – Trenching and Backfilling.

2.04 VALVES

- A. Gate Valves (4-inches to 20-inches in diameter):
 - 1. Minimum working pressure of 350 psi for 4-inch to 20-inch valves.
 - 2. Valve body and EPDM encapsulated wedge constructed of ductile iron or cast iron.
 - 3. All gaskets, seals, seats shall be compatible with Chloramines. Manufacturer shall submit compatibility information for gasket, seals, seats, etc for Engineer's review.
 - 4. Resilient seat gate, bubbletight closure design.
 - 5. Meet or exceed the ANSI/AWWA C509 standards.
 - 6. Bronze stem and stem nut.
 - 7. Fusion Bonded Epoxy-coated interior and exterior in accordance with AWWA C550.
 - 8. Equipped with non-rising stem with 2-inch square operating nut, open left (counterclockwise) rotation.
 - 9. Provide adjustable valve box, riser, and cover. Provide stem extensions for all actuators. Extension length will vary with the depth of bury for each valve and shall extend to within one (1) foot of top of valve box. Provide all necessary appurtenances for complete operation of valve.
 - 10. Provide polyethylene encasement conforming to ANSI/AWWA C105/A21.5 for buried valves, as specified.
 - 11. Connections: Mechanical joint, unless otherwise specified.
 - 12. Provide gaskets, non-asbestos ring style gaskets, rated for the appropriate test pressure, and compatible with chloramines.
 - 13. Provide Stainless Steel Type 304 nuts and bolts. All tie rod type restraints shall be stainless steel.
 - 14. Markings shall be cast on the bonnet or body of each valve and shall show the manufacturer's name or mark, year valve casting was made, size of valve, and the designation of working water pressure.

15. Manufacturer shall furnish an affidavit stating that the valve and all materials conform to the applicable AWWA requirements and all tests specified under the respective standard have been performed and have been met. Valves shall be NSF 61 certified.
16. Contractor shall provide the Owner one valve wrench for the first valve installed and one wrench for every additional five valves installed.
17. Approved manufacturers for valves:
 - a. American Flow Control
 - b. Mueller Company
 - c. AVK
 - d. Clow Valve Company
 - e. Approved Equal.

B. VALVE BOXES

1. Valve boxes shall be three-piece cast iron with a round base, Tyler Union or approved equal.
2. The top of the valve boxes shall be 5 ¼ inches in diameter.
3. Valve box height shall be suitable for the burial depth of the valve, installed plumb, with poly wrap encasement, and shall have sufficient length to permit at least 6-inches of adjustment above and below grade when the valve is laid to the specified depth. Adjustment shall be screw type.
4. Covers shall have the word "Potable Water" or "Non-Potable Water" cast on top.
5. All buried valves shall have a full operator extension, as required to allow for operator use.

2.05 TAPPING SLEEVE:

- A. Stainless steel full wrap around body.
- B. All stainless steel tapped outlet, nuts, bolts, washers.
- C. Gasket to provide seal around full circumference of pipe.
- D. Approved manufacturers:
 1. Romac Industries, Inc.
 2. The Ford Meter Box Company.
 3. Approved equivalent.

2.06 STAINLESS STEEL COUPLINGS:

- A. All type 304 stainless steel middle ring, followers, nuts, bolts, and washers construction.
- B. Minimum length as required for joining cast iron pipe sizes as shown on plans.
- C. Minimum rated working pressure of 250 psi.
- D. Buna N rubber "O"-ring gaskets.
- E. Approved manufacturers:
 1. Dresser Industries, Style 38.
 2. Approved equivalent.

2.07 TRANSITION COUPLINGS:

- A. Long pattern, sleeve type, ductile iron couplings, meeting the requirements of ANSI/AWWA C110/A21.10 and rated for 250 psig.
- B. Epoxy or nylon coated inside and out.
- C. Where pipes of dissimilar metal are joined, ensure dielectric insulation to prevent galvanic corrosion.
- D. Install with stainless steel bolts.
- E. Provide polyethylene encasement.
- F. Approved manufacturers:
 - 1. Power Seal
 - 2. Ford
 - 3. Romac
 - 4. Approved equivalent

2.08 NUTS AND BOLTS:

- A. Buried and non-buried applications, provide AISI 304 Stainless Steel bolts and AISI 304 Stainless Steel nuts, for all nuts and bolts on fittings, valves, hydrants, and transition couplers. Properly lubricated bolts to prevent seizing.
- B. Prior to installing nuts, coat threads of stainless steel fasteners with the following anti-seize compound to prevent galling of threads.
 - 1. Manufacturers:
 - a. Never Seez Compound Corporation, Never-Seez.
 - b. Oil Research, Inc., WLR No. 111.
 - c. Or Equal.

2.09 MECHANICAL JOINT THRUST RESTRAINT

- A. Restrained joints, where required, shall be used for a sufficient distance from each side of the bend, tee, plug, valve, or other fitting to resist thrust which will be developed at the design pressure of the pipe. For the purpose of thrust the following shall apply:
 - 1. Calculate valves as dead ends.
 - 2. Design pressure shall be greater than the pressure class of the pipe or the internal test pressure (Pi), whichever is greater.
- B. PVC
 - 1. DI MJ Fitting:
 - a. Restraint for PVC pipe, at mechanical joint fittings, shall consist of the following:
 - 1) The restraint ring and mechanical joint gland ring shall be manufactured of ductile iron conforming to ASTM A536.
 - 2) The restraint devices shall be coated using MEGA-BOND® or approved equal.
 - 3) The gland ring shall be used to create the seal at the mechanical joint. The seal shall be the EBAA-Seal™

- 4) Improved Mechanical Joint Gasket, or approved equal. A restraint ring, incorporating a plurality of individually-actuating gripping surfaces, shall be used to grip the pipe, and a sufficient number of bolts shall be used to connect the gland ring and the gripping ring. The combination shall have a working pressure rating equal to that found in the most current product brochure.
 - 5) The restraint shall be the Series 2200 for pipes larger than 24-inch and Series 2000PV for pipes smaller than 30-inches, as manufactured by EBAA Iron, Inc., or approved equal.
2. Bell Harness:
- a. Restraint for PVC pipe (4" – 12") at the bell shall consist of the following:
 - 1) A split serrated ring shall be used to grip the plain end of the pipe.
 - 2)
 - 3) The restraint shall be the Series 1900, as manufactured by EBAA Iron, Inc., or approved equal.

2.10 TRENCH INSULATION

- A. Trench insulation shall be extruded rigid board material..
- B. The insulation shall have a thermal conductivity of not more than 0.28 BTU per hour per square foot per degree Fahrenheit per inch of thickness as tested in accordance with ASTM C177.
- C. The insulation shall not absorb moisture to an extent greater than 2.5 percent by volume as tested in accordance with ASTM D2127.
- D. The compression strength of the insulation shall be greater than 20 psi as tested in accordance with ASTM D1621.
- E. The density of the insulation shall be between 0.9 and 1.3 pounds per cubic feet as tested in accordance with ASTM D1622.

PART 3 EXECUTION

3.01 INSTALLATION – PIPE, VALVES, AND APPURTENANCES

- A. Install all pipe and appurtenances in strict accordance with manufacturer's recommendations.
- B. All foreign material or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept clean by approved means during and after laying.
- C. Materials shall be handled carefully. Damage to protective coatings, linings, and joint fittings shall be cause for rejection of the materials.
- D. Prior to installation each pipe section, special or valve shall be thoroughly inspected by the Contractor to detect damage or defects. Contractor shall inform Engineer of such damage or defects. Any parts that are defective or damaged

shall be replaced.

- E. Excavate and backfill excavations and trenches in accordance with Section 31 23 16.13 – Trenching and Backfill.
- F. Keep trenches free from surface and ground water until pipe jointing is complete.
- G. All valves shall be set on cast in place or precast concrete blocks in order to prevent the weight from being transmitted to the pipe.
- H. Before concrete is placed around specials and appurtenances, the appurtenance and pipe shall be wrapped with polyethylene to completely isolate the concrete from the water main construction.

3.02 PIPE THRUST RESTRAINT

- A. Provide all crosses, tees, bends, caps, and other thrust points in the piping system with suitable means of overcoming thrust.
- B. Piping smaller than 6-inches may utilized concrete thrust blocks in lieu of mechanical type restraints.
- C. Pour concrete against undisturbed soil. Concrete must be allowed to cure in thrust restraints for 5 days before pressurizing water lines or have additional approved thrust restraints installed before pressurizing the water line.
- D. Pipe Joints: Do not cover with concrete. Leave completely accessible.
- E. Grease: Apply grease to all buried metal surfaces. Wrap with polyethylene sheet and tape wrap.

3.03 POLYETHELENE ENCASEMENT

- A. Install on all underground metallic items, including: ductile iron pipe, ductile iron fittings, metal body valves, other metal pipe and fittings, fire hydrants, stainless steel couplings, transition couplings, and service and testing tapping saddles.
- B. Install as demonstrated on the Ductile Iron Pipe Research Association website; Execute using Modified Method A for Normal Dry Trench Conditions.
 - 1. https://assets.ctfassets.net/e4roza01bro8/3FDzxkhcHSUjNXzKfVnJnO/1b2d0eb9bcad2f9565155cf83348c713/Corrosion_Control-Polyethylene_Encasement_English_.pdf
- C. Do not cover pipe and fittings until all bedding, joints, and polyethylene wrap have been inspected.

3.04 HYDROSTATIC PRESSURE TESTING

- A. Conduct pressure testing of the pipeline system in accordance with Section 33 13 10.

3.05 DISINFECTION OF POTABLE WATER SYSTEM

- A. Conduct disinfection of the pipeline system in accordance with Section 33 13 00.

3.06 DATA FOR AS-BUILT RECORDS

- A. Record stationing and/or ties of all fittings, valves, and other underground appurtenances installed on sheets provided for such purposes by the Engineer. Include invert or centerline elevations.

END OF SECTION

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SECTION 33 05 13
MANHOLES AND COVERS

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:

1. Modular precast concrete manhole and inlet sections with tongue-and-groove joints, precast cover and base slabs, frame and covers.

1.02 REFERENCES

A. References include, but are not limited to:

1. ASTM A48 - Standard Specification for Gray Iron Castings.
2. ASTM A496 - Deformed Steel Wire for Concrete Reinforcement.
3. ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
4. ASTM A615 - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
5. ASTM C478 - Precast Reinforced Concrete Manhole Sections.
6. ASTM C923 - Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes.
7. Federal Specification SS-S-00210 - Pre-formed Plastic Sealing Compound.
8. Section 1500, City of Fargo Standard Specifications for Construction

1.03 SUBMITTALS FOR REVIEW

- A. See Section 01 33 00.
- B. Shop Drawings: Indicate manhole types, locations, elevations, piping, and conduit sizes and elevations of penetrations.
- C. Product Data: Provide manhole covers, component construction, features, configuration, and dimensions.

1.04 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with a minimum of three-years' experience.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 50° F prior to, during, and 48 hours after completion of masonry Work.

PART 2 PRODUCTS

2.01 GENERAL

- A. When located within City Right-of-way, all storm sewer pipe, manholes and catch basins shall be reinforced concrete.

2.02 REINFORCED CONCRETE MANHOLES

A. Materials:

1. Refer to Paragraph 2.6, Section 1500, City of Fargo Standard Specifications for Construction.
2. Standard Barrel Sections, Base slabs, and Cover slabs: Reinforced precast concrete as specified in accordance with ASTM C478 able to withstand H20 load requirements. Include knockouts for wall pipes.
3. Joints: Use Rubber O-ring gasket type flexible joints ASTM C443.
4. Reinforcement: Reinforce with deformed billet-steel conforming to ASTM A615 or deformed welded wire fabric conforming to ASTM A496 and ASTM A497 for the anticipated loading conditions.
5. Chimney Seal & Extensions: External chimney seal manufactured by Cretex Specialty Products or approved equal.
6. Use PVC pipe adaptor where PVC or PP pipes penetrate manhole walls.
7. Adjusting Rings: Injection molded high density polyethylene manhole adjusting rings manufactured by Ladtech, IPEX, EPP by JSP or approved equal.
8. Manhole Steps: Rubber coated steel as manufactured by M.A. Industries Inc. or approved equal. Comply with all applicable OSHA regulations. Formed integral with manhole sections.
9. Manhole Lids and Frame: ASTM A48, Class 35B Gray (cast) Iron construction machined flat bearing surface, removable lid. Manhole casting shall have a vented lid with the word "STORM" (or the words "STORM SEWER") cast into the lid in letters at least 1-inch high.
 - a. Manufacturer and Products:
 - 1) Neenah Foundry, R-1733, EJ1205Z
 - 2) Or approved equal.

B. Configuration

1. Barrel Construction: Concentric lipped male/female joints.
2. Clear Inside Dimensions: As indicated on the Drawings. Area inlets shall be 30" diameter minimum.
3. Design Depth: As indicated on the Drawings.
4. Clear Lid Opening: 27- inch diameter.
5. Manhole Steps: Minimum of 10 inches in width, 12 inches on center vertical spacing, set into manhole walls in accordance with ASTM C478.13.
6. Adjusting Rings: Provide a minimum of three and maximum of six 2-inch thick, 27-inch diameter inside adjustment rings between manholes and casting top section.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify items provided by other sections of Work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

3.03 REMOVAL OF EXISTING MANHOLES AND APPURTENANCES

- A. Remove existing pavement per Section 02 41 13.
- B. Excavate trench per Section 31 23 33.
- C. Remove manhole base, sections, cover, adjusting rings, castings, frames, and other associated appurtenances, and debris as shown on Drawings or encountered along the route of the project in a manner and schedule that minimizes disruption of storm sewer service and traffic.
- D. Dispose of all materials to a location identified by and a manner specified by the Owner.

3.04 PLACING CONCRETE MANHOLE SECTIONS

- A. Cut and remove existing pipe sections, as necessary, when installing manhole over existing pipe. Place base pad, trowel top surface level.
- B. Place manhole sections plumb and level, trim to correct elevations, anchor to base-pad.
- C. Cut and fit for pipe and conduit sleeves.
- D. Grout lifting holes neatly to the curvature of the barrel with masonry cement. Trowel smooth.
- E. Contour as required.
- F. Install preformed plastic sealing compound or water stop as required between joints of manhole sections to insure leak proof manhole.
- G. Set cover frames and covers level without tipping, to correct elevations.
- H. Furnish and install external manhole chimney seal and extension.
- I. Coordinate with other sections of work to provide correct size, shape, and location.
- J. Construct concrete bench and channel.

3.05 ADJUSTMENTS OF MANHOLE AND INLET CASTINGS

- A. Adjusting rings should be set in place in configuration shown on the Drawings.
- B. Adjustments shall be made with concrete manhole sections, concrete adjustment rings or by other approved means. No more than three, 2" adjustment rings shall be used per manhole or inlet.
- C. Install chimney seal to manufacturer's specifications to provide support, floating casting movement, and watertight connections.
- D. Set frames and grates level without tipping, to correct elevations.

- E. Drill holes, if required, for #5 Rebar into casting as shown on Drawings.
- F. Coordinate with other sections of Work to provide correct size, shape, and location.

END OF SECTION

SECTION 33 05 23

THERMOPLASTIC PIPE INSTALLATION BY HORIZONTAL DIRECTIONAL DRILLING

PART 1 GENERAL

1.01 SUMMARY

A. This section includes:

1. Requirements and Specifications for installation of FPVC, using horizontal directional drilling (HDD).
2. Minimum requirements for design, materials, and equipment used for the horizontal directional drilling methods and techniques.
3. Materials, dimensions, and other pertinent properties of pipe and required accessories.
4. Minimum performance requirements for various components including joints.

B. Related Section include, but are not limited to:

1. Section 01 33 00 - Submittals
2. Section 01 45 00 – Quality Control
3. Section 01 77 00 – Closeout Procedures
4. Section 31 23 16.13 – Trenching and Backfilling
5. Section 33 05 24 – Butt Fusion of Thermoplastic Pipe
6. Section 33 05 09 – Piping Specials for Utilities
7. Section 33 05 97 – Identification and Signage for Utilities
8. Section 33 05 31 – Thermoplastic Utility Pipe
9. Section 33 13 00 – Disinfection of Water Systems
10. Section 33 13 10 – Pipeline Pressure and Leakage Testing

1.02 DESCRIPTION OF WORK

- A. Install pipelines by HDD where shown on the drawings. The drilling equipment shall be set back a sufficient distance from the point of connection or physical boundary that cannot be open cut to give a minimum depth of 7.5', but not more than approximately 20' from ground elevation to the top of the final bore unless shown otherwise on the Drawings. The minimum vertical separation from existing utilities shall be 18-inches. The bore path shall be designed by Contractor to ensure that the drill rod is capable of the combined application of thrust, torque, and bending to the prescribed radius without compromising the pipe pull back.

1.03 REFERENCES

A. Reference Standards include, but are not limited to:

1. ASTM F1962 – Use of Maxi-Horizontal Directional Drilling for Placement of Product Pipe or Conduit Under Obstacles, Including River Crossings.
2. Horizontal Directional Drilling Good Practices Guidelines, Latest Edition, HDD Industry Consortium, 300pp.

1.04 SUBMITTALS

- A. Provide sufficient detail on the proposed materials, and procedures to verify compliance with the Contract requirements. Review of submittal details and data will be based on considerations for the completed Work and utilities. Review and acceptance of the Submittals shall not relieve the Contractor of its responsibilities under this Contract.
1. Unless otherwise noted, Shop Drawings shall have been reviewed and accepted prior to Contractor's mobilization.
- B. Prior to beginning work, submit to Engineer a work plan detailing the procedure and schedule to execute the Work. Work plan shall include a description of all equipment to be used, down-hole tools, a list of personnel, their qualifications and experience (including back-up personnel in the event that an individual is unavailable), list of subcontractors, a schedule of work activity, a safety plan (including MSDS of substances to be used), traffic control plan (if applicable), an environmental protection plan and contingency plans for possible problems. Work plan shall be comprehensive, realistic and based on actual working conditions at each HDD location.
- C. Submit descriptions of methods, equipment, and materials to be used for contact grouting any areas where over-excavation, aborted bores, voids, or cavities are created or encountered during construction.
- D. Submit a Contingency Plan for Remediation of Potential Problems that may be encountered during the drilling operations. Contingency plan shall address the observations that would lead to the discovery of the problem and the methods that would be used to mitigate the problem. Potential problems that shall be addressed in this Plan include, but are not limited to, the following:
1. Loss of returns/loss of circulation of drilling fluids.
 2. Inadvertent returns/hydrofracture or surface spills resulting in drilling fluids entering water or reaching the surface. Stand-by equipment shall be provided to recover fluids. Turbidity barriers shall be part of the stand-by equipment to minimize dispersion in the event that drilling fluids reach the surface.
 3. Encountering obstruction during pilot bore or reaming/pullback.
 4. Drill pipe or carrier pipe cannot be advanced..
 5. Deviations from design line and grade that exceed allowable tolerances.
 6. Drill pipe or carrier pipe broken off in borehole.
 7. Carrier pipe collapse or excessive deformation.
 8. Utility strike.
 9. Deviation from planned bore path.
 10. Hydrolock occurs or is suspected.
 11. Excessive ground settlement or heave.
- E. Submit Plans for disposal of waste materials resulting from the pipeline construction, including drilling fluids, cuttings, waste oil, fuel, discharge water, etc. Identify the disposal site and submit a letter indicating willingness and legal authority to accept the described and anticipated waste products.

- F. Submit plan which provides sketches depicting the layout and locations of equipment within the Work area, including any proposed drilling fluid containment and recirculation pits.
- G. Submit a HDD Work Plan complete with drawings and written description identifying details of proposed method of construction and sequence of operations during construction.
 - 1. Plan shall include a detailed plan and profile of the bore showing any proposed deviations from the Drawings included in design documents and plotted at a scale no smaller than one inch equals 40 feet horizontal and one inch equals four feet vertical.
 - 2. Plan shall include proposed changes to pipe and fitting connections resulting from alignment deviations from the Drawings.
- H. Inadvertent Return and Surface Spill Contingency Plan shall be prepared for the HDD installations. Submit letter signed by an authorized representative confirming that the Plan will be followed. If required by permit conditions, revise the Plan as necessary to satisfy the associated regulatory agency.
- I. Submit calculations identifying the critical downhole pressure that would cause hydrofracture or inadvertent return of drilling fluid. Calculations shall identify the critical points in the alignment where soil cover above the bore is low. Calculations shall identify all parameters used and state all assumptions made in the calculations.
- J. Submit detailed description of methods, equipment, and materials to be used for the pipeline installation. Descriptions of drilling fluid additives shall be accompanied by Materials Safety Data Sheets (MSDS) and Manufacturers' descriptions and warranties. Descriptions of equipment shall include Manufacturers' specifications, calibrations, appropriate drawing, photographs, and descriptions of any modifications since manufacture. Plan shall include the means for complying with all local noise ordinances.
- K. Submit methods and procedures for filling the pipe with water during pull back and testing, if required.
- L. Submit calculations for pipe stresses expected from the pullback, bending, fluid buckling loads, earth loads, groundwater loads, and any other installation and service loads expected on the pipe. All assumptions used in the calculations, including the radius of curvature, assumed drilling fluid weights, whether pipe is assumed to be filled or empty during pullback, and temperature shall be provided.
- M. Submit a plan that provides details on measures to be taken to monitor and protect adjacent utilities, structures, roadways and sidewalks, and provide details on monitoring equipment and provisions, including the layout of all settlement points and other monitoring points. Provide two copies of pre- construction survey of adjacent structures and photographs with captions to document pre-construction conditions.

- N. Submit written documentation of HDD superintendent and key personnel experience in accordance with Paragraph 1.06A and 1.06B.
- O. Submit verification that the directional drill(s) can be completed using the radius of curvature, profile, lines, grades, and geometry shown on the Drawings along with the calculations showing that installation stresses do not exceed allowable pipe stresses. If directional drill(s) cannot be completed in accordance with the intent of the design as shown on the Drawings, submit alternate design based on allowable pipe stresses and manufacturers requirements, not later than 30 days after Notice of Award. If approved by Engineer, alternate design shall be the basis for construction of the directional drills. Cost of the verification with the design intent shown on the Drawings and developing alternative design shall be included in the Unit Bid Price for the Horizontal Directional Drill items. Pipe Class shown on the Drawings is based on the internal working pressure. Contractor shall verify that the pipe class in the bid form and shown on the Drawings has sufficient strength to withstand the pulling forces. If required for a successful installation the Contractor shall recommend a heavy pipe class.
- P. Submit a Safety Plan, including the name of Site Safety Representative, emergency telephone numbers for medical facilities, and precautions for handling and disposal of any hazardous or flammable materials. The Safety Plan shall include a code of safe practices and an emergency plan in accordance with OSHA requirements.
- Q. Schedule: At least fifteen working days prior to mobilization, submit a detailed schedule for the HDD installation(s) showing all major construction activities and durations, with start and end dates. The schedule shall be updated at least every week or more frequently, as directed by the Engineer, and shall include:
1. "One call" utility locate requests and visual confirmation of all crossing utilities and all parallel utilities within the vicinity of the bore centerline.
 2. Rig mobilization and setup.
 3. Pilot bore drilling.
 4. Pre-reaming and reaming.
 5. Layout and thermal butt-fusing of pipe.
 6. Pressure testing of pipe prior to pullback.
 7. Final reaming and pullback of pipe.
 8. Pressure testing of pipe after installation.
 9. Mandrel/pig test to confirm deformations of pipe are within allowable tolerances.
 10. Cleanup, surface restoration, and demobilization.
- R. Soil Separation Plan: Submit details on the pump and soil separation plant. Include dimensions, manufacturer's specifications, pump capacity, noise rating, and soundproofing details on the system.
1. Pump capacity should be specified for water at sea level elevation, and adjusted for actual elevation and fluid viscosity.
 2. Provide details on the generator, including dimensions, noise ratings at twenty-five (25) feet, and soundproofing. Confirm that the generator and

other on-site equipment can be operated without exceeding the maximum allowable noise tolerances allowed by local governing bodies.

- S. Submit records of equipment calibrations and certifications for equipment used for downhole surveys and tracking of the drill head. Procedures for operating the downhole survey tools shall be described, including measures to verify the accuracy of the equipment readings.
- T. The following shall be submitted as construction progresses and at the completion of construction.
 - 1. Submit complete, legible, written daily logs and records as specified in Paragraph 1.06C and as directed by the Engineer, by noon of the following day to which the records correspond..
 - 2. Submit maximum drilling speeds and reaming rates for pilot bore and each reaming pass and confirm that the pump capacity is adequate for these anticipated drilling rates for the mud and/or drilling fluid weights and viscosities anticipated. Submit on a daily basis.
 - 3. Submit measured mud and/or drilling fluid weights used during pilot boring and reaming of the bore measured at a minimum of three times per shift or at least once per 200 feet of drilled or reamed length, whichever is more frequent, with at least two (2) hours between readings.
 - 4. Submit an as-built profile of the pilot bore within 24 hours of completion of the pilot bore.
 - 5. Submit all pressure test records for both the pre- installation and post-installation tests. Submit within 24 hours of completion of such tests.
 - 6. Document any variations between the Drawings and actual profile of the bore path. Notify in writing and by telephone the Engineer immediately upon discovery of any deviations.
- U. Submit a Bentonite/Polymer Management Plan that includes the following as a minimum.
 - 1. Provide a drilling mud plan that outlines the specific drilling fluid design/requirements appropriate for the geology of the soils that will prepare and maintain the bore path.
 - 2. During construction and following completion of the pull, locate and secure disposal site for the drilling fluid.
 - 3. Designate qualified personnel and equipment on Site during directional drilling operations responsible for monitoring drilling fluid pressure, and watching surface conditions for visual signs of frac-out.
 - 4. Provide an emergency response and containment plan for inadvertent drilling fluid discharges (frac-outs). In the event of a fluid spill or frac-out, cease drilling activities.
 - 5. Sediment control systems such as: silt fence or earth berms on uplands, and floating silt barriers or other aquatic barriers, and other means necessary to prevent the spread of the bentonite spill shall be installed immediately.
 - 6. Remediation of the lost bentonite/polymer shall begin immediately. Cleanup shall include removal of the material from the Site and disposal of the material to an appropriate location.

- V. Submit specifications on directional drilling equipment to be used and provide an estimate of pull-back thrust that will be required for pull back based on the length, radius, soil type, and type of pipe. Equipment shall include but not be limited to:
 - 1. HDD drilling rig – provide total thrust and total torque capacities.
 - 2. Reamers – sequence and proposed sizes and type of reamers.
 - 3. Mud system – mixing, fluid additives, storage and separation capacities.
 - 4. Guidance equipment – and proposed method for drilling the bore path.
- W. Submit Specifications on material to be used to Engineer. Material shall include carrier pipe manufacturer, fittings, drilling mud, drilling additives and any other item, which is to be an installed or used during construction.
- X. Proof-of-Design Tests: Manufacturer shall have representative proof-of-design tests of fused pipe joints established for the basis for the maximum allowable pulling loads.
- Y. Failure to submit the information listed in this Article 1.04 shall result in withholding payment for directional drills completed and suspension of additional directional drilling activities.

1.05 PERFORMANCE REQUIREMENTS

- A. Provide all equipment, materials, and personnel necessary to complete the installation shown on the Drawing and specified herein. Equipment and materials shall include, but are not limited to:
 - 1. Directional drilling rig with all ancillary equipment, including drill pipe, drilling fluid, cutting tools, reaming bits, swivels, expanders, motors, pumps, hoses, mixing equipment, drilling fluid processing equipment (cuttings separation equipment), downhole survey equipment, energized surface grid tracking system, fluid pressure and flow rate monitoring equipment, spare parts, pipe handling equipment (cranes, backhoes, rollers, side boom tractors) control equipment, and office equipment.
 - 2. Drilling fluids, water, fuel, lubricant, polymers, or other additives.
 - 3. Any other expendable or reusable materials, supplies, and equipment needed for the installation.
- B. Drilling equipment shall be capable of advancing through the geologic conditions anticipated at the site.
- C. Drilling fluid shall be designed for the geologic conditions to be encountered at the site as anticipated by the Contractor.
- D. Drilling system shall include a fluid pump and separation plant that can achieve the rates of drilling fluid pumping, spoil separation, and slurry cleaning required to achieve planned production rates for the anticipated soils. Shaker screens and hydrocyclones may be required for efficient separation of spoils. The separation plant must fit within the right-of way or easements.
- E. All spoil and slurry must be contained in trucks, tanks, approved recirculation pits, or other containers at all times. Dumping of spoil or slurry on the ground, discharge into sewers, or discharge into the water bodies will not be permitted.

All spoils will be transported and disposed of off-site at an approved disposal facility that meets all State of Minnesota and local requirements.

- F. Pipe rollers and lifters will be required to help the transition of the carrier pipe into the bore and to minimize the pull force. The number of pipe rollers and lifters shall be determined by the Contractor in accordance with the pipe supplier's recommendations. Location and spacing of the rollers and lifters will be done in accordance with the pipe manufacturer's recommendations based on bend radius. Provide a copy of manufacturer's recommendation to Engineer.
- G. All Work shall be in conformance with all applicable federal, state, and local safety requirements. Required safety equipment and procedures shall be employed at all times.
- H. Allow access to the Owner, Engineer and Pipe Supplier and furnish necessary assistance and cooperation to aid in observations and data and sample collection, including, but not limited to the following:
 - 1. The Owner, Engineer and Pipe Supplier shall have full access to the operator control container prior, during, and following all HDD operations. This shall include, but not be limited to, providing visual access to real-time operator control screens, gauges, and indicators.
 - 2. The Engineer and Pipe Supplier shall have full access to the slurry separation plant prior, during, and following all HDD operations. This shall include, but not be limited to, full access to shaker screens, hydrocyclones, conveyor belts, and slurry and spoil holding tanks. The Engineer and Pipe Supplier shall be allowed to collect soil samples from the shaker screens and/or spoil holding tanks on the slurry separation plant a minimum of once per installed pipe section, and whenever changes in conditions are observed or suspected. If requested, assist in the collection of these samples as directed by the Engineer.

1.06 QUALITY ASSURANCE

- A. The HDD Subcontractor shall meet the following minimum qualifications:
 - 1. HDD Subcontractor shall have at least eight years of demonstrated successful experience installing pipelines by the means of HDD.
 - a. HDD Subcontractor must have successfully completed three sewer projects where the carrier pipe was installed with HDD techniques, each meeting the following criteria.
 - b. Minimum thermoplastic carrier pipe nominal diameter of at least 9-inches and
 - c. Minimum length of 500 linear feet in a single pull through soil.
 - 2. Employ skilled, experienced superintendent(s), equipment operator(s) and personnel throughout the project. The superintendent for this project shall have at least ten years of successful experience using the HDD process, with at least two projects meeting the criteria identified in Paragraph 1.06A.2.
 - 3. The HDD equipment operator for this project shall have at least five (5) years of successful experience using the HDD process, with at least two projects meeting the criteria identified in Paragraph 1.06A.2.

- B. Furnish resumes of the superintendent(s) and key personnel. Personnel experience records should include project names, locations, pullback lengths, ground conditions, pipe materials, project description, project Owner, Engineer, and references with names, addresses, and telephone numbers. The superintendent listed in the submittal shall be on site during all construction related activities required for the HDD installation for this project.
- C. Daily Logs and Records: Daily logs and records shall be maintained and shall include the following
1. drilling lengths,
 2. location of drill head,
 3. drilling fluid pressures and flow rates,
 4. drilling fluid losses,
 5. inadvertent returns,
 6. drilling times required for each pipe joint,
 7. any instances of retraction and re-drilling of the pilot bore or segments thereof, and
 8. any other relevant observations, including any observed settlement, heave, frac-outs, or surface spills.
- D. Provide an accurate proven guidance system with an interface meeting the following requirements:
1. Capable of providing a continuous and accurate determination of the location of the drill head during the drilling operation.
 2. Capable of providing a plot of actual locations, at a minimum frequency of 20 feet along the bore path. Plot shall be maintained and updated daily or more frequently, as directed by the Engineer and submitted with horizontal scale of 1:100 and vertical scale of 1:5, at a minimum.
 3. Capable of tracking at all depths up to 65 feet in any soil condition, including hard rock.
 4. Capable of providing immediate information on the tool face of inclination(vertical direction) and azimuth (horizontal direction) and be accurate to +/- 5% of vertical depth of the bore hole at the sensing position at depths up to 65 feet and accurate within 5 feet horizontally.
 5. System must be setup and operated by personnel trained and experienced.
 6. Operator must be aware of any geo-magnetic anomalies and must consider such influences in the operation of the guidance system if using a magnetic system.
 7. Wire line tracking locator systems, shall be supplemented by a "TruTracker" or equivalent tracking system installed between the entry point and the exit point. The coordinates of the surface wire grid system shall be surveyed and recorded. A plot of actual locations of the bore path shall be maintained and updated daily, or more frequently, as directed by the Engineer.
- E. Provide 72 hours advance written notice to the Engineer of the planned inspection of major drilling activities, including pilot bore launch, pre-reaming, reaming, and pipe pullback. Immediately notify the Engineer, in writing, when

any significant problems are encountered. All Work shall be performed in the presence of the Engineer, unless Engineer grants prior written approval to perform such Work in Engineer's absence.

- F. All surveying equipment used for downhole surveying and tracking of the bore path and drill head shall be inspected and calibrated by the equipment manufacturer prior to use. Proof of this inspection and calibration shall be provided to the Engineer prior to commencement of drilling operations.
- G. Failure to submit the information listed in this Article 1.06 shall result in withholding payment for directional drills completed and suspension of additional directional drilling activities

1.07 SITE DESCRIPTION

- A. See project plans.

PART 2 PRODUCTS

2.01 GENERAL

- A. The bore path alignment and design shall be based on the Engineer's plans or pipe manufacturer's alternate design and other factors. Factors include, but are not limited to, pipe bell and barrel diameters, optimum individual pipe length (20' standard), bore path inside diameter, and maximum deflection capabilities of the joint.
- B. Prior to the start of drilling, reaming, and pipe placement operations, locate and identify all existing utilities in proximity to pipeline alignment. Confirm the alignment of all critical utilities, using vacuum excavation or other suitable excavation method, for further detailed confirmations as necessary.

2.02 DRILL PIPE

- A. Provide high quality drill pipes that have been inspected and determined to be adequate for the project requirements. Bent, racked, or fatigued drill pipes shall not be used. Threads must be in good condition. The length of each drill pipe shall be measured and recorded.

2.03 PIPE

- A. The pipe thickness must conform to the most conservative design with respect to design calculations for the critical combination of internal and external pressure, pullback and bending. The pipe will meet the minimum dimension ratio (DR) specified in Section 33 05 31 – Thermoplastic Utility Pipe, unless Contractor's calculations indicate a thicker wall is required.
- B. Pipe shall be fused in accordance with Section 33 05 24 – Butt Fusion of Thermoplastic Pipe.

2.04 DRILLING FLUID SYSTEM

- A. A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of any of the following: Bentonite clay, potable water, polymers and other appropriate additives. No additional material may be used in drilling fluid without prior approval from Engineer. Obtain clean water for the fluid.
- B. Additives to drilling fluid such as drill soap, polymers, etc. shall be “environmentally safe” and be approved for such usage. Use of diesel fuel is not acceptable.
- C. Pumping system shall have a minimum capacity of 50 GPM and be capable of delivering the drilling fluid at a constant minimum pressure of 1000 psi. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid recycling system to prevent spills from entering into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage and facilities.
- D. Drilling Fluid and soil separator shall have a sufficient capacity to separate the materials without overflowing or spilling and have sufficient capacity to deliver drilling fluid for the drilling operations.

2.05 OTHER EQUIPMENT:

- A. Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe. Rollers shall be used as necessary to assist in pull back operations and in layout/jointing of piping.

2.06 JOINTS, INTERCONNECTIONS, AND PULLING BELL ASSEMBLIES

- A. Pipe and fused joint shall be capable handling the specified internal pressure, as well as vacuum and external pressures that can occur in pipeline operation. Fused joints shall exhibit such performance attributes in straight alignment or at minimum radius bends. Pipe pulling bell assemblies shall be designed and furnished by the pipe manufacturer. Pulling bell assembly shall have the same performance characteristics as the pipe to which it is connecting. It shall be fabricated with filling/testing ports, of appropriate size, for testing of the pipe after it is pulled through the bore path. After complete installation, the pulling head may also be helpful, with or without further connection of piping, in normal higher-pressure hydrostatic testing of the installed piping.

PART 3 EXECUTION

3.01 GENERAL

- A. Provide adequate control of surface water and drilling fluids drainage and runoff, and provide silt fences, hay bales, and wattles to prevent surface water or drilling fluids from being transported off-site. Provide barricades, fencing, or other safety measures to prevent public access into Work and staging areas.
- B. Do not initiate HDD until all submittals are received, reviewed, and approved by the Engineer. Do not initiate HDD until all required permits are obtained. Copies of all permits shall be provided to the Engineer prior to construction.
- C. Notify Engineer 48 hours in advance of starting work. Directional Bore shall not begin until the Engineer is present at the job site and agrees that proper preparations for the operation have been made. The Engineer's approval shall not relieve the Contractor for the satisfactory completion of the Work.
- D. Drawings show existing utilities that are believed to be near the directional drill alignment. Information on the location of existing utilities has been furnished to the Engineer by others. There is no guarantee that these utilities are located as shown or that other utilities are not be present. Field locate existing utilities in advance of the work so as not to delay work and avoid conflict or disruption of utility services.
- E. Large rock, cobble and bedrock may exist due to the topography and geology of the region. No attempt has been made by the owner to determine the limits, amount, or type of rock that may be encountered
- F. Drilled pipe shall have been installed and allowed to set for a minimum of 24 hours whenever the ambient temperature is 20 degrees greater than or 20 degrees less than the ground temperature at time of insertion before making connection to the direct bury pipe.
- G. To provide the most effective pull force for installation of the thermoplastic pipe, the pipe that has entered the bore and is below ground level may be maintained full of water during the entire pullback process, if required. The above grade portion of the pipe will be kept empty during the pull in.

3.02 PERSONNEL REQUIREMENTS

- A. Personnel shall be fully trained in their respective duties, and in safety, as part of the directional drilling crew. Each person must have at least two years directional drilling experience. Competent and experienced supervisor representing the Contractor and Drilling Subcontractor shall be present at all times during the actual drilling operations. A responsible representative who is thoroughly familiar with the equipment and type of work to be performed, must be in direct charge and control of the operation at all times. Supervisor must be continually present at the job site during the actual Directional Bore operation. Contractor and Subcontractor shall have a sufficient number of competent workers on the job at all times to insure the Directional Bore is made in a timely and satisfactory manner. Personnel who are unqualified, incompetent or otherwise not suitable for the performance of this project shall be removed from the jobsite and

replaced with a suitable person.

3.03 PROTECTION OF UNDERGROUND UTILITIES

- A. Notify "One Call" system to request marking of utilities and individually notify all other known or suspected utilities to request marking of utilities. Confirm that all requested locates are made prior to commencing drilling operations. Make all diligent efforts to locate any unmarked or abandoned utilities using all available information, maps, and drawings. Visually confirm and stake all existing lines, cables, or other underground facilities including exposing all crossing utilities and utilities within twenty feet laterally of the centerline of designed drilled path.
- B. Control drilling practices to prevent damage to existing utilities. Make diligent effort to locate surface evidence of any other potential subsurface obstructions, such as piers and piles.

3.04 WORK STAGING AREA

- A. Erect appropriate barriers, warning lights, signs, painted with approved colors, warnings, and graphics to ensure adequate warnings to personnel and the public in accordance with local governing bodies.
- B. Maintain the Work area to minimize adverse impacts on public use activities. Maintain the Site free of debris and unnecessary equipment and materials.
- C. Follow all requirements of the Inadvertent Return and Surface Spill Contingency Plan as approved and control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. Maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming, and pullback operations and shall be capable of quickly removing spoils. Immediately notify Engineer of any inadvertent returns or spills and immediately contain and clean up the return or spill.
- D. At the completion of construction, remove all temporary facilities installed. Unused soil, aggregate, and other materials shall be removed and disposed of at approved sites in accordance with Federal, State, and Local regulations.
- E. Install an enclosure fence around the Work area. Enclosure fence shall be adequate to prevent entry of unauthorized persons.
- F. Provide and maintain all temporary lighting required for operations, safety, testing, and inspection. Remove temporary lighting immediately after completion of construction.

3.05 MOBILIZATION

- A. Mobilize all equipment, materials, and personnel necessary to construct the carrier pipeline using the HDD process at the locations.

1. Appropriate precautions and measures shall be employed to prevent erosion, surface drainage, and spillage of drilling fluids or other materials that adversely impact the environmental quality of the site. Silt fences, hay wattles, and hay bales shall be used to minimize erosion and contain any spillage or runoff. Shovels, brooms, buckets, and barrels shall be kept on-site to facilitate containment and cleanup. Vacuum truck or trailer unit will be on standby and capable of responding within one hour to any spill or inadvertent return incident.
2. Layout area shall be free of stones, wood, debris, and obstructions. Pipe rollers shall be provided during the fusion process to facilitate pipe fusion and pullback.

3.06 DRILLING PROCEDURE

- A. Drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path shall be surveyed for any surface geo-magnetic variations or anomalies.
- B. The capacity of the directional drilling system used shall be adequate to install the specified pipeline. The pumps used shall be adequate to supply the required flow rate and pressures at the anticipated drilling fluid viscosity at all times. Drilling speeds shall not exceed pump capacity. Drilling speeds shall be monitored continuously during HDD operations.
- C. Place silt fence between drilling operations and any drainage, wetland, waterway or other area designated for such protection by Contract Documents, State, Federal and Local Regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Comply with applicable environmental regulations. Fuel or oil may not be stored in bulk containers within 200' of any water-body or wetland
- D. At all times during the pilot bore provide and maintain a bore tracking system that monitors and accurately records the position of the drill head in the x, y, and z axes. Record these data at least once per drill every thirty feet.
 1. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed tolerances specified, such occurrences shall be reported immediately to the Engineer. Undertake all necessary measures to correct deviations and return to design line and grade.
 2. Drilling fluid pressures and flow rates shall be continuously monitored and recorded. The pressure shall be monitored at the pump. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.
 3. Maximum allowable drilling speeds shall be calculated for pilot boring and each reaming pass and shall not be exceeded for pilot boring or reaming passes. Measurements shall be taken every thirty (30) feet or thirty (30) minutes, whichever is more frequent.
 4. Measure and record drilling fluid viscosity and density at least three (3) times per shift or at least once per 200 feet of drilled and reamed length,

whichever is more frequent with at least two (2) hours between readings, using calibrated Marsh funnel and mud balance. These measurements shall be included in daily logs submitted to the Engineer. Document modifications to the drilling fluids, by noting the types and quantities of drilling fluid additives and the dates and times when introduced. The reason for the addition of drilling fluid additives or other modifications shall be documented and reported.

- E. Employ experienced licensed surveyors registered in the State of Minnesota to locate the entry and exit points, and to establish horizontal and vertical datum for the bore and the pipe layout and fabrication areas. Engineer shall locate the connection points and the limits of the area that cannot be open cut.
- F. Drill entrance and exit angles shall be as shown on the Drawings or pipe manufacturer's alternate design, unless otherwise approved in writing by the Engineer.
- G. The pilot bore shall follow the design path of the bore shown on the Drawings, unless Contractor has submitted alternative design(s).
 - 1. Horizontal and vertical deviations shall be less than plus or minus two feet from the design path centerline. Continuously monitor horizontal and vertical position and record the position at least once per drill pipe length, or at thirty (30) feet, whichever is less.
 - 2. The radius of curvature shall not be less than that shown on the Drawings or pipe manufacturer's alternate design. The radius of curvature shall be calculated over the distance of three drill pipe sections.
 - 3. The location of the entry and exit points shall be in accordance with the approved HDD Work Plan. All Work necessary to correct excessive deviations from line and grade, including re-drilling, redesigning connections, and acquiring additional easement, at no additional cost to the Owner and without schedule extension.
- H. Completely pre-ream the bore to the final diameter prior to pullback. Final borehole diameter shall be determined by pipe manufacturer based on alignment of the bore path shown or as determined by the pipe manufacturer's alternate design. Perform a presumptive low air pressure test in prior to pipe pullback to verify the integrity of the pipe.
- I. Perform a presumptive low air pressure test in prior to pipe pullback to verify the integrity of the pipe.
- J. Pipe Pullback:
 - 1. The pipe shall be installed by pulling it into the reamed bore path in a continuous operation, behind final reaming tool.
 - 2. The pipe shall be isolated from excessive torsional and axial stresses by a swivel device.
 - 3. All measurements shall be made, recorded, and submitted on the daily logs during final reaming and pipe pullback.
 - 4. The maximum pull (axial tension force) exerted on the carrier pipeline shall be measured continuously and limited to the maximum allowed by the Pipe Supplier so that the pipe or fused joints are not overstressed. A

- factor of safety over the maximum allowable is not required.
5. The pipelines shall be adequately supported during installation to prevent overstressing or buckling. Provide adequate support/rollers along the stringing area to support the required length of the carrier pipe for each bore. Such support/rollers shall be spaced according to the pipe supplier, and the rollers be comprised of a non-abrasive material arranged in a manner to provide support to the bottom and bottom quarter points of the pipeline allowing for free movement of the pipeline during pullback. The pipe layout area shall be cleared of all foreign objects that could damage the piping during pullback.
 6. The leading end of the pipe shall be closed during the pullback operation, in accordance with the pipe supplier's recommendations. A pulling head shall be used that is rated at the allowable pull force capability of the pipe section being installed, in accordance with the pipe supplier's recommendations.
 7. Each length of pipe shall be inspected and cleaned as necessary to be free of debris immediately before joining.
 8. Tracer wire will be attached to the leading end of the pipe pulling head and shall extend the full length of the installed pipe.
 9. Handle the carrier pipe in a manner that does not overstress or damage pipe. Vertical and horizontal curves shall be limited to Pipe Supplier's recommended bend radius. If the pipe is buckled or otherwise damaged, the damaged section shall be removed and replaced. Take appropriate steps during pullback to ensure that the carrier pipe and tracer wires will be installed without damage.
 10. The carrier pipe, if required for proper installation, shall be filled with water as it enters the bore to reduce pullback loads and to ensure that adequate internal pressure is maintained at all points to counterbalance external pressures.
 11. Monitor and inspect pipe rollers and method for suspending pipe at entry during the pullback operation to avoid damage to the pipe.
 12. Cease operations if the pipe is damaged and remove the pipe from the bore and repair the pipe using the Pipe Supplier's recommended procedure or replace the damaged pipe before resuming installation.
 13. Damage to the pipe resulting from installation or contact grouting shall be removed and replaced. To confirm no damage to the pipe, upon completing of pullback and grouting, perform the following test on the completed pipeline:
 - a. A sphere or pig, one inch less in diameter than the internal diameter (including fusion beads) of the product pipe, which is capable of allowing water to pass through it, complete with a pulling cable on either side of sphere or pig, shall be pulled through the entire length of the pipeline. If the pig or sphere cannot pass through the pipe, it shall be considered collapsed and damaged. Check Pipe Supplier's tolerance and fused bead size.
 14. After the carrier pipe is completely pulled through the bore, provide a minimum of 24 hours, or as recommended by the Pipe Supplier, before the final pipe tie-in.
 15. Conduct a final hydrostatic test of the installed pipeline. Final test shall be in accordance with Section 33 31 19. Repair any defects discovered during the test, and repeat until the pipe passes the test.

- K. Pipe shall be installed with either the assembled-line or cartridge installation methods, described in paragraphs 3.04.A or 3.04.B. When space permits, the assembled-line method, where pipe lengths are connected together in one length and pulled in as a single unit shall be used. Pipe shall be placed on pipe rollers before pulling into bore hole with rollers spaced close enough to prevent excessive sagging of pipe.
- L. The cartridge method shall be utilized when the contractor has insufficient space for pipe layout. Using this method, the contractor can assemble and install a single pipe joint and then advance the pipe section into the bore path.
- M. Pilot hole shall be drilled on bore path with no deviations greater than 5% of depth over a length of 100'. In the event that pilot does deviates from bore path more than 5% of depth in 100', Contractor shall notify Engineer and Engineer may require Contractor to pull-back and re-drill from the location along bore path before the deviation.
- N. Bore hole profile shall be verified after bore has been reamed and prior to carrier pipe installation. Reamed profile shall be submitted to Engineer for comparison to design Drawings, and to pipe manufacture for compliance with pipe installation requirements 24 hours prior to carrier pipe installation.
- O. Upon successful completion of pilot hole, ream a final bore path to a minimum diameter determined by pipe manufacturer. Submit and follow submitted plan for enlarging (reaming) the bore path having defined the incremental size increases and type of each of the reamers. Bore path shall be swabbed with the final sized reamer prior to the start of final pull back.
- P. After successfully reaming bore path to the required inside diameter, pull the pipe through the bore hole. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore path. During pull-back operations do not apply more than the maximum safe pipe pull force at any time. In the event that pipe becomes stuck, notify Engineer. Engineer, Contractor, and/or the maintaining agency shall discuss options and then work shall proceed accordingly.
- Q. Excess pipe shall be removed and the bore path associated with this excess pipe shall be filled with flowable fill or grout unless the area of the excess pipe is excavated and backfilled as part of the tie-in operations. In the event that a drilling fluid fracture, inadvertent returns or returns loss occurs during pilot hole drilling operations, cease operations notify Engineer. Engineer, Contractor, and/or the maintaining agency shall discuss options and then work shall proceed accordingly.
- R. Notify Engineer immediately in the event that an obstruction is encountered preventing further advancement of the drill pipe, or pullback of the pre-reamer, reamer, and/or pipe. Make all diligent and reasonable efforts to advance past the object by drilling slowly through the object, pulling back, and drilling along a new bore path that avoids the object, or excavating and exposing and removing the

object, and all other reasonable attempts to continue the bore. Notify the Engineer of proposed measures to attempt to advance past the object, prior to initiating the attempt. If the Contractor attempts to pullback and re-drill, adhere to line and grade tolerances established, unless the Engineer approves variance, in writing, prior to the attempt to re-drill. The Contractor and Engineer shall investigate the cause and together determine an appropriate response.

Appropriate response may include revisions to equipment or methods, retraction and re-drilling of a portion of the bore, or abandonment of the hole. If abandonment is deemed necessary, recover, to the extent practicable, any drill pipe, product pipe, and tools in the bore, and properly abandon the bore by contact grouting unless otherwise directed in writing by the Engineer. If the bore is abandoned, begin a second attempt to install the pipeline at an alternate location subject to approval, in writing, by the Engineer. Take all reasonable actions to complete the installation with minimal delays.

3.07 BASIC ASSEMBLY/PULLING METHODS

- A. Fuse and Pull Assembly Method: Fuse and pull assembly method is defined as the fusing of individual sections of thermoplastic pipe in a secured entry and assembly pit. The pipe sections are assembled individually and then progressively pulled into the bore path a distance equivalent to a single pipe section. This assembly-pull process is repeated for each pipe length until the entire line is pulled through the bore path to the exit point.
- B. Fused-Line Method: Fused-line option is defined as the pre-assembly of multiple lengths of thermoplastic pipe, with subsequent pulling installation into the bore path as a long pipe string. Provide an entry ramp to the entrance of the bore path. Ramp shall be of sufficient length and grade such that at any point prior to the pipe string entering prepared bore path minimum bending radius is not exceeded. Provide necessary equipment or ground surface preparation to allow the pipe to be pulled back along the surface prior to the entry ramp and bore path without damaging the PE encasement.

3.08 CLEANING ASSEMBLED AND TESTING OF HDD PIPE SEGMENTS

- A. Assemble pipe and appurtenances in accordance with Manufacturers written procedure and as supplemented by these specifications. Prior to transitional joint assembly, pipe and joint components shall be thoroughly cleaned and examined to ensure proper assembly and performance. Provide a factory-trained representative for recommendations on the proper and efficient installation of the pipe.
- B. HDD installations 24 inch and larger shall have a factory-trained representative to observe and for recommending the proper installation of the pipe.
- C. Following successful pull-back of pipe, perform hydro-test pipe as required in Section 33 13 10 – Pipeline Pressure and Leakage Testing.

3.09 DEMOBILIZATION

- A. Remove all equipment, materials, drilling fluids, muck, waste, and debris from the site and restore the site to its original condition upon completion of the installation. Restoration and demobilization shall be completed within seven (7) calendar days of the completion of the pipeline installation.

3.10 RECORD KEEPING

- A. Maintain a daily project log of drilling operations and a guidance system log with a copy given to Engineer at completion of boring. Record Drawings shall be certified by the Contractor, for accuracy, as required in Section 01 33 00.

3.11 DEFECTIVE BORES

- A. Defective bore(s) shall be defined as unsuccessfully completed bore(s), cased or uncased, as a result of obstructions or rock of any nature that did not allow completion of the initial bore.

END OF SECTION

SECTION 33 05 24
BUTT FUSION OF THERMOPLASTIC PIPE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Acceptable fusion technique and practice for pipe and safe handling and storage.
- B. Related Sections include, but are not limited to:
 - 1. Section 01 33 00 - Submittals
 - 2. Section 01 45 00 – Quality Control
 - 3. Section 01 77 00 – Closeout Procedures
 - 4. Section 31 23 33 – Trenching and Backfilling
 - 5. Section 33 05 09 – Piping Specials for Utilities
 - 6. Section 33 05 97 – Identification and Signage for Utilities
 - 7. Section 33 05 31 – Thermoplastic Utility Pipe
 - 8. Section 33 13 00 – Disinfection of Water Systems
 - 9. Section 33 13 10 – Pipeline Pressure and Leakage Testing
 - 10. Section 33 05 23 – Thermoplastic Pipe Installation by HDD

1.02 QUALITY ASSURANCE

- A. Manufacturer Requirements
 - 1. Fusible polyvinylchloride pipe shall be tested at the extrusion facility for properties required to meet all applicable parameters as outlined in AWWA C905 and Section 33 05 31. Testing priority shall be in conformance with AWWA C905.
- B. Fusion Technician Requirements
 - 1. Fusion Technician shall be fully qualified by the pipe supplier to install fusible 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. Warranty
 - 1. The fusing contractor shall provide in writing a warranty for a period of two years for all the fusion joints, including formation, installation, and pressure testing on thermoplastic pipe. The fusing warranty shall be two years for fusible PVC pipe joints, including formation, installation, and pressure testing on fusible PVC pipe.
 - 2. Warranty periods shall begin on the date of Substantial Completion for the project.

1.03 SUBMITTALS

- A. Per Section 01 33 00 – Submittals.
- B. The following Product Data is required from the pipe supplier and/or fusion provider:

1. Name of the pipe manufacturer and a list of the piping and quantities to be provided by manufacturer.
 2. Product data and pipe supplier data indicating conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards. This will include experience of pipe supplier by years and number of projects; warranty information; and independent laboratory testing certification.
 3. Material and pipe property testing in conformance with this specification and applicable standards indicating conformance from the pipe extruder per AWWA C900 and AWWA C905.
- C. Test results will be prepared and made available from the pipe extruder to the Owner or Engineer for each extrusion run.
- D. Fusion joint data and fusion technician data indicating conformance with this specification and applicable standards, including written documentation regarding any intended variance from this specification and applicable standards. This will include fusion joint warranty information and recommended project specific fusion parameters, including criteria logged and recorded by data logger.
- 1.04 SUBMITTALS AT PROJECT CLOSEOUT
- A. Per Section 01 77 00 – Closeout Procedures.
- B. Fusion report for each fusion joint performed on the project, including joints that were rejected. Submittals of the Fusion Technician’s joint reports are required as requested by the Owner or Engineer. Specific requirements of the Fusion Technician’s joint report shall include:
1. Pipe Size and Dimensions.
 2. Machine Size.
 3. Fusion Technician Identification.
 4. Job Identification Number
 5. Fusion Number.
 6. Fusion, Heating, and Drag Pressure Settings.
 7. Heat Plate Temperature.
 8. Time Stamp.
 9. Heating and Cool Down Time of Fusion.
 10. Ambient Temperature.

PART 2 PRODUCTS

2.01 FUSIBLE PVC (FPVC) PIPE

- A. Pipe and materials shall comply with the requirements of Section 33 05 31 – Thermoplastic Utility Pipe.

2.02 FUSION JOINTS

- A. Fusible pipe lengths shall be assembled in the field with butt-fused joints. Follow the pipe supplier’s written instructions for this procedure. Joint strength shall be equal (within 5% of pipe wall tensile value) to the pipe as demonstrated by

testing requirements. All fusion joints shall be completed as described in this specification.

2.03 CONNECTIONS AND FITTINGS FOR PRESSURE APPLICATIONS

- A. Connections shall be defined in conjunction with the linking of project piping, as well as the tie-ins to other piping systems.
- B. Materials shall comply with requirements of Section 33 05 09 – Piping Specials for Utilities and Section 31 11 14 – Ductile Iron Utility Pipe and Fittings.

PART 3 EXECUTION

3.01 DELIVERY AND OFF-LOADING

- A. All pipe shall be bundled or packaged 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.
- B. Each pipe shipment should be inspected prior to unloading to see if the load has shifted or otherwise been damaged.
- C. Each pipe shipment should be checked for quantity and proper pipe size, color, and type.
- D. Pipe should be loaded, off-loaded, and otherwise handled in accordance with manufacturer's instructions.
- E. 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.
- F. During removal and handling, be sure that the pipe does not strike anything. Significant impact could cause damage, particularly during cold weather.
- G. If appropriate unloading equipment is not available, pipe may be unloaded by removing individual pieces. Care should be taken to insure that pipe is not dropped or damaged. Pipe should be carefully lowered, not dropped, from trucks.
- H. In preparation for pipe installation, placement of pipe should be as close to the fusion area as practical.

3.02 HANDLING AND STORAGE

- A. Any length of pipe showing a crack or which has received a blow that may have caused an incident fracture, even though no such fracture can be seen, shall be marked as rejected and removed at once from the Work. Damaged areas, or possible areas of damage may be removed by cutting out and removing the suspected incident fracture area. Limits of the acceptable length of pipe shall be determined by the Owner or Engineer.
- B. Any scratch or gouge greater than 10% of the wall thickness will be considered significant and can be rejected unless determined acceptable by Owner or

Engineer.

- C. 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.
- D. 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. Use of hooks, chains, wire rope or any other handling device which creates the opportunity to damage the surface of the pipe is strictly prohibited.
- E. After delivery to the project site, fusible pipe shall be stored at ambient temperature and protected from ultraviolet light degradation. If pipe is to be stored for periods of 6 months or longer, the pipe must be shaded or otherwise shielded from direct sunlight. Covering of the pipe which allows for temperature build-up is strictly prohibited. Pipe should be covered with an opaque material while permitting adequate air circulation above and around the pipe as required preventing excess heat accumulation.
- F. Racks or dunnage to prevent damage to the bottom of the pipe during storage should support the pipe lengths. Supports should be spaced to prevent pipe bending and deformation. The pipe shall be stored in stacks no higher than that given in the following table:

Pipe Diameter (inches)	Max. No. of Rows Stacked
8 or less	5
12 to 21	4
24 to 30	3
33 to 48	2

3.03 FUSION PROCESS

A. General

- 1. Fusible pipe will be handled in a safer and non-destructive manner before, during, and after the fusion process and in accordance with pipe supplier's recommendations.
- 2. Pipe will be fused by qualified fusion technicians, as documented by the pipe supplier. Training records for qualified fusion technicians shall be available to Owner or Engineer upon request.
- 3. Each joint fusion shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine. Joint data shall be submitted as part of the As-Recorded information.
- 4. Polyethylene fusible pipe will be installed in a manner so as not to exceed the recommended bending radius.
- 5. Fusible polyvinylchloride pipe will be installed in a manner so as not to exceed the recommended minimum bending radius set by the manufacturer. Should Contractor exceed the pipe manufacturer's

recommended minimum bending radius, any damaged pipe shall be replaced at no additional cost to the Owner.

6. Where fusible pipe is installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, shall not be exceeded.
7. 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 properties, including the following elements:
 - a. Heat Plate – Heat Plates shall be in good condition with no deep gouges or scratches within the pipe circle being fused. Plates shall be clean and free of any contamination. Heater controls shall properly function, and 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 recommendations.
 - b. Carriage – Carriage shall travel smoothly with no binding at less than 50 psi. Jaws shall be in good condition with proper 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, or potential safety issues during fusion.
 - d. DATALOGGER – The current version of the pipe supplier's recommended and compatible software shall be used. Protective case shall be utilized for the handheld wireless portion of the unit. Datalogger operations and maintenance manual shall be 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.
8. 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. A weather protection canopy that allows full machine motion of the heat plate, fusion assembly and carriage shall be provided for fusion in inclement and/or windy weather.
 - 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 polyvinylchloride pipe.

B. Joint Recording

1. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the butt-fusion of thermoplastic or fused PVC pipe. The software shall register and/or record the parameters required by the manufacturer and these specifications. Data not logged by the data logger shall be logged manually and be included in the Fusion Technician's joint report.

END OF SECTION

SECTION 33 05 31
THERMOPLASTIC UTILITY PIPE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Polyvinyl Chloride (PVC) Pressure Pipe 4-inch through 36-inch for potable water.

1.02 RELATED SECTIONS

- A. Section 01 33 00 - Submittals
- B. Section 01 45 00 – Quality Control
- C. Section 01 77 00 – Closeout Procedures
- D. Section 31 23 16.13 – Trenching and Backfilling
- E. Section 33 05 23 – Thermoplastic Pipe Installation by Horizontal Directional Drilling
- F. Section 33 05 24 – Butt Fusion of Thermoplastic Pipe
- G. Section 33 05 09 – Piping Specials for Utilities
- H. Section 33 05 97 – Identification and Signage for Utilities
- I. Section 33 13 00 – Disinfection of Water Systems
- J. Section 33 13 10 – Pipeline Pressure and Leakage Testing

1.03 REFERENCES

A. Reference Standards

1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
2. American Association of State Highway and Transportation Officials (AASHTO).
3. ASTM International (ASTM):
 - a. D1784, Standard Specification for Rigid Poly(Vinyl-Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
 - b. D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
4. American Water Works Association (AWWA):
 - a. C600, Installation of Ductile-Iron Water Mains and their Appurtenances.
 - b. C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipes and Fittings for Water.
 - c. C900, Polyvinyl Chloride (PVC) Pressure Pipe, and Fabricated Fittings, 4 IN through 60 IN, for Water Transmission and

- d. Distribution.
- e. M23, PVC Pipe – Design and Installation.
- f. M41, Ductile-Iron Pipe and Fittings.
- 5. NSF International (NSF):
 - a. 61, Drinking Water System Components – Health Effects.
- 6. Underwriters Laboratories, Inc. (UL).

1.04 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00.
- B. Product Data
 - 1. For PVC Pressure Pipe that is used for water distribution, wastewater force mains or wastewater gravity mains, including:
 - a. PVC Pressure Pipe
 - b. Manufacturer
 - c. Dimension Ratio
 - d. Joint Types
 - 2. Restraint, if required in Contract Documents
 - a. Retainer glands
 - b. Thrust harnesses
 - c. Any other means of restraint
 - 3. Gaskets
- C. Certificates
 - 1. Furnish an affidavit certifying that all PVC Pressure Pipe meets the provisions of this Section, each run of pipe furnished has met Specifications, all inspections have been made and that all tests have been performed in accordance with AWWA C900.

1.05 QUALITY ASSURANCE

- A. Qualifications
 - 1. Manufacturers
 - a. Finished pipe shall be the product of 1 manufacturer for each size, unless otherwise approved by the Engineer.
 - b. Pipe manufacturing operations shall be performed under the control of the manufacturer.
 - c. All pipe furnished shall be in conformance with AWWA C900.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store and handle in accordance with the guidelines as stated in AWWA M23.

PART 2 - PRODUCTS

2.01 POLYVINYL CHLORIDE (PVC) PIPE

- A. Manufacturers
 - 1. The manufacturer must comply with this Specification and related Sections.
 - 2. Approved Manufacturer's
 - a. JM Eagle, Inc.

- b. Diamond Plastics Corporation.
- c. Northern Pipe Products.

B. Pipe

- 1. Pipe shall be in accordance with AWWA C900.
- 2. PVC Pressure Pipe for potable water shall meet the requirements of NSF 61.
- 3. Pressure Pipe shall be approved by the UL.
- 4. Pipe shall have a lay length of 20 feet except for special fittings or closure pieces necessary to comply with the Drawings.
- 5. The pipe material shall be PVC, meeting the requirements of ASTM D1784, with a cell classification of 12454. Outside diameters must be equal to those of cast iron and ductile iron pipes.
- 6. As a minimum the following Dimension Ratio's apply:

Diameter (inch)	Min Pressure Class (psi)
4 through 12	DR 14
16 through 24	DR 18
30 through 36	DR 18

- 7. Pipe Markings
 - a. Meet the minimum requirements of AWWA C900. Minimum pipe markings shall be as follows:
 - 1) Manufacturer's Name or Trademark and production record
 - 2) Nominal pipe size
 - 3) Dimension Ratio
 - 4) AWWA C900
 - 5) Seal of testing agency that verified the suitability of the pipe
- 8. Provisions for Thrust
 - a. Thrusts at bends, tees, plugs or other fittings shall be mechanically restrained joints. Restrained joints shall consist of approved mechanical restrained joints per Section 31 05 09 – Piping Specials and Fittings.
 - b. Concrete thrust blocking per Section 33 05 09 – Piping Specials for Utilities, may be used on piping smaller than 12-inches.
 - c. No thrust restraint contribution shall be allowed for the restrained length of pipe within the casing.
- 9. Joints
 - a. Joints shall be gasket, bell and spigot and push-on type conforming to ASTM D3139.
 - b. Since each pipe manufacturer has a different design for push-on joints, gaskets shall be part of a complete pipe section and purchased as such.
 - c. Lubricant must be non-toxic and NSF approved for potable water applications.

2.02 FUSIBLE POLYVINYL CHLORIDE (FPVC) PIPE:

- A. FPVC pipe shall be manufactured of PVC resin conforming to ASTM D1784 with a cell classification of 12454 and in accordance with AWWA C900 - "Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 4 in. through 60 in. for

Water Transmission and Distribution”.

- B. Joints: FPVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.
- C. Minimum Pressure Class: All FPVC pipe shall have the following minimum pressure class (PC) or pressure rating (PR) or as indicated on the Drawings and elsewhere in this specification:
 - 1. AWWA C900 Fusible PVC Pipe: DR-18, PR 235 psi, DIPS.
 - 2. Contractor shall provide a higher-pressure class if required based on handling and the proposed installation methods and pull back force.
- D. Pipe shall be designed and provided for the stresses imposed during construction and be checked to be within allowable limits for the FPVC pipe provided.
- E. Pipe is to be furnished with minimum net laying lengths of 40 feet. Contractor shall coordinate net laying lengths of greater than 40 feet with pipe supplier, subcontractors, and shipping requirements.
- F. FPVC pipe shall be certified to meet the requirements of NSF-61, NSF-61G.
- G. Warranty
 - 1. A two-year warranty for the pipe shall be included and shall cover the cost of replacement pipe and freight to project site, should the pipe have any defects in material or workmanship.
 - 2. In addition to the pipe warranty, the fusing Subcontractor shall provide a written warranty for a period of two years for all fusion joints, including formation, installation, and pressure testing.
 - 3. Warranty periods shall begin on the date of Substantial Completion.
- H. Butt Fusion
 - 1. Use butt fusion jointing method for FPVC pipe.
 - 2. Comply with AWWA C906, ASTM F2620, and Section 33 05 24 for Butt Fusion joints.

PART 3 - EXECUTION

3.01 GENERAL

- A. Contractor shall provide the Owner with a minimum 48-hour notice on all requests to take a watermain out of service and shall be only at off-peak times.
- B. Perform all connections to the existing water system in the presence of the Owners Representative.
- C. Do not operate valves within or directly connect to the existing water system unless expressly directed to do so by the Owners Representative.

3.02 FIELD MEASUREMENTS

- A. The Drawings indicate required pipe sizes and the general arrangement for major piping. Locations shall be verified in the field by the Contractor. Valves, fittings, and appurtenances shall be of such dimensions to allow for the installation of this piping substantially as shown on the Drawings. In the event it should become necessary to change the location of any of the work due to interference with other work, Contractor shall consult with the Engineer prior to making any changes and all such changes shall be made at no additional cost to the Owner.
- B. Prior to roughing in any facilities or installation of piping and equipment, consult all related drawings including general, mechanical, electrical, etc., and inform self of materials, locations of structures, pipes, duct banks, electrical conduits, etc., which may impact the installation.
- C. Discrepancies discovered before or after work has started, shall be brought to the attention of the Engineer immediately, and the Engineer reserves the right to require minor changes in the work to eliminate such discrepancies.
- D. Pipe connections to equipment shall be subject to approval of Engineer and coordinated to meet the manufacturer's recommendations and requirements.
- E. No work that connects directly to equipment shall be installed before complete shop drawings of said equipment have been reviewed and approved by the Engineer.

3.03 PROJECT CONDITIONS

- A. Verify all dimensions of and between existing structures and locations of existing piping and equipment required for the proper installation of all new piping and equipment.
- B. Contractor shall be responsible for verification of location of all existing piping and structures. Potholing and or excavation to expose existing piping, conduits, etc. may be required prior to installation of new piping or connection to existing piping. Adjustments to the locations of new piping may be required due to locations of existing piping and sequencing of construction that will be required. Adjustments required shall be at no additional cost to the Owner.

3.04 INSTALLATION

- A. General
 - 1. Install pipe, fittings, specials, and appurtenances as specified herein, as specified in AWWA C600, AWWA C605, AWWA M23 and in accordance with the pipe manufacturer's recommendations.
 - 2. Excavate and backfill trenches per Section 31 23 16.13 – Trenching and Backfill and in accordance with Drawing details.
 - 3. Provide shoring per Section 31 41 00 – Shoring.
 - 4. Dewater trenches per Section 31 23 19 – Dewatering.
 - 5. Embed PVC Pressure Pipe in accordance with Section 31 23 16.13 – Trenching and Backfill and in accordance with Drawing details.
 - 6. All buried piping with less than 7.5-feet of cover shall be insulated. Trench insulation shall be provided above the pipe with a minimum thickness of

four (4) inches as shown on the drawings.

7. All joints shall be properly restrained in accordance with Section 31 05 09 – Piping Specials for Utilities.

B. Pipe Handling

1. Haul and distribute pipe and fittings at the project site.
2. Handle piping with care to avoid damage.
 - a. Inspect each joint of pipe and reject or repair any damaged pipe prior to lowering into the trench.
 - b. Use only nylon ropes, slings or other lifting devices that will not damage the surface of the pipe for handling the pipe.
3. At the close of each operating day:
 - a. Keep the pipe clean and free of debris, dirt, animals and trash – during and after the laying operation.
 - b. Effectively seal the open end of the pipe using a gasketed night cap.

C. Joint Making

1. Mechanical Joints
 - a. In accordance with Section 33 11 14 – Ductile Iron Pipe and Fittings.
2. Push-on Joints
 - a. Install Push-On joints as defined in AWWA C900.
 - b. Wipe clean the gasket seat inside the bell of all extraneous matter.
 - c. Place the gasket in the bell in the position prescribed by the manufacturer.
 - d. Apply a thin film of non-toxic vegetable soap lubricant to the inside of the gasket and the outside of the spigot prior to entering the spigot into the bell.
 - e. When using a field cut plain end piece of pipe, refinish the field cut to conform to AWWA C605.
3. Joint Deflection
 - a. Deflect the pipe only when necessary to avoid obstructions, or to meet the lines and grades shown in the Drawings.
 - b. Joint deflection shall not exceed 50 percent of the manufacturer's recommendation.

D. Installation by Horizontal Directional Drilling

1. See Section 33 05 23 – Thermoplastic Pipe Installation by Horizontal Directional Drilling.
2. See Section 33 05 24 – Butt Fusion of Thermoplastic Pipe.

E. Detectable Metallic Tape and Tracer Wire Installation

1. See Section 33 05 97 – Identification and Signage for Utilities.

3.05 FIELD OR SITE QUALITY CONTROL

- A. Notify Engineer 48 hours in advance of test.
- B. Carry out selected tests as pipeline construction progresses to ensure construction methods are producing satisfactory results.

- C. Remove debris, sediment, and other material from installed pipe before testing. Do not discharge or flush sand, gravel, concrete, debris, or other foreign material into any existing pipeline system. Flushing with clean water only will be allowed but with minimal flows to eliminate exceeding capacities of receiving systems. Flushing into existing pressurized water systems is NOT ALLOWED.
- D. Potable Water Mains
 - 1. Provide Pipeline Pressure and Leakage Testing per Section 31 13 10.
 - 2. Provide Disinfection of Water Systems per Section 31 13 00.

END OF SECTION

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SECTION 33 05 97
IDENTIFICATION AND SIGNAGE FOR UTILITIES

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. GPS Mapping of buried utilities.
 - 2. Tracer Wire for Thermoplastic Pressure Pipe.
 - 3. Detector tape for all buried utilities.
- B. Related Sections include, but are not limited to:
 - 1. Section 01 33 00 – Submittal Procedures.
 - 2. Section 33 05 05 – Trenching and Backfilling.
 - 3. Section 33 05 09 – Piping Specials for Utilities.
 - 4. Section 33 05 31 – Thermoplastic Utility Pipe.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Shop Drawings: Submit manufacturer's data on materials furnished indicating compliance with the specifications.

PART 2 PRODUCTS

2.01 TRACER WIRE MATERIALS

- A. Approved Manufacturers:
 - 1. Copper Clad Steel (CCS) Trace Wire
 - 2. Open Trench
 - 1) Copperhead #12 High Strength part # 1230-HS
 - 2) Approved Equivalent
 - b. Directional Drilling/Bore
 - c. Copperhead Extra High Strength part # 1245*EHS
 - 1) Approved Equivalent
 - 3. Connectors
 - a. Copperhead 3-way locking connector part # LSC1230*
 - b. DryConn 3-way Direct Bury Lug: Copperhead Part # 3WB-01
 - c. Approved Equivalent
 - 4. Termination/Access
 - a. Non-Roadway access boxes applications:
 - 1) Trace wire access boxes Grade level Copperhead adjustable lite duty Part # LD14*TP
 - 2) Approved Equivalent
 - b. Concrete/Driveway access box applications:
 - 1) Trace wire access boxes Grade level Copperhead Part # CD14*TP 14"
 - 2) Approved Equivalent
 - c. Fire hydrant trace wire access box applications:

- 1) Above ground two terminal with 1" conduit. Copperhead part # T3-75-F (Cobra T3 Test Station, denoting "F" includes mounting flange)
 - 2) Approved Equivalent
5. Grounding
 - a. Drive in Megnesium Anode: Copperhead Part # ANO-1005 (1.5 lb)
 - b. Approved Equivalent
- B. Tracer Wire
 1. Direct bury wire. Installed on all underground utilities such as water and sewer pipes.
 2. Trace wire shall have HDPE insulation intended for direct bury, color coated per APWA standard for the specific utility being marked.
 3. Open Trench Trace wire - Trace wire shall be #12 AWG Copper Clad Steel, High Strength with minimum 450 lb. break load, with minimum 30 mil HDPE insulation thickness.
 4. Directional Drilling/Boring Trace wire - Trace wire shall be #10 AWG Copper Clad Steel, Extra High Strength with minimum 1,150 lb. break load, with minimum 30 mil HDPE insulation thickness.
- C. Tees
 1. All mainline trace wires shall be interconnected in intersections, at mainline tees and mainline crosses.
 - a. Tees: the three wires shall be joined using a single 3-way lockable connector.
 - b. 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.
 2. Non-locking friction fit, twist on or taped connectors are prohibited.
- D. Trace Wire Termination/Access
 1. All trace wire termination points shall utilize an approved trace wire access box (above ground access box or grade level/in-ground access box as applicable), specifically manufactured for this purpose.
 2. All grade level/in-ground access boxes shall be appropriately identified with "water" cast into the cap and be color coded.
 3. A minimum of 2 ft. of excess/slack wire is required in all trace wire access boxes after meeting final elevation.
 4. All trace 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.
 5. Grounding anode wire shall be connected to the identified (or bottom) terminal on all access boxes.
 6. Service Laterals on public property – Trace wire must terminate at an approved grade level/inground trace wire access box, located at the edge of the road right-of-way, and out of the roadway at all fire hydrants, curb stops, and service laterals.
 7. Service Laterals on private property – Trace wire must terminate at an approved above-ground trace 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.

8. Hydrants – Trace wire must terminate at an approved above-ground trace wire access box, properly affixed to the hydrant grade flange. (affixing with tape or plastic ties shall not be acceptable)
9. Long-runs, in excess of 500 linear feet without service laterals or hydrants – Trace wire access must be provided utilizing 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. The grade level/in-ground trace wire access box shall be delineated using a minimum 48" polyethylene marker post, color coded per APWA standard for the specific utility being marked.

E. Trace Wire Grounding

1. Trace wire must be properly grounded at all dead ends/stubs
2. Grounding of trace wire shall be achieved by use of a drive-in magnesium grounding anode rod with a minimum of 20ft 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.
3. When grounding the trace wire at dead ends/stubs, the grounding anode shall be installed in a direction 180 degrees opposite of the trace wire, at the maximum possible distance.
4. When grounding the trace wire in areas where the trace wire is continuous and neither the mainline trace wire or the grounding anode wire will be terminated at/above grade, install grounding anode directly beneath and in-line with the trace 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 trace wire with a mainline to lateral lug connector.
5. Where the anode wire will be connected to a trace wire access box, a minimum of 2 ft. of excess/slack wire is required after meeting final elevation.

F. Prohibited Products and Methods

1. Un-insulated trace wire
2. Trace wire insulations other than HDPE
3. Non locking, friction fit, twist on or taped connectors
4. Brass or copper ground rods
5. Wire connections utilizing taping or spray-on waterproofing
6. Looped wire or continuous wire installations, that has multiple wires laid side-by-side or in close proximity to one another
7. Trace wire wrapped around the corresponding utility
8. Brass fittings with trace wire connection lugs
9. Wire terminations within the roadway, i.e. in valve boxes, cleanouts, manholes, etc.
10. Connecting trace wire to existing conductive utilities

2.02 DETECTOR TAPE MATERIALS

A. MATERIALS

1. Detectable Solid Aluminum Foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.
 - a. Manufacturers and Products:
 - 1) Mutual Industries; Detectable Tape.
 - 2) Reef Industries; Terra Tape, Sentry Line Detectable.
 - 3) Presco; Detectable Tape.
 - b. "Terra Tape: as manufactured by:
 - 1) REEF Industries, Inc., or equal
 - c. Width: 6-inch.
 - d. Color: In accordance with APWA Uniform Color Code.

PART 3 EXECUTION

3.01 GPS MAPPING

- A. All piping and fittings shall be mapped using GPS after final locations have been determined and prior to backfilling. GPS shall provide horizontal and vertical control.
- B. GPS points shall be recorded at minimum at the following locations:
 1. Along all piping lengths at a distance not to exceed 100 feet between points.
- C. All points where a pipe experiences a change in direction. If a pipe is installed in a bent fashion the number of GPS points taken shall be sufficient to accurately determine the location of the pipe through the bend.
 1. All fittings such as elbow, tees, etc. shall be mapped.
 2. Pipe terminals – beginnings and endings.
- D. Saving of GPS data shall be confirmed prior to backfilling. GPS mapping data shall be submitted to the Engineer in an organized manner.

3.02 DETECTOR TAPE INSTALLATION

- A. Install the detector tape 24-inches below finished grade directly above and parallel with pipelines. Detector tape shall be installed for all site piping outlined in Section 33 11 00 – Water Utility Distribution Piping, Section 33 11 13 – Steel Water Utility Transmission Piping, and the Piping Schedule and shall be labeled in accordance with this section.
- B. At each manhole, bring the detector tape up to the manhole to a point approximately 24-inches below finished grade. Drill through the manhole and pull the detector tape through the manhole and label the loose end with a plastic marker. Grout hole with non-shrink grout or water stop material.

3.03 TRACER WIRE INSTALLATION

- A. At each buried appurtenance, bring the tracer wire up to ground level to a point of easy connection for testing and appropriately mounted.
- B. Tracer wire, access boxes, and accessories shall be incidental to the pipe installation cost.

END OF SECTION

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SECTION 33 11 14
DUCTILE IRON PIPE AND FITTINGS

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. Furnishing and installation of the following, as indicated, in accordance with the provision of the Contract Documents:
 - a. Ductile Iron Pipe and Fittings.

B. Related section include:

1. Section 01 33 00 – Submittal Procedures.
2. Section 01 45 00 – Quality Controls.
3. Section 01 61 00 – Common Product Requirements.
4. Section 01 77 00 – Closeout Procedures.
5. Section 01 78 23 – Operations and Maintenance Data.
6. Section 31 23 16.13 – Trenching and Backfill.
7. Section 31 23 19 – Dewatering.
8. Section 31 41 00 – Shoring.
9. Section 33 05 19 – Piping Specials for Utilities.
10. Section 33 05 31 – Thermoplastic Utility Piping.
11. Section 33 13 10 – Pipeline Pressure and Leakage Testing.
12. Section 33 13 00 – Disinfection of Water Systems.

1.02 QUALITY ASSURANCE

- A. The equipment and material to be furnished under this Contract shall be in accordance with Section 01 45 00 Quality Controls and Section 01 61 00 Common Product Requirements.
- B. Piping modifications subject to Engineer's review. No additional compensation allowed for modifications required to suit equipment furnished by Contractor.

1.03 REFERENCES

A. Reference Standards include:

1. ANSI/AWWA C104/A21.4: Cement-Mortar Lining for Gray-Iron and Ductile-Iron Pipe and Fittings for water.
2. ANSI/AWWA C105/A21.5: Polyethylene Encasement for Gray and Ductile Cast-Iron Piping for water and other liquids.
3. ANSI/AWWA C110/A21.10-98: Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. (76 mm Through 1,219 mm), for Water.
4. ANSI/AWWA C111/A21.11 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
5. ANSI/AWWA C115/A21.15: Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
6. ANSI/AWWA C150/A21.50: Thickness Design of Ductile-Iron Pipe.
7. ANSI/AWWA C151/A21.51: Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sand Lined Molds for water or other liquids.

8. ANSI/AWWA C208: Dimensions for Fabricated Steel Water Pipe Fittings.
9. ANSI/AWWA C219: Bolted, Sleeve-Type Couplings for Plain-End Pipe.
10. AWWA C600-10: Installation of Ductile-Iron Water Mains and Their Appurtenances.
11. AWWA C606-11: Grooved and Shouldered Joints.
12. AWWA C651-05: Standard for Disinfecting Water Mains.
13. AWWA C653-03: Disinfection of Water Treatment Plants.
14. NSF Standards No. 60 and 61: National Sanitation Foundation.

1.04 SUBMITTALS

- A. Submit Shop Drawings in accordance with Section 01 33 00 for all pipe and fittings indicating: Name of Manufacturer, Materials, Standard Dimensions, References, and Joint Data.
- B. Submit Affidavit of Compliance for ductile iron pipe and fittings. The affidavit letter from the pipe and fitting manufacturers shall include stating the product(s) are supplied new from the manufacturer and all linings required by the specification for the pipe or fittings are supplied by the manufacturer and are covered by the manufacturer's warranty.
- C. Submit design calculations for structural design of pipe thickness where pipe class or thickness is not specifically called out.
- D. Grooved/shouldered joint couplings and fittings shall be shown on drawings and product submittals, and shall be specifically identified with the applicable style or series designation.
- E. Submit written certification from the grooved/shouldered component manufacture that all grooved/shouldered components (couplings, fittings, valves, gaskets, bolts and nuts) are of the same manufacture and grooving tools are of the same manufacturer as the grooved/shouldered components.
- F. Operations and Maintenance Data shall be submitted in accordance with specification Section 01 78 23.
- G. Certification that all materials in contact with treated or potable water are ANSI/NSF 61 approved.

1.05 PAINTING AND IDENTIFICATION SYSTEMS

- A. All material and equipment in this section shall be factory primed. Primer shall be compatible with finish coats of paint.
- B. The Contractor shall refinish and restore to the original appearance all equipment that has sustained damage to the manufacturer's finish or prime coats of paint or enamel.
- C. Finish painting of all materials and equipment in this Section shall be the responsibility of the Contractor unless otherwise specifically indicated.
- D. Provide process pipe identification.

1.06 REGULATORY REQUIREMENTS

- A. All Products that may come into contact with water intended for use in a Public Water System shall meet American National Standards Institute (ANSI)/National Sanitation Foundation (NSF) International Standards 60 and 61, as appropriate. A Product will be considered as meeting these standards if so certified by NSF, the Underwriters Laboratories, or other organization accredited by ANSI to test and certify each Product.

PART 2 PRODUCTS

2.01 DUCTILE IRON PIPE (DIP)

A. Approved Manufacturers

1. American Cast Iron Pipe Company
2. McWane Ductile
3. U.S. Pipe
4. Or Approved Equal

B. Pipe

1. Pipe shall be in accordance with AWWA/ANSI C111/A21.11, AWWA/ANSI C150/A21.15, and AWWA/ANSI C151/A21.51.
2. All Pipe shall meet requirements of NSF 61.
3. Pipe shall have a lay length of 18 feet or 20 feet except for special fittings or closure pieces and necessary to comply with the drawings.
4. As a minimum the following pressure classes apply. The drawings may specify a higher pressure class or the pressure and deflection design criteria may also require a higher pressure class, but in no case should they be less than the following:

Pipe Diameter (inches)	Minimum Pressure Class (psi)
3 – 12	350
14 – 20	250
24	200
30 – 64	150

5. Pipe markings shall meet the minimum requirements of AWWA/ANSI C151/A21.51. Minimum pipe markings shall be as follows:
 - a. "DI" or "Ductile" shall be clearly labeled on each pipe
 - b. Weight, pressure class and nominal thickness of each pipe
 - c. Year and country pipe was cast
 - d. Manufacturer's mark
6. Pressure and Deflection Design
 - a. Pipe design shall be based on trench conditions and design pressure specified in the drawings.
 - b. Pipe shall be designed according to AWWA/ANSI C150/A21.5, AWWA/ANSI C151/A21.51, and AWWA M41 for trench construction, using the following parameters:
 - c. Unit weight of fill (w) = 130 pcf
 - d. Live Load = AASHTO HS 20
 - e. Trench Depth = as indicated on drawings
 - 1) Bedding Conditions = Type 4

- 2) Working Pressure (P_w) = as indicated on drawings
 - 3) Surge Allowance (P_s) = 100 psi
 - 4) Design Internal Pressure (P_i) = $P_w + P_s$ or 2:1 safety factor of the actual working pressure plus the actual surge pressure, whichever is greater.
 - 5) Maximum calculated deflection (D_x) = 3 percent
 - 6) Restrained Joint Safety Factor = 15 percent
- f. Trench Depths shall be verified after existing utilities are located.
 - 1) Vertical alignment changes required because of existing utility or other conflicts shall be accommodated by an appropriate change in pipe design depth.
 - 2) In no case shall the pipe be installed deeper than it allows.
- 7. Provisions for Thrust Restraint
 - a. Thrust at bends, tees, plugs or other fittings shall be mechanically restrained joints when required by drawings.
 - b. Restrained joints, when required, shall be used for a sufficient distance from each side of the bend, tee, plug, valve, or other fitting to resist thrust which will be developed at the design pressure of the pipe. For the purpose of thrust the following shall apply:
 - 1) Valves shall be calculated as dead ends
 - 2) Design pressure shall be greater than the working pressure of the pipe or the internal pressure (P_i) whichever is greater.
 - 3) Restrained joints shall consist of approved mechanical restrained or push-on restrained joints.
 - c. The pipe manufacturer shall verify the length of pipe with restrained joints to resist thrust in accordance with drawings, AWWA M41, and the following:
 - 1) The weight of earth (W_e) shall be calculated as the weight of the projected soil prism above the pipe for unsaturated soil conditions.
 - 2) If indicated on the drawings and the geotechnical borings that ground water is expected, account for reduced soil density.
- 8. Joints
 - a. General – Comply with AWWA/ANSI C111/A21.11
 - b. Push-On Joints
 - 1) Fastite Joint Pipe
 - 2) Tyton Joint Pipe
 - c. Mechanical Joints with Mechanical Restraints
 - 1) See Section 33 05 09 - Piping Specials for Utilities
 - d. Restrained Joints
 - 1) Flex-Ring Joint Pipe
 - 2) Lok-Ring Joint Pipe
 - 3) TR Flex Joint Pipe
 - 4) HP Lok Joint Pipe
 - e. Flanged Joints – ANSI/AWWA C110/A21.10 and ANSI/AWWA C115/A21.15.
 - 1) Field Fabricated flanges are prohibited.
- 9. Gaskets

- a. All rubber joint gaskets utilized on Ductile Iron Pipe shall be in conformance with AWWA/ANSI C111/A21.11
 - b. Flanged Gaskets
 - 1) Full Face
 - 2) Manufactured true to shape from minimum 80 durometer SBR rubber stock of a thickness not less than 1/8 inch.
 - 3) Virgin Stock
 - 4) Conforming to the physical and test requirements specified in AWWA C111/A21.11
 - 5) Finished Gaskets shall have holes punched by the manufacturer and shall match the flange patten in every respect
 - 6) Frayed cut edges resulting from job site gasket fabrication are not acceptable.
 - c. Furnish hydrocarbon resistant gaskets, when required.
10. Bolts and Nuts
- a. See section in section 33 11 00.
11. Ductile Iron Pipe Exterior Coatings
- a. The exterior of ductile iron pipe shall have an undercoat layer of arc sprayed zinc per ISO 8179 with 1 mil thick asphaltic overcoat in accordance with AWWA C151 for ductile iron pipe, AWWA C115 for flanged pipe and AWWA C110 and C153 for fittings.
 - b. The mass of the zinc applied shall be 200 g/m2 of pipe surface area.
 - c. A finishing layer topcoat shall be applied to the zinc.
 - d. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes - External zinc-based coating - Part 1: Metallic zinc with finishing layer. Second edition 2004- 06-01."
12. Ductile Iron Pipe Interior Lining
- a. Cement Mortar Lining
 - 1) Ductile Iron Pipe for potable water shall have a cement mortar lining in accordance with AWWA/ANSI C104/A21.04 and be acceptable according to NSF 61.
 - b. Ceramic Epoxy or Epoxy Linings
 - 1) Ductile Iron Pipe for use in wastewater applications (sanitary sewer only) shall be lined with a Ceramic Epoxy or Epoxy Lining Protecto 401 Ceramic Epoxy Lining.
 - 2) Apply lining at a minimum of 40 mils DFT
 - 3) Due to the tolerances involved, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum using a joint compound as supplied by the manufacturer. Apply the compound by brush ensuring a smooth finish without excess buildup in the gasket seat or on the spigot ends.
 - 4) Coat the gasket seat and spigot ends after the application of the lining.
 - 5) Surface preparation shall be in accordance with the manufactures recommendations.
 - 6) Check thickness using a magnetic film thickness gauge in accordance with method outline in SSPC PA 2. Test the interior lining of all pipe barrels for pinholes with a non-

- destructive 2,500 volt test. Repair any defects prior to shipment.
- 7) Mark each fitting with the date of application of the lining system along with its numerical sequence of application on the date and records maintained by the applicator of his work.
 - 8) For all ductile iron pipe in wastewater service where the pipe has been cut, coat the exposed surface with the touch-up material as recommended by the manufacturer.

2.02 DUCTILE IRON FITTINGS

A. Approved Manufacturers

1. American Cast Iron Pipe Company
2. McWane/Tyler Ductile
3. U.S. Pipe
4. Sigma Corporation
5. Star Pipe Products
6. EBAA Iron, Inc.
7. Or Approved Equal

B. Fittings

1. Fittings shall be in accordance with AWWA/ANSI C110/A21.10, AWWA/ANSI C153/A21.53.
2. Fittings for potable water service shall meet requirements of NSF 61.
3. Fittings at a minimum shall meet or exceed the pressure classes of the pipe which the fitting is connected, unless specifically indicated on the drawings.

C. Fittings Markings

- a. Meet the minimum requirements of AWWA/ANSI C151/A21.51
- b. Minimum Markings shall include:
 - 1) "DI" or "Ductile" cast or metal stamped on each fitting
 - 2) Applicable AWWA/ANSI standard for that fitting
 - 3) Pressure rating
 - 4) Number of degrees for all bends
 - 5) Nominal diameter of the openings
 - 6) Year and country fitting was cast
 - 7) Manufacturers mark
2. Joints
 - a. Push-On Joints
 - 1) Comply with AWWA/ANSI C111/A21.11
 - b. Mechanical Joints
 - 1) Comply with AWWA/ANSI C111/A21.11
 - c. Mechanical Joints with mechanical restraint.
 - 1) Refer to Section 33 05 09 – Piping Specials for Utilities.
 - d. Push-On Restrained Joints
 - 1) Restraining Push-On Joints by means of a special gasket.
 - 2) Pressure rating shall exceed the working and test pressure of the pipeline
 - 3) Approved Manufacturers Products:

- (a) Flex-Ring Joint Pipe – Contractor shall note that all existing Ductile Iron Pipe fittings scheduled for points of connections were installed with Flex-Ring Fittings. Contractor shall verify prior to construction.
 - (b) Lok-Ring Joint Pipe
 - (c) TR Flex Joint Pipe
 - (d) HP Lok Joint Pipe
 - e. Flanged Joints
 - 1) AWWA/ANSI C115/A21.15
 - 2) Flange bolt circles and bolt holes shall match those of pipe
 - (a) Field fabricated flanges are prohibited
- 3. Gaskets
 - a. See Ductile Iron Pipe
- 4. Bolt and Nuts
 - a. See Appurtenances section in this specification.
- 5. Ductile Iron Fittings Exterior Coatings
 - a. See Ductile Iron Pipe
- 6. Ductile Iron Fittings Interior Lining
 - a. See Ductile Iron Pipe
- D. Ductile Iron Fittings Polyethylene Encasement
 - 1. V-Bio Enhanced Polyethylene Encasement
 - a. See Section 33 05 09 - Piping Specials for Utilities.

PART 3 EXECUTION

3.01 PREPARATION

- A. Make necessary field measurements to determine pipe laying lengths; fabricate pipe; deliver pipe to Site; store pipe with ends capped to prevent contamination and damage to interior; prepare pipe for installation; work pipe into place without forcing or springing.
- B. Do not store or ship small diameter pipe inside larger diameter pipe.
- C. Ream pipe and tube ends. Remove burrs. Repair lining at pipe cuts.
- D. Remove scale and dirt, inside and outside, before assembly.
- E. Remove welding slag or foreign material from pipe and fitting materials.
- F. Remove temporary preservative coatings from valves, fittings, and appurtenances prior to installation.
- G. Clean, repair, or replace equipment malfunctioning due to presence of foreign material left in piping during installation or entering piping after installation due to Contractor's work at no cost to Owner.
- H. All work performed and material furnished shall be inspected by the Contractor, but such inspection shall not relieve the manufacturer of responsibility to furnish material and perform work in accordance to this specification.

3.02 DUCTILE IRON PIPE AND FITTINGS

A. General

1. Install pipe, fittings, specials and appurtenances as specified herein, as specified in AWWA C600 and in accordance with the pipe manufacturer's recommendations.
2. Lay pipe to the lines and grades as indicated in the Drawings.
3. Excavate and backfill trenches per Section 33 23 16.13 – Trenching and Backfill and in accordance with Drawing details.
4. Provide shoring per Section 31 41 00 – Shoring.
5. Dewater trenches per Section 31 23 19 – Dewatering.
6. Embed PVC Pressure Pipe in accordance with Section 33 23 16.13 – Trenching and Backfill and in accordance with Drawing details.

B. Joints:

1. Buried: Push-on or Mechanical.
2. Interior submerged: Flanged or grooved and shouldered.
3. Interior exposed: Flanged or grooved and shouldered, except where indicated otherwise on the Drawings.

C. Mechanical Joints:

1. Carefully assemble in accordance with the manufacturer's recommendation.
2. Bolts shall be uniformly tightened to the torque values listed in Appendix A of ANSI/AWWA C111/A21.11. Overtightening of bolts to compensate for poor installation practice will not be permitted.
3. The holes in mechanical joints with tie rods shall be carefully aligned to permit installation of the tie rods.

D. Penetrations:

1. Install pipe straight through concrete walls or floors.
2. Provide wall sleeves where ductile iron pipe passes through concrete walls and floors, unless specified otherwise on Drawings.
3. Extend pipe such that the end extends 4" beyond the face of the wall unless specified otherwise on Drawings.
4. Install embedded wall flange in center of wall or floor and grout in place when embedded wall pipe flange shown on Drawings.
5. Fabricate wall pipes to dimensions required.

E. Support pipe at fittings with rods; anchor and support in accordance with Section 40 05 07 - Hangers and Supports for Process Piping.

F. Pipe and fittings to match face and drill of valves and appurtenances.

3.03 POLYETHYLENE ENCASEMENT

- A. Metallic piping, fittings, valves, and appurtenances shall be fully encased in polyethylene film tubing.
- B. Refer to Section 33 05 09 - Piping Specials for Utilities.

3.04 DETECTABLE METALLIC TAPE AND TRACER WIRE INSTALLATION

- A. See Section 33 05 97 – Identification and Signage for Utilities.

3.05 FIELD OR SITE QUALITY CONTROL

- A. Notify Engineer 48 hours in advance of test.
- B. Carry out selected tests as pipeline construction progresses to ensure construction methods are producing satisfactory results.
- C. Remove debris, sediment, and other material from installed pipe before testing. Do not discharge or flush sand, gravel, concrete, debris, or other foreign material into any existing pipeline system. Flushing with clean water only will be allowed but with minimal flows to eliminate exceeding capacities of receiving systems. Flushing into existing pressurized water systems is NOT ALLOWED.
- D. Potable Water Mains
 - 1. Provide Pipeline Pressure and Leakage Testing per Section 31 13 10.
 - 2. Provide Disinfection of Water Systems per Section 31 13 00.

END OF SECTION

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SECTION 33 13 00
DISINFECTION OF WATER SYSTEMS

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Disinfection of potable water system.
 - 2. Testing and reporting results.
- B. Related Sections include, but are not limited to:
 - 1. Section 01 33 00 – Submittal Procedures.
 - 2. Section 01 45 00 – Quality Control.
 - 3. Section 01 77 00 – Closeout Procedures.
 - 4. Section 31 23 19 – Dewatering.
 - 5. Section 33 05 09 – Piping Specials for Utilities.
 - 6. Section 33 05 31 – Thermoplastic Utility Pipe.
 - 7. Section 33 11 14 – Ductile Iron Utility Pipe and Fittings.
 - 8. Section 33 13 10 – Pipeline Pressure and Leakage Testing.

1.02 REFERENCES

- A. American Water Works Association (AWWA):
 - 1. B300, Hypochlorites.
 - 2. B30I, Liquid Chlorine.
 - 3. B302, Ammonium Sulfate.
 - 4. B303, Sodium Chlorite.
 - 5. C651, Disinfecting Water Mains.
 - 6. C652, Disinfection of Water Storage Facilities.
 - 7. C653, Disinfection of Water Treatment Plants.
- B. NSF International (NSF):
 - 1. NSF/ANSI 61, Drinking Water System Components - Health Effects.
 - 2. NSF/ANSI 372, Drinking Water System Components - Lead Content.
- C. Standard Methods for the Examination of Water and Wastewater, as published by American Public Health Association, American Water Works Association, and the Water Environment Federation.

1.03 SUBMITTALS FOR INFORMATION

- A. Informational Submittals:
 - 1. Plan describing and illustrating conformance to appropriate AWWA standards and this Specification.
 - 2. Procedure and plan for cleaning system.
 - 3. Procedures and plans for disinfection and testing.
 - 4. Proposed locations within system where Samples will be taken.
 - 5. Type of disinfecting solution and method of preparation.
 - 6. Method of disposal for highly chlorinated disinfecting water.

7. Independent Testing Agency: Certification that testing agency is qualified to perform chlorine concentration testing, and bacteriological testing in accordance with AWWA standards, State of North Dakota requirements, and this Specification.
8. Certified Bacteriological Test Results:
 - a. Facility tested is free from coliform bacteria contamination.
 - b. Forward results directly to Owner and Engineer.

1.04 DEFINITIONS

- A. Disinfectant Residual means the concentration of disinfectant in the treated water.
- B. PPM means parts per million.

1.05 QUALITY ASSURANCE

- A. Regulatory Agency Requirements: Comply with North Dakota Department of Environmental Quality requirements.
- B. Perform work in accordance with AWWA C651 for the disinfection of water mains.
- C. Testing Firm: Company specializing in testing potable water systems, approved by the North Dakota Department of Environmental Quality. Contractor shall notify the City Public Works Department to come out and collect samples for the bacteriological test. Contractor shall coordinate sampling and testing schedule with the City and the laboratory. Contractor shall pay all testing fees and lab costs.
- D. Submit bacteriologist's signature and authority associated with testing.
- E. The cleaning and disinfection work shall be conducted prior to connection to the existing water lines or to any portion that has been put into service. Unless otherwise approved, hydrostatic testing shall be completed prior to final cleaning and disinfection.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Protect against damage and contamination.
- B. Maintain caution labels on hazardous materials.
- C. Maintain storage room dry and with temperatures as uniform as possible between 60- and 80-degrees F.
- D. Provide necessary signs, barricades, and notices to prevent any person from accidentally consuming water or disturbing system being treated.

1.07 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Section 01 33 00 – Submittal Procedures and Section 01 77 00 – Closeout Procedures.
- B. Disinfection report:
 1. Type and form of disinfectant used.

2. Date and time of disinfection.
 3. Test locations.
 4. Initial and final disinfectant residuals (quantity in treated water) in ppm for each test.
 5. Date and time of flushing start and completion.
 6. Disinfectant residual after flushing in ppm for each location test.
- C. Bacteriological report:
1. Date issued, project name, and testing laboratory name, address, and telephone number.
 2. Time and date of water sample collection.
 3. Name of person collecting samples.
 4. Test locations.
 5. Initial and final disinfectant residuals in ppm for each test location.
 6. Coliform bacteria test results for each test.

PART 2 PRODUCTS

2.01 ACCEPTABLE DISINFECTION CHEMICALS

- A. Components and Materials in Contact with Water for Human Consumption:
1. Comply with the requirements of the Safe Drinking Water Act and other applicable federal, state, and local requirements. Provide certification by manufacturer or an accredited certification organization recognized by the Authority Having Jurisdiction that components and materials comply with the maximum lead content standard in accordance with NSF/ANSI 61 and NSF/ANSI 372.
 - a. Use or reuse of components and materials without a traceable certification is prohibited.
- B. AWWA B300, Hypochlorite: Shall conform to Federal Specification O-C-114a, Type II, Grade B, or Federal Specification O-C-602b.
- C. AWWA B301, Liquid Chlorine: Shall conform to Federal Specification BB-C-120a.

PART 3 EXECUTION

3.01 GENERAL

- A. Conform to AWWA C651 for pipes and pipelines, except as modified in these specifications.
- B. Contractor's Equipment:
1. Furnish chemicals and equipment, such as pumps and hoses, to accomplish disinfection.
 2. Water used to fill pipeline may be supplied using a temporary connection to existing distribution system. Provide protection against cross-connections as required by AWWA C651.
- C. Disinfect the following items installed or modified under this Project, intended to hold, transport, or otherwise contact potable water:

1. Pipelines: Disinfect new pipelines that connect to existing pipelines up to point of connection.
 2. Disinfect surfaces of materials that will contact finished water, both during and following construction, using one of the methods described in AWWA C652 and AWWA C653. Disinfect prior to contact with finished water. Take care to avoid recontamination following disinfection.
- D. The basic disinfection procedure for new mains consists of:
1. Inspecting materials to be used to ensure their integrity.
 2. Preventing contaminating materials from entering the water main during storage, construction, or repair and noting potential contamination at the construction site.
 3. Removing, by flushing or other means, those materials that may have entered the water main or appurtenances.
 4. Preventing contamination of existing mains from cross-connection during flushing, pressure testing, and disinfection.
 5. Pressure testing the water main to ensure the main meets the purchaser's allowable leakage rate. Hydrostatic pressure tests should be conducted with potable water.
 6. Chlorinating and adequately documenting the process used for disinfection.
 7. Flushing the chlorinated water from the main. Refer to ANSI/AWWA C655 Field Dechlorination for dechlorination procedures, if dechlorination is required.
 8. Determining the bacteriological quality of water samples collected from the pipe by laboratory test after disinfection.
 9. Final connecting of the newly disinfected water main to the active distribution system without sacrificing sanitary practices and conditions.

3.02 CLEANING AND FLUSHING

- A. Before disinfecting, clean foreign matter from pipe.
- B. Potable water shall be used for disinfection, hydrostatic pressure testing, and flushing.
- C. If continuous feed method or slug method of disinfection, as described in AWWA C651, are used flush pipelines with potable water until clear of suspended solids and color.
- D. Drainage should take place away from the construction or work area. Adequate drainage must be provided during flushing. Provide hoses, temporary pipes, ditches, and other conduits as needed to dispose of flushing water without damage to adjacent properties
- E. If applicable, the valve(s) isolating the main from existing system should be locked out and tagged out to prevent unintentional release of the elevated chlorine residual water used for disinfection.
- F. Flush service connections and hydrants. Flush distribution lines prior to flushing hydrants and service connections. Operate valves during flushing process at least twice during each flush.

- G. Flush pipe through flushing branches and remove branches after flushing is completed.

3.03 DISINFECTION OF WATER SYSTEMS

- A. Perform disinfecting in accordance with AWWA C651 and Section 1300, City of Fargo Standard Specifications for Construction prior to start-up. Coordinate with other Contractors, Engineer, and Owner.
- B. There are four methods of chlorination available: tablet/granule, continuous feed, slug, and spray. However, the Engineer has written the spec assuming the tablet/granule chlorination method will be utilized. Contractor shall consult with the Engineer if another chlorination method will be utilized.
1. Tablet/granule method gives an initial chlorine dose of 25 mg/L;
 2. Continuous-feed method gives a 24-hr chlorine residual of not less than 10 mg/L;
 3. Slug method gives a 3-hr exposure of not less than 50 mg/L free chlorine;
 4. Spray method gives a 30-min exposure of not less than 200 mg/L free chlorine.
- C. For wells, add the required amount of chlorination material into the casing before installation of pumping equipment. Agitate as required for thorough mixing.
- D. The tablet method consists of placing calcium hypochlorite granules or tablets in the water main during installation and then filling the main with potable water to create a chlorine solution. This method may be used only if the pipes and appurtenances are kept clean and dry during construction.
1. **WARNING:** This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.
- E. Placement of calcium hypochlorite granules during construction.
1. Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals.
 2. The quantity of granules at each location shall be as shown in Table 1.

Table 1 Weight of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft (150-m) interval

Pipe Diameter (<i>d</i>)		Calcium Hypochlorite Granules	
<i>in.</i>	<i>(mm)</i>	<i>oz</i>	<i>(g)</i>
4	(100)	1.7	(48)
6	(150)	3.8	(108)
8	(200)	6.7	(190)
10	(250)	10.5	(298)
12	(300)	15.1	(428)
14 and larger	(350 and larger)	$D^2 \times 15.1$	$D^2 \times 428$

Where *D* is the inside pipe diameter, in feet $D = d/12$

- F. Placement of calcium hypochlorite tablets during construction.

1. Calcium hypochlorite tablets (5-grams) shall be placed in the upstream end of each section of pipe to be disinfected, including branch lines.
2. Also, at least one tablet shall be placed in each hydrant branch and in other appurtenances.
3. The number of 5-g tablets required for each pipe section shall be $0.0012 d^2 L$ rounded to the next higher integer, where d is the inside pipe diameter, in inches, and L is the length of the pipe section, in feet.
4. Table 2 shows the number of tablets required for commonly used sizes of pipe.
5. Calcium hypochlorite tablets shall be attached by an adhesive meeting the requirements of NSF/ANSI 61.
6. There shall be adhesive only on the broadside of the tablet attached to the surface of the pipe.
7. Attach tablets inside and at the top of the main.
8. If the tablets are attached before the pipe section is placed in the trench, their positions shall be marked on the pipe exterior to indicate that the pipe has been installed with the tablets at the top.

Table 2 Number of 5-g calcium hypochlorite tablets required for dose of 25 mg/L*

Pipe Diameter		Length of Pipe Section, ft (m)				
		13 (4.0) or less	18 (5.5)	20 (6.1)	30 (9.1)	40 (12.2)
<i>in.</i>	<i>(mm)</i>	Number of 5-g Calcium Hypochlorite Tablets				
4	(100)	1	1	1	1	1
6	(150)	1	1	1	2	2
8	(200)	1	2	2	3	4
10	(250)	2	3	3	4	5
12	(300)	3	4	4	6	7
16	(400)	4	6	7	10	13

*Based on 3.25-g available chlorine per tablet

G. Filling and contact time.

1. When installation has been completed, the main shall be filled with water such that the full pipe velocity is no greater than 1 ft/sec (0.3 m/sec).
2. Fill rate must be carefully controlled to ensure tablets do not come loose from pipe.
3. Precautions shall be taken to ensure that air pockets are eliminated.
4. Water used to fill the new main shall be supplied through a temporary connection that shall include an appropriate cross-connection control device, consistent with the degree of hazard, for backflow protection of the active distribution system.
5. The chlorinated water shall remain in the pipe for at least 24 hr. If the water temperature is less than 41 oF (SaC), the water shall remain in the pipe for at least 48 hr. A detectable free chlorine residual (~0.2 mg/L) shall be found at each sampling point after the 24- or 48-hr period.
6. Test for disinfectant residual at each of the following locations:
 - a. End of piping runs.
7. All water supply and distribution mains shall be disinfected with chlorine prior to acceptance by the owner.
8. As chlorinated water flows past new fittings and valves, related valves shall be operated so as to disinfect appurtenances and pipe branches. All valves shall be opened and closed a minimum of two times during the

contact period.

H. Draining, Flushing and Dechlorination

1. After the applicable retention period, heavily chlorinated water should not remain in prolonged contact with pipe. To prevent damage to the pipe lining or to prevent corrosion damage to the pipe itself, the heavily chlorinated water shall be flushed from the main fittings, valves, and branches until chlorine measurements show that the concentration in the water leaving the main is no higher than that generally prevailing in the distribution system or that is acceptable for domestic use.
2. Drain and flush using fresh water pumped through the system.
3. Properly dispose of heavily chlorinated water supply in an environmentally acceptable manner. Do not allow flow into a waterway without neutralizing disinfectant residual.
 - a. Refer to ANSI/AWWA C655 Field Dechlorination for dechlorination procedures.
 - b. It is recommended that any high-velocity flushing be completed prior to disinfection. Dechlorination equipment may not be capable of handling high flows with high levels of chlorine.

3.04 BACTERIOLOGICAL TESTING

- A. After disinfection and flushing, test water for bacteriological contamination.
- B. Bacteriological testing is required on all new and replaced water main before the water main is placed in service. The tests ensure that the water being introduced into the system has been properly disinfected and is free of contamination.
- C. Notify Owner and Engineer when ready for sampling so personnel from the Owner's Water Utility Department could come out and collect the samples for the bacteriological test.
- D. All water samples for bacteriological testing shall be collected from a newly installed water service.
 1. If a project does not include newly installed water services, the Contractor shall supply all labor and materials necessary to collect the sample.
 2. The materials, location, and method for abandonment/removal of necessary materials shall be approved by the Engineer.
 3. Water samples may not be collected from a fire hydrant.
- E. After final flushing and before the new water main is connected to the distribution system, two consecutive sets of acceptable samples, taken at least 24 hours apart, shall be collected from the new main.
 1. At least one set of samples shall be collected from every 1,200 feet of new water main.
 2. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and show the absence of coliform organisms and the presence of a chlorine residual.
 3. The basic procedure is as follows:
 - a. Insert litmus paper test strip in the discharge stream of the hydrant while it is being flushed. The color change will indicate that there

- is residual chlorine content.
 - b. Before the valves are opened, obtain a sterile sample of the disinfected main. This water sample will be taken after the completion of the pressure test.
 - c. 100-ml samples will be taken with a chlorine neutralizer tablet in the container.
 - d. The sample must be taken to the water plant immediately for testing. If this is not possible, the sample must be kept in a refrigerated container, however, the test must begin within 24 hours.
 - e. Results will be available approximately 24 hours from the time the test is admitted.
 - f. A second sample is obtained from the same location at least 24 hours after the first sample. This sample indicates that the residual chlorine content is such that verification is obtained that the pipe, newly introduced water, and any debris are disinfected. As such, the sample must be obtained from water that has remained in the new pipe for at least 24 hours.
 - g. Both samples must pass the test before the new water main may be opened and put in use in the distribution system.
 - h. When flushing the mains, care must be taken to ensure that flow is away from the existing mains. This may involve flushing $\frac{1}{2}$ block in one direction until the water is clear, and then closing that valve and flushing from the other end of the block for a mid-block hydrant.
- F. If the initial disinfecting fails to produce satisfactory results, the main shall be reflushed and re-sampled.
 - G. If check samples also fail, the main shall be rechlorinated by the continuous feed or slug method until satisfactory results are obtained.
 - H. The Contractor should note that the testing tank may require sterilization in order to avoid contamination of the mains during the testing process.
 - I. The pipe installation crews will need to ensure that the pipes are free of dirt, debris and other matter.
 - J. It must be remembered that the final water quality test is not the primary means for certifying the sanitary condition of the main. The sanitary handling of materials, the construction practices, and the continual inspection of the work are the primary means for ensuring the sanitary condition of the water main.
 - K. The Contractor shall assist as necessary to obtain the samples.

3.05 FIELD QUALITY CONTROL

- A. Section 01 45 00 - Quality Control: Field inspection and testing.
- B. Samples for bacteriological analysis shall be collected in sterile bottles.
- C. Two or more successive test samples indicating bacteriological satisfactory water shall be obtained a minimum of 24 hours apart, before any system is placed into operation.

END OF SECTION

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SECTION 33 13 10
PIPELINE PRESSURE AND LEAKAGE TESTING

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Field hydrostatic pressure and leakage testing of water mains and associated appurtenances.
- B. Related Sections included, but not limited to:
 - 1. Section 01 33 00 – Submittal Procedures.
 - 2. Section 01 45 00 – Quality Control.
 - 3. Section 01 77 00 – Closeout Procedures.
 - 4. Section 31 23 19 – Dewatering.
 - 5. Section 33 05 09 – Piping Specials for Utilities.
 - 6. Section 33 05 31 – Thermoplastic Utility Pipe.
 - 7. Section 33 11 14 – Ductile Iron Utility Pipe and Fittings.
 - 8. Section 33 13 00 – Disinfection of Water Systems.

1.02 SUBMITTALS FOR INFORMATION

- A. Section 01 33 00 – Submittal Procedures.
- B. Testing Schedule and Procedure - A testing schedule and test procedure shall be submitted to the Engineer for review and acceptance not less than 21 days prior to commencement of testing work. The schedule shall indicate the proposed time and sequence of testing of the pipeline.
- C. The testing procedure shall establish the limits of the pipeline to be tested, the position of all valves during testing, the location of temporary bulkheads, disposal of test water, and all other methods and procedures to be followed in performing the required testing work.

1.03 QUALITY ASSURANCE AND SPECIAL REQUIREMENTS

- A. All pipelines and appurtenances shall be pressure and leakage tested in accordance with AWWA C600 for Ductile Iron Pipes, AWWA C604 for Steel Pipes, AWWA C605 for PVC Pipes and these specifications.
- B. During testing of the water line, all valves shall be in the open position.
- C. Temporary bulkheads shall be provided during testing so that the test pressures are not applied to existing or new valves and hydrants, or to existing water lines or to any portion that has been put into service of new lines installed under this Contract.
- D. The tests shall be conducted before connections are made to existing water lines or to any portion that has been put into service or new water lines installed under this Contract.

- E. Upon completion of testing, connections made to existing water lines or to any portion that has been put into service of new water lines installed under this Contract shall be visually inspected for leakage after placing the water line into service and before backfilling the connection.

PART 2 PRODUCTS

2.01 TEST EQUIPMENT

- A. All necessary piping connections between the line to be tested and the water source, together with pumping equipment, water meter, pressure gauges, backflow protection, and other equipment, materials, and facilities required to perform the specified tests, shall be provided. All flanges, valves, bulkheads, bracing, blocking, and other sectionalizing devices shall be provided. All temporary sectionalizing devices shall be removed upon completion of testing. Vents shall be provided in test bulkheads where necessary to expel air from the line to be tested.
- B. Test pressures to be applied by means of a force pump sized to provide and maintain the required pressure without interruption during the test.
- C. Water meters and pressure gauges shall be accurately calibrated and shall be subjected to review and acceptance by the Engineer.
- D. Permanent gauge connections shall be installed at each location where test gauges are connected to the pipeline in manholes during performance of required tests. Drilling and tapping of pipe walls will not be permitted. Upon completions of testing work, each gauge connection shall be fitted with a removable plug or cap acceptable to the Engineer.

PART 3 EXECUTION

3.01 PREPARATION

- A. When filling the line with water, care shall be taken to ensure that all air release valves, and other venting devices are properly installed in the open position. Hand-operated vent valves shall not be closed until water flows in an uninterrupted stream from each valve. Care shall be taken to ensure that the rate at which the line is filled with water does not exceed the venting capacity of the installed air vent valves and devices.
- B. Piping shall be adequately blocked, anchored, and supported before the test pressure is applied. Underground piping shall be tested before the joints are covered.

3.02 FLUSHING

- A. Foreign material left in pipelines during installation can result in valve or hydrant seat leakage during pressure tests. Every effort shall be made to keep lines clean during installation. Thorough flushing is recommended prior to a pressure test; flushing shall be accomplished by partially opening and closing valves

several times under expected line pressure, with flow velocities adequate to flush foreign material out of the valves

3.03 HYDROSTATIC FIELD TESTING

- A. The pipeline shall be filled and allowed to stand for 24-hour prior to testing if lining is cement-mortar.
- B. After the pipeline to be tested has been filled with water, the test pressure shall be applied and maintained without interruption for 2-hours plus the additional time required by the Engineer to examine all piping undergoing the test and for the Contractor to locate all defective joints and pipe materials.
- C. The hydrostatic test pressure shall not be less than 1.25 times the stated anticipated maximum sustained working pressure of the pipeline measured at the highest elevation along the test section and not less than 1.5 times the stated sustained working pressure at the lowest elevation of the test section. However, in no case shall the test pressure exceed the rated pressure for any joint, thrust restraint, valve, fitting, or other connected appurtenance of the test section
- D. Before applying the specified test pressure, air shall be expelled from all air vents along the section of pipe being tested. Measurements of leakage shall not be attempted until all trapped air has been vented and a constant test pressure has been established.
- E. After the pressure has stabilized, line leakage shall be measured by means of a suitable water meter installed in the pressure supply piping on the pipeline side of the force pump.
- F. Test the pipeline in sections, limiting each test section to a maximum of 1,500 linear feet.
- G. Any exposed pipe, fittings, valves and joints shall be examined carefully during the test. In addition, the entire length of the pipeline shall be examined for movement, defects, and leaks that may appear on the surface. Any revealed damage or defective pipe, fittings, valves, or joints shall be repaired or replaced with sound material, and the test shall be repeated until satisfactory results are obtained.

3.04 ALLOWABLE MAKEUP WATER

- A. Makeup water shall be defined as the quantity of water that must be supplied into a newly laid pipe or any valved section thereof to maintain pressure within 5 psi (34.5 kPa) of the specified test pressure after pipe has been filled with water and the air has been expelled.
- B. Makeup water shall not be measured by a drop in pressure in a test section over a period of time. Measurements of leakage shall not be attempted until all trapped air has been vented and a constant test pressure has been established. After the pressure has stabilized, line leakage shall be measured by means of a suitable water meter installed in the pressure supply piping on the pipeline side of the force pump.

- C. The quantity of allowable makeup water shall not exceed the test allowance specified in AWWA C600 for Ductile Iron Pipes, AWWA C604 for Steel Pipes or AWWA C605 for PVC Pipes. For Ductile Iron and PVC pipes, leakage shall not exceed the rate established by the following formula:
1. $Q = (LD\sqrt{P})/148,000$, in which:
 - a. Q= maximum permissible leakage rate in gallons per hour for the length of line being tested.
 - b. L= length of the line being tested in feet.
 - c. D= internal diameter of the pipe in inches.
 - d. P= average test pressure in psig.
- D. These formulas are based on a testing allowance of 10.5 gpd/mi/in. (0.978 L/day/km/mm) of nominal diameter at a pressure of 150 psi (1,030 kPa).
1. Note: The makeup water allowance is provided to account for the losses that may occur because of the expulsion of entrapped air, movement because of seating of valves or joint restraints, and a slight increase of pipe diameter because of internal pressure. There may also be losses associated with connected appurtenances and accessories.
- E. Allowance tables. Makeup water allowances for various pipe diameters and test pressures are provided in Tables 4a and 4b of AWWA C605, and Tables 5a and 5b of AWWA C600.
- F. Metal-seated valves. When testing against closed metal-seated valves, an additional allowance per closed valve of 0.0078 gph/in. (0.0012 L/h/mm) of nominal valve size shall be allowed. When testing against existing valves is necessary, some leakage can be expected and should not be the sole basis for rejection.
- G. Hydrant. When hydrants are in the test section, the test shall be made against closed hydrant valves.
- H. Whenever the pipeline to be tested contains pipe of different diameters, joint types and material, the allowable makeup water shall be calculated separately for type and corresponding length of line. The resulting allowable makeup water rates shall be added to obtain the total allowable leakage for the entire pipeline.
- I. All joints in piping shall be watertight and free from visible leaks during the hydrostatic field test. All visible leaks shall be repairs regardless of the amount of leakage.
- J. Acceptance shall be determined based on the hydro test. If any test of laid pipe requires makeup water greater than that specified, repairs or replacements shall be accomplished, and the pipe retested.

END OF SECTION

DIVISION 35 WATERWAY AND MARINE CONSTRUCTION

SECTION 35 22 00
FLAP GATES AND SLIDE GATES

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:

1. The CONTRACTOR shall furnish all labor, materials, equipment and incidentals required to install, ready for operation and field test stainless steel gates and appurtenances as shown on the Contract Drawings and as specified herein.
2. The gates and appurtenances shall be supplied in accordance with the latest edition of AWWA C561 Standard for Fabricated Stainless Steel Slide Gates as modified herein. The allowable leakage rate for the stainless steel gates in this specification shall be 1/2 the allowable leakage listed in the latest revision of AWWA C561.
3. Gates installed in drinking water or water treatment applications shall be NSF/ANSI 61 certified. Provide manufacturer certification of conformance to this standard.

B. Related Sections include, but are not limited to:

1. Section 01 31 13 - Project Coordination.
2. Section 01 33 00 - Submittal Procedures.
3. Section 01 45 00 - Quality Control.
4. Section 01 50 00 - Temporary Facilities and Controls.
5. Section 01 77 00 - Closeout Procedures.

1.02 REFERENCES

A. Reference Standards:

1. HI – Hydraulic Institute Standards.
2. ASTM – American Society for Testing and Materials.
3. AISI – American Iron and Steel Institute.
4. ANSI – American National Standards Institute.
5. AWWA - American Water Works Association.

1.03 SUBMITTALS

- A. Shop Drawings and Product Data:** Submit, in accordance with Section 01 33 00, detailed specifications, drawings, and data covering all materials, parts, devices, equipment, and other accessories forming part of equipment for the complete operational system.
- B. Manufacturer's Instructions:** Furnish under provisions of Section 01 33 00.
- C. Operations and Maintenance Data:** Submit in accordance with Section 01 33 00 on all parts, devices, equipment, and other accessories furnished forming the complete operational system. Include a complete write-up of how the sluice gate and associated actuator are to operate and be maintained and how to make adjustments and repairs.

1.04 QUALITY ASSURANCE

- A. Sluice gates shall be complete with operators and actuators specified and installed as shown on Drawings. Sluice gates shall be complete with all appurtenances specified or shown on Drawings for installation, maintenance and operation. All material and equipment shall be new and of the highest quality.
- B. Sluice gates and actuators shall be supplied by one single manufacturer.

1.05 DELIVERY STORAGE AND HANDLING

- A. Delivered materials shall be stockpiled and stored at locations approved by the OWNER until required for installation. Materials shall be stored in accordance with manufacturer's instructions.
- B. CONTRACTOR shall inspect materials upon delivery for loss or damage in transit. CONTRACTOR shall be responsible for the replacement of damaged materials; damaged materials shall be removed from the Site.

PART 2 PRODUCTS

2.01 SLUICE GATES

A. GENERAL

- 1. Sluice gates shall be designed assuming a maximum flood elevation of 901.00 and assuming the gate well is empty of water. The operating floor and inverts shall be as indicated on the drawings for each gate well. The gate may be opened/operated when flood water elevation is at 896.00.
- 2. Conform to AWWA C561 unless modified herein this specification.
- 3. Gates shall be as specified herein and have the characteristics and dimensions shown on the Contract Drawings. Leakage shall not exceed 0.05 gpm/ft of wetted seal perimeter in seating head and unseating head conditions.
- 4. The gate shall utilize self-adjusting seals. Due to the difficulty of accessing gates when they are in service, gates that utilize adjustable wedges, wedging devices or pressure pads are not acceptable.
- 5. All structural components of the frame and slide shall be fabricated of stainless steel having a minimum thickness of 1/4-inch and shall have adequate strength to prevent distortion during normal handling, during installation and while in service.
- 6. Slide gate frames shall be shipped fully assembled with the invert member welded to the side frames and the slide installed in the frame unless the overall width of the slide gate exceeds 96 inches, or the overall height of the slide gate exceed 25 feet.
- 7. All welds shall be performed by welders with AWS D1.6 certification.
- 8. Finish: Mill finish on stainless steel. Welds shall be sandblasted to remove weld burn and scale. All iron and steel components shall be properly prepared, and shop coated with a primer.
- 9. Materials:
 - a. Frame Assembly and Retainers: Stainless Steel, Type 304L or 316L, ASTM A240

- b. Slide and Stiffeners: Stainless Steel, Type 304L or 316L, ASTM A240
- c. Stem: Stainless Steel, Type 304 or 316, ASTM A276
- d. Anchor Studs: Stainless Steel, Type 316, ASTM A276
- e. Fasteners and Nuts: Stainless Steel, Type 316, ASTM F593/F594
- f. Invert Seal (Upward Opening Gates Only): Neoprene or EPDM ASTM D-2000
- g. Seat/Seals and Facing: Ultra-High Molecular Weight Polyethylene ASTM D4020
- h. Lift Nuts: Bronze ASTM B584
- i. Pedestals and Wall Brackets: Stainless Steel, Type 304L or 316L, ASTM A240
- j. Operator Housing: Cast aluminum or ductile iron
- 10. Manufacturer:
 - a. Whipps, Inc. Series 900 Stainless Steel Gate
 - b. Fontaine, Series 20

B. FRAME

- 1. The frame assembly, including the guide members, invert member and yoke members, shall be constructed of formed stainless steel plate with a minimum thickness of 1/4-inch.
 - a. Frame design shall allow for embedded mounting, mounting directly to a wall with stainless steel anchor bolts and grout or mounting to a wall thimble with stainless steel mounting studs and a mastic gasket material. Mounting style shall be as shown on the Contract Drawings.
 - b. All wall mounted or wall thimble mounted gates shall have a flange frame. Flat frame gates are not acceptable.
 - c. The structural portion of the frame that incorporates the seat/seals shall be formed into a one-piece shape for rigidity. Guide members that consist of two or more bolted structural members are not acceptable. Guide member designs where water loads are transferred through the assembly bolts are specifically not acceptable.
 - d. Gussets shall be provided as necessary to support the guide members in an unseating head condition. The gussets shall extend to support the outer portion of the guide assembly and shall be positioned to ensure that the load is transferred to the anchor bolts, or the wall thimble studs.
 - e. The frame shall extend to accommodate the entire height of the slide when the slide is in the fully opened position on upward opening gates or downward opening weir gates.
 - f. On self-contained gates, a yoke shall be provided across the top of the frame. The yoke shall be formed by two structural members affixed to the top of the side frame members to provide a one-piece rigid assembly. The yoke shall be designed to allow removal of the slide. The Yoke shall be sized to withstand normal operating loads as well as the maximum hoist output. The Yoke deflection shall not exceed 1/360 of the gate width or a maximum of 1/4" whichever is less at maximum operating load.
 - g. A rigid stainless steel invert member shall be provided across the bottom of the opening. The invert member shall be of the flush

- bottom type on upward opening gates.
- h. A rigid stainless steel top seal member shall be provided across the top of the opening on gates designed to cover submerged openings.
- i. A rigid stainless-steel member shall be provided across the invert of the opening on downward opening weir gates.

C. SLIDE

1. The slide and reinforcing stiffeners shall be constructed of stainless-steel plate. All structural components shall have a minimum thickness of 1/4-inch.
 - a. The slide shall not deflect more than $1/720$ of the span or $1/16$ inch, whichever is smaller, under the maximum design head.
 - b. When the width of the gate opening in feet multiplied by the maximum design head in feet is greater than 80 square feet the portion of the slide member that engages the guide shall be $1/2$ " thick. When the width of the gate opening in feet multiplied by the maximum design head in feet is greater than 120 square feet, the portion of the slide that engages the guide members shall be of a "thick edge" design. The thick edge portion of the slide shall have a minimum thickness of 2.5 inches.
 - c. Reinforcing stiffeners shall be welded to the slide and mounted horizontally. Vertical stiffeners shall be welded on the outside of the horizontal stiffeners for additional reinforcement. When required to maintain proper plate stress and deflection intermediate vertical gussets shall be provided. Appropriate safety factors shall be applied to the ultimate tensile and yield strength of the material.
 - d. The stem connector shall be constructed of two angles or plates. The stem connector shall be welded to the slide. A minimum of two bolts shall connect the stem to the stem connector.

D. SEALS

1. All gates shall be provided with a self-adjusting seal system to restrict leakage in accordance with the requirements listed in this specification.
 - a. All gates shall be equipped with UHMW polyethylene seat/seals to restrict leakage and to prevent metal to metal contact between the frame and slide. Seat contact pressure shall not exceed 600 psi at the design head.
 - b. The seat/seals shall extend to accommodate the $1-1/2$ x the height of the slide when the slide is in the fully closed or fully opened position.
 - c. All upward opening gates shall be provided with a resilient seal to seal the bottom portion of the gate. The seal shall be attached to the invert member, or the bottom of the slide and it shall be held in place with stainless steel attachment hardware.
 - d. All downward opening weir gates shall be provided with UHMW polyethylene seat/seals across the invert member.
 - e. The seal system shall be durable and shall be designed to accommodate high velocities and frequent cycling without loosening or suffering damage.

- f. All seals must be bolted or otherwise mechanically fastened to the frame or slide. Arrangement with seals that are force fit or held in place with adhesives are unacceptable.
- g. The seals shall be mounted so as not to obstruct the water way opening.
- h. Gates that utilize rubber "J" seals or "P" seals are not acceptable.
- i. The seal system shall have been factory tested to confirm negligible wear (less than 0.01") and proper sealing.

E. STEM

- 1. A threaded operating stem shall be utilized to connect the operating mechanism to the slide. On rising stem gates, the threaded portion shall engage the operating nut in the manual operator or motor actuator. On non-rising stem gates, the threaded portion shall engage the nut on the slide.
 - a. The threaded portion of the stem shall have a minimum outside diameter of 1-1/2 inches. Stem extension pipes are not acceptable.
 - b. The stem shall be constructed of solid stainless-steel bar for the entire length, the metal having a tensile strength of not less than 75,000 psi.
 - c. The stem shall be threaded to allow full travel of the slide unless the travel distance is otherwise shown on the Contract Drawings.
 - d. Maximum L/R ratio for the unsupported part of the stem shall not exceed 200.
 - e. The operating stem shall be designed to transmit in compression at least 2 times the rated hoist output with an effort of 40 lb on the crank or handwheel. The Euler column formula shall be utilized. Where a hydraulic or electric actuator is used, the stem design load shall not be less than 1.25 times the output thrust of the hydraulic cylinder with a pressure equal to the maximum working pressure of the fluid supply or 1.25 times the output thrust of the electric actuator at the stalled condition.
 - f. The stem shall be designed to withstand the tension load caused by the application of a 40 lb effort on the crank or handwheel without exceeding 1/5 of the ultimate tensile strength of the stem material.
 - g. The threaded portion of the stem shall have machine rolled threads of the full Acme type with a 16-microinch finish or better. Stub threads are not acceptable.
 - h. Stems of more than one section shall be joined by stainless steel or bronze couplings. The coupling shall be bolted to the stems.
 - i. Stems, on manually operated gates, shall be provided with adjustable stop collars to prevent over closing of the slide.

F. STEM GUIDES

- 1. Stem guide shall be provided when necessary to ensure that the maximum L/R ratio for the unsupported part of the stem is 100 or less.
 - a. The sluice gate shall be installed with 2x the number of stem guides calculated by the formula above.
 - b. Stem guide brackets shall be fabricated of stainless steel and shall be outfitted with UHMW or bronze bushings.

- c. Adjustable in two directions.

G. MANUAL OPERATORS

1. Unless otherwise shown on the Drawings, gates shall be operated by a manual handwheel or a manual crank-operated gearbox. The operator shall be mounted on the yoke of self-contained gates or on the pedestal of non-self-contained gates.
 - a. The gate manufacturer shall select the proper gear ratio to ensure that the gate can be operated with no more than a 40 lb effort when the gate is in the closed position and experiencing the maximum operating head.
 - b. An arrow with the word "OPEN" shall be permanently attached or cast onto the operator to indicate the direction or rotation to open the gate.
 - c. Handwheel operators shall be fully enclosed and shall have a cast aluminum housing.
 - d. Handwheel operators shall be provided with a threaded cast bronze lift nut to engage the operating stem.
 - e. Handwheel operators shall be equipped with roller bearings above and below the operating nut.
 - f. Positive mechanical seals shall be provided above and below the operating nut to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
 - g. The handwheel shall be removable and shall have a minimum diameter of 15 inches.
 - h. Crank-operated gearboxes shall be fully enclosed and shall have a cast aluminum or ductile iron housing.
 - i. Gearboxes shall have either single or double gear reduction depending upon the lifting capacity required.
 - j. Gearboxes shall be provided with a threaded cast bronze lift nut to engage the operating stem.
 - k. Bearings shall be provided above and below the flange on the operating nut to support both opening and closing thrusts.
 - l. Gears shall be steel with machined cut teeth designed for smooth operation.
 - m. The pinion shaft shall be stainless steel and shall be supported on ball or tapered roller bearings.
 - n. Positive mechanical seals shall be provided on the operating nut and the pinion shafts to exclude moisture and dirt and prevent leakage of lubricant out of the hoist.
 - o. The crank shall be cast aluminum or cast iron with a revolving nylon grip.
 - p. The crank shall be removable.
 - q. All gates having widths in excess of 72 inches and widths greater than twice their height shall be provided with two gearboxes connected by an interconnecting shaft for simultaneous operation.
 - r. Interconnecting shafting shall be constructed of aluminum or stainless steel.
 - s. Flexible couplings shall be provided at each end of the interconnecting shaft. Couplings shall be stainless steel or non-metallic.

- t. One crank shall be provided to mount on the pinion shaft of one of the gearboxes.
- u. If the operating assembly is motorized, a stainless-steel enclosure shall be provided over the interconnecting shaft to comply with OSHA regulations.
- v. An extended operator system utilizing chain and sprockets shall be furnished by the manufacturer when the centerline of the crank or handwheel, on a non-gear operator, is located over 48-in above the operating floor. Chain wheels are not acceptable.
- w. A removable stainless steel or aluminum cover shall be provided to enclose chain and sprockets.
- x. The extended operator system shall lower the centerline of the pinion shaft to 36-in above the operating floor.
- y. A handwheel may be utilized in conjunction with a gearbox in lieu of the extended operator system if the centerline of the pinion shaft is 60-in or less above the operating floor.
- z. Pedestals shall be constructed of stainless steel. Aluminum pedestals are not acceptable. Do not paint stainless-steel surfaces.
- aa. The pedestal height shall be such that the handwheel or pinion shaft on the crank-operated gearbox is located approximately 36-in above the operating floor.
- bb. Wall brackets shall be used to support floor stands where shown on the Drawings and shall be constructed of stainless steel.
- cc. Wall brackets shall be reinforced to withstand in compression at least two times the rated output of the operator with a 40 lb effort on the crank or handwheel.
- dd. The design and detail of the brackets and anchor bolts shall be provided by the gate manufacturer and shall be approved by the Engineer. The gate manufacturer shall supply the bracket, anchor bolts and accessories as part of the gate assembly.
- ee. Operators shall be equipped with fracture-resistant clear butyrate or lexan plastic stem covers.
- ff. The top of the stem cover shall be closed.
- gg. The bottom end of the stem cover shall be mounted in a housing or adapter for easy field mounting.
- hh. Stem covers shall be complete with indicator markings to indicate gate position.
- ii. When shown on the Contract Drawings, provide 2-inch square nut, mounted in a floor box, with a non-rising stem.
- jj. The square nut shall be constructed of bronze.
- kk. The floor box shall be constructed of stainless steel or cast iron and shall be set in the concrete floor above the gate as shown.
- ll. Provide one aluminum or stainless-steel T-handle wrench for operation.

H. ANCHOR BOLTS

- 1. Anchor bolts shall be provided by the gate manufacturer for mounting the gates and appurtenances.
 - a. Quantity and location shall be determined by the gate manufacturer.

- b. If epoxy type anchor bolts are provided, the gate manufacturer shall provide the studs and nuts.
- c. Anchor bolts shall have a minimum diameter of 1/2-inch.
- d. Anchor bolts shall penetrate the concrete structure wall and shall not penetrate the annulus fill between pipe and wall.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Installation of the gates and appurtenances shall be done in a workmanlike manner. It shall be the responsibility of the CONTRACTOR to handle, store and install the equipment specified in this Section in strict accordance with the manufacturer's recommendations.
- B. The CONTRACTOR shall review the installation drawings and installation instruction prior to installing the gates.
- C. The gate assemblies shall be installed in a true vertical plane, square and plumb.
- D. The CONTRACTOR shall fill the void in between the gate frame and the wall with non-shrink grout as shown on the installation drawing and in accordance with the manufacturer's recommendations.
- E. The CONTRACTOR shall add a mastic gasket between the gate frame and wall thimble (when applicable) in accordance with the manufacturer's recommendations.

3.02 FIELD TESTING

- A. Sluice Gates:
 - 1. After installation, all gates shall be field tested in the presence of the Engineer and Owner to ensure that all items of equipment are in full compliance with this Section.
 - 2. Each gate shall be cycled to confirm that they operate without binding, scraping, or distorting.
 - 3. The effort to open and close manual operators shall be measured and shall not exceed the maximum operating effort specified above.
 - 4. Electric motor actuators shall function smoothly and without interruption.
 - 5. Each gate shall be water tested by the Contractor, at the discretion of the Engineer and Owner, to confirm that leakage does not exceed the specified allowable leakage.

END OF SECTION